NAV1.960730.001

Navy Log
Aero-Otitis Media
Submarine
Personnel Record
circa 1941 - 1946
as received by the RECC

DEPARTMENT OF THE NAVY
BUREAU OF MEDICINE AND SURGERY
2300 E STREET NW
WASHINGTON DC 20372-5300

IN REPLY REFER TO
6470
Ser 21/0136
08 May 96

From: Chief, Bureau of Medicine and Surgery
To: Director, Department of Defense, Radiation Experiments Command Center, 6801 Telegraph Road, Alexandria, VA 22310-3398

Subj: AERO-OTITIS MEDIA STUDY OF SUBMARINE PERSONNEL LOG BOOK

Ref: (a) PHONCON BUMED (CAPT La Fontaine)/RECC (COL Bailey) of 3 May 96

Encl: (1) Two Copies of Aero-Otitis Media Study of Submarine Personnel Log Book

1. The original log book of the Aero-Otitis Media Study of Submarine Personnel conducted at the Medical Research Laboratory, Submarine Base, New London, Connecticut in 1944-1945 was discovered at the Naval Submarine Medical Research Laboratory (NSMRL) on 30 April 1996. The Bureau of Medicine and Surgery (BUMED) dispatched an officer on 2 May 1996 to obtain a copy of the log. The original log book remains secured at NSMRL.

2. In reference (a), it was agreed that BUMED would forward two copies of the log book to the Department of Defense Radiation Experiments Command Center (RECC), and that the RECC would assume responsibility for coordinating further evaluation of, and answering inquires regarding, the log's content. It was also agreed that the RECC would collaborate with the Department of Veterans Affairs (DVA) in this evaluation.

3. The Navy looks forward to continued close cooperation with the RECC and DVA in evaluation of this important historical document, including the identification of study participants and development of public releases and reports addressing the study.

4. My point of contact is Captain Richard L. La Fontaine, MSC, USN, (MED-211) who may be reached at (202)762-3447, DSN 762-3447, or FAX (202)762-0931.

W. M. PARSONS
Assistant Chief, Operational
Medicine and Fleet Support
Acting

Copy to:
HQ AFMOA/SGOE
NSMRL (w/o encl)

(Original log pages and attachments not numbered. Circled numbers added to copied pages. Complete copy comprises 444 pages, including attachments and this title page. Log ends on page numbered 227 with last entry dated May 10th [1946].)

(Facsimile of Log Book Cover)

LOG

AERO~OTITIS MEDIA

SUBMARINE ~
~ PERSONNEL

R E C O R D

U. S. GOVERNMENT PRINTING OFFICE
PROPERTY NO. 50187

Capt C.W. Shilling
Ltjg H.L. Haines

AERO-OTITIS MEDIA IN SUBMARINE PERSONNEL

Outline of Log:

History of Project

Previous Articles in Navy Medical Bulletin

Teed's Work and Articles

Dr. Stacy Guild's conference

June 19th Mitchel Field

Dr. Fowlers and Dr. Burnam's articles

July 4th Project Request

Dr. Haines arrives - September 9th 1944.

Mr. Harris pre and post pressure article

Capt. Shilling's paper Oct. 8th 1944

Project - problems - experiment - summary

Log began Oct. 23rd 1944.

Dr H. Haines

November 3, 1941

Captain Louis H. Roddis (MC) U.S.N.
Editor, U. S. Naval Medical Bulletin
Bureau of Medicine and Surgery
Navy Department
Washington, D. C.

Dear Captain Roddis:

I am enclosing a paper entitled "Aero-Otitis Media in Submarine Escape Training" which may or may not be of interest to you from the standpoint of publication in the Naval Medical Bulletin.

If you feel that some time in the future you may want to use it for publication, of course you may keep it. If, however, you feel that you do not have a place for the paper even in some future publication, would you be so kind as to return it to me and I will submit it to some other journal.

We contemplated for a time, working it into the series which we are sending to you concerning the audiometric determinations but have decided that it does not have a sufficiently close relationship to be included in this group.

Most sincerely,

C. W. Shilling
Lieut. Comdr. (MC) U.S.N.

CWS/mtr
encl.

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AERO-OTITIS MEDIA IN SUBMARINE ESCAPE TRAINING

by

Charles W. Shilling, Lieutenant Commander,

Medical Corps, United States Navy.

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At the Submarine Escape Training Tank, U. S. Submarine Base, New London, Connecticut, every candidate for "lung" training is subjected to 50 pounds increased air pressure in the recompression chamber, as required by training regulations, prior to entering the water for actual training with the submarine escape appliance.

As the air pressure in the chamber is raised, a feeling of pressure on the ear drums is noted because of the inequality in pressure on both sides of the drum caused by restricted air flow through the eustachian tube to the inner side of the drum in contrast to the more ready flow through the external auditory canals to the outer side of the drum.

The eustachian tube acts as a ventilating shaft and as a means of drainage for the middle ear. In the resting state its walls lie in apposition but ~~in spite of~~ notwithstanding this, for the majority of those taking air pressure, it permits of sufficiently rapid equalization so that no real difficulty is experienced. If difficulty is experienced, the act of swallowing or yawn-

ing causes the dilator muscles to contract and thus the tube is opened which for many is all the additional help necessary to facilitate equalization of air pressure. Others find that by closing the mouth, holding the nose and "blowing against the ears" they can more readily facilitate the opening of the eustachian tubes and thus achieve the rapid equalization necessary in taking high pressure air. An ear which is temporarily "blocked" may suddenly give way with a high pitched squeak which is audible to all those near the subject.

However, in some cases, none of these acts are effective in permitting equalization of pressure and if the application of air pressure is continued under these conditions, aero-otitis media results and it is with this condition that this paper is concerned.

Failure to properly ventilate the middle ear may be the result of ignorance or inexperience, but equlaization of ventilation may be temporarily impossible according to Armstrong and Heim (1) because of any of the following conditions: "Stenosis of the eustachian tube as the result of acute and chronic infections of the upper part of the respiratory tract, nasal obstruction, sinusitis, tonsillitis, tumors of the nose and nasopharynx, paralysis of the soft palate or superior pharyngeal muscles, enlargement of the pharyngeal or tubal tonsil, inflamma-

tory conditions of the eustachian tube or middle ear and scar tissue about the ostium of the eustachian tube". If such conditions exist the air pressure increase must be st opped and the subject returned to atmospheric air pressure (locked out) or there will be sharp pain in the ears accompanied by damage to the drum and middle ear.

This damage Armstrong and Heim (1) have called aero-otitis media — "an acute or chronic traumatic inflammation of the middle ear caused by a pressure difference between the air in the tympanic cavity and that of the surrounding atmosphere, commonly occuring during changes of altitude in airplane flights and characterized by inflammation, discomfort, pain, tinnitus, and deafness". Lovelace, Mayo and Boothby (2) say, "Aero-otitis media is caused by the lack of ventilation of the middle ear during changes in atmospheric pressure to such an extent that traumatization occurs in the tympanic cavity." At this point it might be well to note that whereas the pressure difference between atmospheric pressure (760 mm Hg) and 18,000 feet (380 mm Hg) is only 380 mm. of mercury, the difference between atmospheric pressure and 50 pounds (gauge) increased air pressure is 2585 mm. of mercury.

In our experience, the damage which can be noted with the otoscope ranges all the way from very slight congestion through marked congestion or inflammation, retraction, bleb formation

caused b y actual hemorrhage into the drum membrane, to complete rupture of the drum with frank hemorrhage from both the external canal and the eustachian tube. To the uninitiated, it is truly alarming to look at an ear that a few minutes before was white, glistening and normal and see a fiery red drum so congested and retracted as to cause obliteration of all normal landmarks and covered with bubble-like bulges caused either by or hemorrhage dissecting the strata of the drum membrane. Often this active congestion and hemorrhage extends onto the walls of the external auditory canal and must also extend into the tympanic cavity for blood at times comes from the eustachian tube in the absence of a rupture of the drum membrane.

Manigan (3) found "a fully retracted drum", "ecchymotic hemorrhages into the drum" and "inflammation around the pharyngeal opening of the eustachian tube". He also says, "hemorrhagic blebs in the external aural canal or on the drum membrane as the result of air trapped in the middle ear".

The individual complaints vary with the degree of damage from a mild feeling of fullness or "water in the ears" to excruciating pain. Deafness, either partial or complete, is an almost constant complaint. Tinnitus is a frequent complaint.

Some subjects experience severe pain in their sinuses, usually the frontal. This pain may be noted first when the pressure is being built up. It may be lance-like and momentary but frequently is steady and sever enough to ~~cause~~ necessitate the pressure ~~to be~~ being stopped

and the subject ~~to be~~ having "locked out" to normal air pressure again.

Nose bleed is occasionally encountered probably because of excessive trauma when holding the nose and "blowing against the ears". Bleeding, of course, occasionally comes from sinuses. Cases of severe toothache have at times developed under pressure which were relieved upon return to atmospheric pressure. Hidden cavities and leaky fillings have been invariably found in these cases.

A few case histories may serve to illustrate more clearly the various types of damage encountered in attempting to take 50 pounds increased air pressure.

Patient T - January 13, 1941. Complained of pain in both ears, which was of such severity that air pressure increase was halted at 7 pounds and the subject put in the outer lock where the air pressure was slowly dropped to normal atmospheric pressure while the others in the main compartment continued to increase the pressure until reaching 50 lbs. Examination revealed moderate congestion of both drums. By next morning there was evidence of clearing of the condition and by the 16th of January he was considered to be ready to try it again.

Patient N - December 23, 1940. Unable to take more than 20 pounds pressure so was "locked out" as described above. Complained of pain left ear only. Examination revealed right ear normal but left with marked congestion, retraction and bubble-like areas of hemorrhage into the drum membrane. Spit out considerable

blood streaked material draining from left eustachian tube. December 24 - some lessening of congestion. December 26 - clearing nicely with areas of hemorrhage becoming deep purple. December 27 - clearing continues with areas of hemorrhage showing organization with change to orange brown color. By January 22,-1941 - left drum completely cleared of acute dondition but dull, thickened and showing areas resembling scars.

Patient Ni - January 6, 1941. "Locked out" of pressure at 12 pounds. Complained of pain in the region of the frontal and ethmoidal sinuses. The frontal sinuses were cloudy to translumination and by X-ray also showed involvement. January 7 - Pain continues despite local heat and shrinkage of nasal mucous membrane. January 8 - As pain continues patient turned in sick bay for continuous treatment. Was discharged to duty on the 13 of January, free from pain. Had never had any sinus pain before.

Patient C - January 2, 1941. At the original ear examination both drums were dull, scarred and retracted and the left had a large white placque around the periphera and also a very thin translucent area just off center at about 4:30 o'clock. He was advised of the condition but since he was an officer candidate for Submarine School who had been sent a long distance, he was allowed to attempt "lung training". While taking pressure, he noted pain in his left ear and than a feeling as if something

had given away followed by relief of pain. He completed his training and reported to the Submarine Medical Examiner. A large perforation with ragged edges was found to have completely replaced the thin area noted prior to taking pressure. The ear remained clean and dry and the drum healed over by the 18th of January but the area of the scar is so large and thin that it will undoubtedly rupture again at the least pressure.

Patient D - November 3, 1940. Took 50 pounds pressure without any difficulty but as the pressure was being dropped felt slight pain and there suddenly appeared a marked hemorrhage of the left ear and of the nose. Contrary to instructions this man "held his nose and blew" while pressure was being dropped, thus inhibiting equalization of pressure. Examination of left ear after cessation of hemorrhage and cleaning out of canal revealed a drum which was a deep purplish-red with a rupture of fair size on the periphera of the drum at 11:30 o'clock,(pars flaccida)with blood still dripping from the perforation. Examination of the right ear showed marked congestion bulging and evidence of hemorrhage into the drum membrane but no rupture. Because of the danger of infection, the man was turned-in on the ward where the ward medical officer wanted to lance the right ear, refusing to believe that it had been normal upon examination less than an hour before. By the 20th of November, the right ear had cleared except for an area of organizing hemorrhage now brownish purple in color. The left ear drum however was

purplish-black in its entirety and devoid of the normal landmarks although the ruptured area had healed over. By December 3rd, both ears were almost normal except that the drums were dull and thickened and a brownish area still persisted in the right ear.

Patient M - January 8, 1941. Completed the pressure and the "lung" training but had continual pain in left ear since that time until reporting to sick bay on January 11 at which time there was marked bulging of drum with evidence of acute inflammation. Was given local treatment and general sedation but on 12 January condition was worse and a parancentesis was done with a heavy drainage of pus and marked relief of pain. Ear drained for a few days but eventually healed without complication. Although a mild upper respiratory infection was present at the time of admission on the 11th of January, it is believed that the otitis-media had its origin in the air pressure experience on the 8th as the pain had continued from that time.

Patient L - developed acute mastoiditis requiring immediate hospitalization. This developed almost immediately following a painful pressure exposure and there can be no doubt as to the etiology.

It is worthy of note that during the fiscal year July 1, 1940 to June 30, 1941, in which this study was undertaken, there were 4,333 officers and men examined for "lung" training. Of this number there were 256 turned down for the following defects:

Catarrhal condition of upper respiratory tract - 109; Otitis externa - 48; Tachycardia - 35; Hypertension - 38; Other general causes - 24. There were an additional 222 who failed to equalize pressure and were thus, at least temporarily, prevented from completing training. These conditions were in the main, only temporary for there were but 19 who were permanently disqualified and taken off submarines; 9 because of failure to equalize pressure and 10 because of defects noted during the physical examination of a nature serious enough to necessitate disqualification.

2751 of the men taking the 50 pound pressure test were included in this study. Of these 1866 were taking pressure for the first time, 44 had tried before but never successfully completed the pressure test and 941 had the pressure one or more times previously. Of the men taking pressure for the first time there were 152 men having ear trouble of sufficient severity to cause them to be "locked out" of the chamber before completing the test. This usually occured before reaching 10 pounds. In addition there were 139 men who had enough trouble to require the increase of air pressure to be stopped one or more times during the test. Of the experienced men taking pressure, there were 55 "locked out" and 25 who had to stop in order to equalize. Sinus pain forced a total of 9 men to

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come out of the tank while in addition there were 26 who experienced pain while the air pressure was increasing and 9 who experienced it during the dropping of the pressure. There were 40 men who experienced nose bleed during or immediately following the pressure test.

The clinical entity termed "aero-otitis media" is new only in its application to aviation medicine since traumatic pressure injury to the middle ear was observed and described as early as 1896 when Alt (4) reported three cases of "apoplectiform labyrinthitis" in caisson workers. However, his cases may have been due to compressed-air illness for as Anthony (5) says, "There are two main types of ear trauma, one where the symptoms are part of the symptom complex of caisson disease and produced by nitrogen bubbles in the cochlear and vestibular apparatus, the other where they are directly due to the action of the compressed air."

We know that as early as 1900 this distinction was clearly understood for Heller, Mager and von Schrotter(6) divided their cases of ear trauma in caisson workers into two groups. The first group consisted of cases of temporary deafness and vertigo caused by compression. The second group was composed of the cases which showed "Meniere's syndrome" and in which the aural lesions were thought to be due to nitrogen bubbles.

In 1909 Keays (7) reported on 3,692 cases of compressed-air illness. Of these, vertigo without other symptoms was noted in 113 cases, pains in the ears, hemorrhages from them and temporary deafness in 68 cases, Meniere's symptom-complex in 14 cases and apoplectiform deafness in 2 cases. Two years later Bassoe (8) reported that 87 men of a group of 161 caisson disease cases gave a history of ear affections, 33 complained of dizziness, and rupture of the drum occured in two cases.

Silberstern (9) in 1912 reported on 190 cases of caisson disease including 11 cases of hyperaemia of the ear drum, 12 of hemorrhage into the tympanum, 3 cases of myringitis and one case of suppurative otitis media. In the same year Hill (10) wrote his book on Diving in which he says, "The cases of ear trouble were of two kinds: (1) Cases of temporary deafness and vertigo, lasting not more than 8 to 14 days, and caused by non-equalization of the pressure on either side of the drum during compression. The tympanic membrane showed signs of congestion, and there appeared in some cases hemorrhages either in its substance or in the middle ear. Bloodstained sputum might be coughed up from the back of the throat, the blood coming from the Eustachian tube. (2) Cases of Meniere's Complex, vertigo, vomiting and deafness-symptoms which might persist indefinitely, and were caused by lesions produced b y air bubbles, either in the central tracts

of the cochlear vestibular nerve or in the internal labyrinth of the ear."

Anthony (5) in his excellent study of seventy cases of compressed air injuries to the ears and accessory sinuses occuring in the Memphis tunnels reports that, "Pain occurred in each of the 70 cases of compressed air injuries that I have seen. Eighteen cases complained of coughing up bloody secretion or of having a bloody discharge from the nose, 19 cases complained of vertigo, seven cases complained of severe tinnitus, three cases showed nystagmus which cleared up within one week, and one case complained of double vision, but the diplopia lasted only two or three days. Thirty-four cases complained of marked deafness in one or both ears. Fifty-five of these cases gave a history of having had an upper respiratory infection before entering the tunnel of compressed air, and on examination, I found that at least 95 per cent of the cases had evidence of an upper respiratory infection.

"Sixty-nine of the 70 compressed air injuries had ear injuries. The injury was bilateral in 31 cases and affected only one ear in 38 cases. There were 52 cases of acute congestion of the ear drum, 23 cases of hemorrhage in the drum, 19 cases of perilabyrinthitis, nine cases of otitis media, purulent acute, in each of which it was necessary to incise the ear drum, and two cases of acute mastoiditis."

The question of rupture of the tympanic membrane is one of great interest. All those working with compressed-air have seen cases and those reporting in the literature all agree that it does occur. Dewatripont (11) reports that "because of too rapid compression and also decompression, 18 have suffered a rupture of both tympanic membranes, 3 of one; at least the latter said to us that the blood drained from but one ear, but it is possible that the drum of the other was ruptured also, without external drainage of the blood being produced." This quotation brings up a most interesting problem, for he evidently is assuming that because there is frank hemorrhage from the external ear that there must be a rupture of the tympanic membrane. This is not true for it frequently occurs that there is a hemorrhage into the tympanic membrane with dissection of either the very thin outer epithelial layer or the equally thin inner layer from the middle fibronous layer and on occasions there is a rupture of either of these thin covering membranes allowing frank hemorrhage without a complete rupture through the entire tympanic membrane. As was noted above Silberstern (9) reported "12 hemorrhages into the tympanum" but he does not mention a single case of complete rupture of the drum. As noted earlier in this paper, hemorrhagic blebs and air bubbles have often been observed in the drum membrane itself. Blood has been noted coming from the external canal or from a eustachian tube

and upon examination no complete perforation of the drum could be demonstrated. This is not to say that perforation cannot occur for it does; but it is simply a warning not to assume a complete perforation because of hemorrhage. Guttich (12)(13)(14) presents animal experimental work and observations on men to prove that in rupture of the ear drum while diving or swimming under water, there is a flow of water into the middle ear causing such marked dizziness and loss of balance that without outside help the individual would not be able to make his way to the surface and would drown. "That death due to this type of vestibular imbalance is possible in swimmers cannot be doubted." He advises great care in deep diving especially in cold water and the wearing of oiled cotton in the external auditory canals. Van Dishoeck (15) has developed a pneumophone for the measurement of resistance of eustachian tubes in caisson workers.

U.S. Naval records on this condition are incomplete since many never report for treatment; others are treated as ambulatory patients and are not admitted to the sick list even for record; and others are given the disease diagnosis of Otitis Media. The proper diagnosis for these cases is Rupture, Traumatic, Tympanum #2548, Speciality letter U, for diving and submarine escape appliance. The Annual Report of the Surgeon General, U. S. Navy lists no such injuries for 1935, 1936, 1937 and 1938 but does list 2 cases for 1939. Vail (16) in 1929 quoted from a letter

from the Surgeon General of the Navy saying that there were "no admission to the sick list for damage to the ears that could be considered due to diving activity." He also quotes Lt. Comdr. G. H. Making with whom we agree when he says, "As is well known, the incidence of damage to the ear drums among diving personnel of the Navy is much greater than would appear from a study of the vital statistics published in the Surgeon General's annual report. This state of affairs obtains for one of two reasons: the condition is overshadowed by some other incident of diving more serious in nature or the ear damage is insufficient to warrant placing the diver on the sick list with the sending of the customary notice to the Bureau of Medicine and Surgery." Vail himself reports two cases of complete rupture of the drum one in three places with bleeding from the nose and from the affected ear. Proper recording and reporting of this condition is of extreme importance not only because of the danger of immediate complications but also because of the frequently associated diminution of auditory acuity.

As noted in the illustrative case histories; complications range from otitis media to mastoiditis but the most frequent and also the most serious complication of aero-otitis media is the associated loss of auditory acuity. This matter has been made the subject of a separate paper by Shilling and Everley (17) but it is important at this time to emphasize that the loss

may at times be sufficiently great to be disabling; and that it may take as much as a month to clear in favorable cases and in some cases may never return to normal.

Treatment of a conservative nature has been most effective in our series. In some of the first cases treated an attempt was made to equalize the air pressure by the use of an eustachian catheter or the ~~Pulligzer~~ Politzer bag but no more relief was obtained than by instillation of warm soothing oil to the ear. Anthony (5) tried inflation of the eustachian tubes in 25% of his cases but found no benefit and in fact says it is contra-indicated because of the frequency inflammation of the Eustachian tube. At the present time "auralgin" in the external ears and shrinking of the mucous membrane of the nose by spraying with an ephedrine inhalant is used exclusively in the treatment of these ears with excellent results. Manigan (3) recommends conservative treatment and advises against inflation or myringotomy even in the presence of a bulging drum membrane. For the restoration of normal hearing time is the only treatment available, as it is necessary to await the organization and final absorption of the blood and serum in both the drum membrane itself and in the inner ear.

The alleviation of this condition by the inhalation of helium-oxygen mixtures was advocated in 1939 by Lovelace, Mayo and Boothby (2) because of the increased speed with which it would diffuse through the eustachian tube into the middle ear. Crosson, Jones and Sayers (18) in the work on the Queens Midtown tunnel in N.Y.C.

found that 82 out of 84 locked out because of blocked ears were able to re-enter the pressure chamber without difficulty after breathing a helium-oxygen mixture for 3 minutes. Requarth (19) found not only that great immediate relief was obtained by breathing the helium-oxygen mixture but that he had much less "infection and suppuration" in the ears of the helium treated cases.

PREVENTION rests largely upon careful physical examination to eliminate men suffering from any acute or chronic upper respiratory infection, common head cold, acute or chronic tonsillitis, pharyngitis, sinusitis, otitis or marked obstruction of the nasal passages by polyps or deviated nasal septum.

The use of the helium-oxygen mixture during the taking of the pressure was advocated by the authors already quoted and by Hall (20) and has proven to be of undoubted value in assisting the men to take pressure without injury to the tympanic membrane.

Educational measures leading to a complete understanding of the value of swallowing, yawning and the use of the Valsalva inflation of the ear are of distinct value and should never be neglected.

If extensive pressure exposure is anticipated a pre-exposure audiometric study should be made both as a safeguard to the workman and to the employer.

SUMMARY. A study of 152 cases of aero-otitis media occurring in men undergoing submarine escape training is presented, with

seven complete illustrative case histories.

The anatomy, physiology, etiology, symptomatology, pathology, treatment and prophylaxis are discussed in some detail.

Special mention is made of the necessity for accurate reporting of these cases because of the complication of diminished auditory acuity.

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DO NOT ADDRESS THE SIGNER OF THIS
BUT ADDRESS YOUR REPLY TO
BUREAU OF MEDICINE AND SURGE.
NAVY DEPARTMENT, WASHINGTON,
AND REFER TO NO.

B-DLY

WASHINGTON, D.C. November 10, 1941.

Dear Shilling:

I have your paper on "Aero-Otitis Media in Submarine Escape Training," and propose to use it in a future number of the Bulletin, and at an early as possible date, as, of course, this is really naval medicine. The principal trouble we have had so far is lack of funds for publication, but I am putting up quite a scrap for more money and I think I am going to get it, and in which case we will have a little more leeway to publish. Lack of funds compelled me to pull a dozen or more articles out of the October number and shift them over into January.

No doubt you have received the Surgeon General's letter, which I prepared, in regard to the request of the New York ~~Navy~~ Yard for copies of your article on auditory injuries from noises.

With kind regards, I am,

Very sincerely,

Louis H. Roddis

LOUIS H. RODDIS
Captain, (MC) U. S. Navy
Editor, U. S. Naval Medical Bulletin

Lieutenant Commander C. W. Shilling, (MC) U.S.N.
U. S. Submarine Base
New London, Connecticut

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November 13, 1941

Captain Louis H. Roddis (MC) U.S.N.
Bureau of Medicine and Surgery
Navy Department
Washington, D. C.

Dear Captain Roddis:

Thank you very much for the letter in which you say that you will be able to use the paper entitled "Aero-Otitis Media in Submarine Escape Training."

I trust that you will get the necessary funds that you are asking for and thus will be able to publish some of the papers submitted to you.

As you will hope, if the letter you may already received, I have taken care of the matter of the request for a copy of my article for the New York Navy Yard.

Most sincerely,

C. W. Shilling
Lieut. Comdr. (MC) U.S.N.

(4) Sheets

C O P Y

MEDICAL RESEARCH LABORATORY
U. S. SUBMARINE BASE
NEW LONDON, CONNECTICUT

December 20, 1941

Captain John R. Poppen (MC) U.S.N.
Bureau of Aeronautics
Navy Department
Washington, D.C.

Dear Captain Poppen:

I am sending you this report which has been submitted for publication in the Navy Medical Bulletin, simply because I thought that you might be interested in the aviation angle which we have suggested.

The relationship between aero-otitis media and loss of auditory acuity has been well established and we believe is definitely proven by the experimental results which we present and we also feel that this may be of sufficient significance to the aviation branch to indicate a more thorough and painstaking investigation which, of course, we are not in a position to do because of lack of material.

Most sincerely,

C. W. Shilling
Lieut. Comdr. (MC) U.S.N.

C O P Y

(2) - Sheet 1

C O P Y

Refer to
No. Aer-F-30-HC

NAVY DEPARTMENT
BUREAU OF AERONAUTICS
WASHINGTON

1 January 1942.

Dear Dr. Shilling:

I have received and read your article on Auditory Acuity in Submarine Personnel with great interest. It represents a well planned and well executed study and should be a valuable contribution.

Our first reaction is to question the seriousness of aero-otitis media as a clinical entity among flying personnel. On the basis of our clinical experience, we find the condition to the extent of being disabling, very very rare. Among the flight surgeons with whom I have discussed the matter, there is a universal impression that it is, indeed, a rare exception that the condition is seen. The equalization of pressure in the middle ear is such a common happenstance that its efficient function is the subject of instruction, discussion and lore. They become so accustomed to the condition and their own pet means for providing adequate equalization that they do not encounter serious or even discomforting degrees of inadequate equalization of pressure.

Because of our impressions, I have checked through the records of the Bureau of Medicine and Surgery, and I find, for instance, that the incidence of otitis media, acute and chronic, for the year 1940 was 1.37 for flight personnel as compared with 2.92 for nonflight personnel. This may be partly a reflection of the care with which flying personnel are selected but the population included a large number of nonpilots, enlisted men who are not so carefully selected as the pilots. They represent the cross-section of enlisted personnel in general. Accordingly, we have never been seriously concerned about the problem from the point of view of its clinical significance.

Nevertheless, your suggestion to investigate the matter and determine its significance by painstaking investigation is well taken and we will initiate steps to carry out such a study.

With very best personal wishes and Seasons Greetings, I am,

Respectfully yours,

J. R. Poppen
Captain, (MC), U.S.N.

Lt. Comdr. C. W. Shilling, (MC) USN
U.S.Submarine Base
New London, Connecticut
Medical Department.

C O P Y

(2)-Sheet 2

C O P Y

MEDICAL RESEARCH LABORATORY
U. S. SUBMARINE BASE
NEW LONDON, CONNECTICUT

February 2, 1942.

Captain J. R. Poppen (MC) U.S.N.
Division of Aeronautics
Bureau of Medicine and Surgery
Navy Department, Washington, D.C.

Dear Doctor Poppen:

Thank you very much for your letter concerning the article on Auditory Acuity of Submarine Personnel, which we sent to you.

I guess I was overenthusiastic in my evaluation of the degree of importance to be attached to the condition of aero-otitis media as a clinical entity among flying personnel. We have also noted that deep-sea divers and trained pressure workers experience practically no difficulty in the proper equalization of pressure in the middle ear. Almost all of our trouble comes with the groups of students who are taking pressure for the first time. However, in the numerous histories which we took we did find a number of individuals on several occasions because of acute upper-respiratory infections who did have marked difficulty in taking pressure, --in some instances leading to actual repture of the ear drums, and these cases invariably showed not only the acute hearing loss which is commonly associated with acute aero-otitis media, but also showed a permanent loss of auditory acuity.

It is interesting to note from the statistical standpoint that flight personnel did not have as great an incidence of otitis media, acute and chronic, as did the non-flight personnel. However, it is a well known fact that the acute aero-otitis media does not generally got into the records, for the case usually clears in two or three days without infection of any kind and without the necessity of admission to the Sick List. As a matter of fact, we ha a very low incidence of acute otitis media, suppuration, and mastoiditis in the group of subjects which we have studied in this connection. Of over one thousand men experiencing aero-otitis media, only one developed mastoiditis, acute, and only three developed otitis media, acute, but in spite of this we did find a consistent loss in auditory acuity, even in the absence of more serious complications. It is true of course that experienced personnel rarely, if ever, have any difficulty in equalizing pressure.

Thank you very much for your interest in this matter.

With kindest personal regards,

C. W. Shilling
Lieut.Comdr. (MC) U.S.N.

CWS:JWK

HISTORY OF PROJECT

Aero-otitis Media which is the changes produced in the ear due to failure to adjust to changes in barometric pressure. The changes are objective and subjective. The subjective changes are fullness, deafness, pain, and sometimes vertigo. The objective finding graded (1) redness and injection along the manubrium and shrapnells area. (2) diffuse redness and echymosis of drum, (3) diffuse echymosis and evidence of fluid in drum and middle ear, (4) free bleeding in ~~canal~~, middle ear ruptured blebs on drum, or reuptured drum.

Wherever men have been subjected to changes in pressure (sand hogs, divers, flying personnel, submarines, etc.) there has been the problem of aero-otitis media. The problem is not a new one as Spanish writers of the 16th century spoke of the bleeding from mouth, nose, and ears in the pearl and sponge divers. At the Submarine Base, New London, Conn., aero-otitis media is seen in those taking pressure and lung training, the figure varying from 20% - 30% throughout the year. Some of these with aero-otitis media fail pressure and are dropped from submarines. Others with aero-otitis media pass and continue in subs. Those failing pressure are given two more chances of passing pressure before failing submarines. Those passing pressure are given lung training in tank and are subjected to pressure during this training. It is the object of this study to reduce the incidence and treat aero-otitis media. The problem of which this is a continuation has already been undertaken by Capt. C. W. Shilling, Lt. (jg) Everley and Comdr. Teed. (see articles in log --)

The problem of aero-otitis media in submarine personnel has been magnified tremendously by the war where many thousands are given lung training and pressure each year. There are more going through lung training in a month now than went through lung training in a year before the war. Over 13,000 were trained last year.

The problem of aero-otitis media is more easily studied here at Sub. base than in the Air service. The subjects are treated in groups and are given 50 lbs. pressure. There are no other contributing factors such as noise or lack or increase of oxygen. Men are examined immediately before and immediately after chamber runs.

(1)

(2) Excerpts from PART XIX of the series of articles on AUDITORY ACUITY IN SUBMARINE PERSONNEL -- published in NAVAL MEDICAL BULLETIN July 1945:

(2)

"This damage Armstrong and Mann have called aero-otitis media ....an acute or chronic traumatic inflammation of the middle ear caused by a pressure difference between the air in the tympanic cavity and that of the surrounding atmosphere, commonly occurring during changes of altitude in airplane flights and characterized by inflammation, discomfort, pain, tinnitus, and deafness."

"The clinical entity termed "Aero-otitis media" is new only in its application to aviation medicine since traumatic pressure injury to the middle ear was observed and described as early as 1886 when Alt reported three cases.....

"It is important at this time to emphasize that the loss may at times be sufficiently great to be disabling; and that it may take as much as a month to clear in favorable cases and in some cases may never return to normal."

"Although in the cases presented in this paper the damage has been caused by pressure in excess of one atmosphere, it is equally likely to occur, as pointed out by Armstrong and Mann, in aviators upon too rapid return from a rarified atmosphere to atmospheric pressure. It seems certain that loss of auditory acuity must also be associated with damage to the ears under these conditions. In 1935, Armstrong in reporting a free fall in space, reported an apparent diminution of hearing acuity probably due to "atmospheric conditions". In sixteen cases presented by Lovelace, Mayo, and Boothby experiencing difficulty with the ears during a rapid descent from a high altitude, subjective deafness was a symptom in seven, one complained of tinnitus, and all experienced a feeling of fullness or pain in the ears. This loss of hearing in the aviator becomes of particular significance during flight when voice communication is necessary."

Summary:

.....

"The positive relationship between loss of auditory acuity due to damage to the ears of divers during exposure to high pressure air and the same type of damage to aviators during too rapid return to atmospheric pressure from a rarified atmosphere was suggested."

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step toward an attempt to learn more concerning its nature. A logical procedure to follow will be the study of what may be thought to be normal specimens of the fish concerned to determine normal findings and the type of food found in the alimentary tract. A limited oceanographic survey of the grounds and levels at which the poisonous specimens are taken might shed some light on contamination of feeding grounds. The active part of the investigation would be feeding experiments with specimens of fish (when obtained) to determine gross toxicity in animals, and finally an attempt toxicologically at identifying and isolating the toxin which may be the active poison. A valuable lead in the identification of the toxin may be contained in the definite chain of symptoms seen in almost all reported cases of fish poisoning. The most important determination will be locating the source or genesis of the toxin so that steps might be taken to neutralize its occurrence, and thus a decadent industry be restored to the islands which need both the increased activity and a sounder source of food supply.

CONCLUSION

Pending recognition of the toxin and the agents producing it, it is recommended that the species of fish mentioned herein be avoided in certain seasons when caught in the Virgin Island-Culebra areas; that larger and spawning members of these species be avoided, and, finally, that the caranx and barracuda be avoided at all times.

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AUDITORY ACUITY AMONG SUBMARINE PERSONNEL

PART I

By Lieutenant Commander Charles W. Shilling, Medical Corps, United States Navy, and Chief Pharmacist's Mate Ira A. Everley, United States Navy

The term "submarine ears" has long been applied to anyone in the Navy who has demonstrated any degree of deafness, and thus deafness came to be regarded as associated with submarine duty. It has been observed by the authors that many men of long submarine experience have normal hearing and thus we determined to investigate the allegation to find whether or not it was based on fact.

(5)-Sheet 1

Deep-sea diving, Diesel engine exposure, gunfire exposure, and numerous other naval and industrial hazards have likewise come to be regarded as detrimental to hearing. Little or no accurate and controlled investigation has been done regarding any of these so-called naval hazards to hearing and it was decided, the necessary equipment being readily available at the Submarine Base, New London, Conn., to investigate the matter exhaustively.

In the course of this investigation over 1,500 audiometric examinations have been made. In all cases a complete otological history and physical examination were accomplished, including a record of any disease or injury incurred by the subject which might, in any way, affect the acuity of hearing.

Method.—For the first and major part of the audiometric examinations, we used a standard Western Electric 2A audiometer and for the latter part, a new standard Western Electric 6B audiometer. These instruments were calibrated in the factory and direct comparison of the two machines gave interchangeable results. Both machines were also checked against known normals and gave accurate readings throughout the entire range. A Hartmann tuning fork set was used with forks ranging from 128 (C) to 2049 (C4). The watch used for testing the hearing was an Ingersoll, although for a large group both the Ingersoll and a Navy standard stop watch were used. The whispered and spoken voice, and coin clicks were done in accordance with paragraph 1434, Manual of the Medical Department, United States Navy. The audiometric determinations were conducted in accordance with standard procedure either in a specially constructed soundproof room where the sound level was below 30 decibels, or under similar sound conditions in a room in the mine depot. The sound levels of the audiometric rooms and of the Diesel laboratory were determined by means of a General Radio sound level meter, type number 759 which was calibrated at the factory and again at this base.

The otological examination included the physical examination of the ears by otoscope, the determination of the watch tick, whispered voice, spoken voice and coin click for both ears in accordance with the instructions as noted above, the Weber test, the Rinne test, the Romberg, the Babinski-Weill, and examination for spontaneous nystagmus, with any additional comment deemed necessary.

The history of each individual included the following information: Date, name, age, rank or rate, ship or station, length of naval service, submarine service, deep-sea diving duty, lung training duty, aviation duty; and in the case of machinist mates, the length of time with various types of Diesel engines; and in the case of radiomen, the length of time standing regular radio watches.

(5)-Sheet 2

A complete history of family deafness, difficulty in taking pressure, and of exposure to gunfire or explosion was taken. Routine gunfire exposure was considered to be that in which no more serious symptoms than slight loss of hearing for 15 to 20 minutes or ringing in the ears for about the same length of time had been experienced. Since almost all naval personnel have at times noted these minor symptoms they have, for the purpose of this investigation, been classified as "routine." Audiometric examination has demonstrated the correctness of this classification. The auditory threshold was determined by the "inaudibility to audibility" method and thus the ascending threshold is used throughout. The tone interrupter was used as a frequency check and audibility control.

Care was taken to have a complete understanding of the questions and to elicit a comprehensive history of frequent sore throat, colds affecting ears, bleeding from the ears, otitis media, otitis externa, perforated ear drums, sinusitis, mastoiditis, and any operative treatment of the ears, nose, throat, sinuses, or mastoids. Any history of diphtheria, scarlet fever, meningitis, and syphilis was also investigated.

The history automatically classifies the men in the following groups: Negative or normal, submarine duty, submarine machinist mate duty, submarine radio duty, diving duty, gunfire exposure, and, in addition, a large miscellaneous group in which there were additional positive factors other than those mentioned above or in which two or more of the above were positive for the same individual. Thus a submarine machinist mate might also have experienced an attack of scarlet fever as a child or had severe otitis media or had syphilis, any of which factors would eliminate him from the "pure" machinist mate submarine group and place him in the miscellaneous machinist mate group. There, of course, were others who had experienced severe gunfire trauma as well as having served in a submarine and thus must be included in the miscellaneous group. Those individuals having only one positive finding so far as the history was concerned, were classified as "pure" cases. Thus the "pure" submarine machinist mates are those cases giving a history of exposure to Diesel engines while on submarine duty and who gave no other positive history so far as trauma, accident, or illness that might affect the hearing. The "pure" machinist mate cases are presented as a separate group with the "miscellaneous" machinist mates composing an additional group.

HEARING LOSS DUE TO EXPOSURE TO DIESEL ENGINE NOISE

A. *Acute loss.*—This section concerns the acute loss of hearing, as determined by audiometric examination, due to exposure to the noise of Diesel engines for periods of 1, 2, 3, and 4 hours. The subjects were not selected men and they were not ruled out by a below average

(5)-Sheet 3

"normal" or preexposure audiogram, for the study was relative to the individual's normal hearing and only acute changes were being investigated. A series of audiograms were run prior to exposure to determine the normal level and, routinely, a history and physical examination of the ears was taken.

The exposure was given in the Diesel laboratory at the Submarine Base to the 16-cylinder V. M. I. experiment X S-20 and to the 10-cylinder radial type Continental engines. The V. M. I. was the noisier of the two with readings as high as 122 decibels as measured by use of the General Radio type 759 sound level meter. This level varied with the position of the meter from 100 decibels at the most remote point in the building to 122 decibels near the air intake on either the port or starboard side at the after end of the engine. The area where the men spent most of their time varied from 108 to 112 decibels. The Continental engine produced over-all sound levels measuring 85 decibels minimum throughout the laboratory and 103 to 112 decibels in various positions near the engine. These over-all sound levels do not reach the intensity of the engine room of a submarine as a 126-decibel average over-all sound level was reported by Mr. Wohlberg for two of our new submarines with main engines operating at normal cruising speed.

However, the auditory trauma produced in the laboratory was sufficient to cause marked loss, as will be noted by reference to table 1, showing the results of 9 representative cases.

TABLE 1.—*Acute damage, submarine Diesel engines*

Cycles	Ear	Sensation units			Percent loss normal hearing		
		Normal	1 hour exposure	Loss*	Normal loss	1 hour exposure loss	Difference loss
		Decibels	*Decibels*	*Decibels*	*Percent*	*Percent*	*Percent*
64	R	−0.2	+11	±10.8	+0.0	18.3	+18.3
	L	+3.7	+5	+1.3	6.7	8.3	+1.6
128	R	+5.52	+12.2	+6.68	6.8	13.6	+6.8
	L	+5.31	+9.6	+4.29	5.7	11.4	+5.7
256	R	+7.85	+18.77	+10.92	7.2	17.1	+9.9
	L	+7.86	+15.66	+7.80	7.2	14.4	+7.2
512	R	+3.70	+13.22	+9.52	3.2	10.5	+7.3
	L	+2.74	+13.33	+10.59	2.4	10.5	+8.1
1,024	R	−1.07	+10.00	+11.07	+.8	7.6	+8.4
	L	−1.50	+10.44	+11.94	+1.5	7.6	+9.1
2,048	R	+2.33	+19.55	+17.22	1.6	15.7	+14.1
	L	+5.70	+18.33	+12.63	4.7	14.1	+9.4
4,096	R	+17.32	+33.66	+16.34	14.7	28.3	+13.6
	L	+24.76	+41.33	+16.57	21.6	35.3	+13.7
8,192	R	+4.11	+18.77	+14.66	4.3	20.2	+15.9
	L	+7.30	+20.33	+13.03	7.4	13.8	+6.4
Average (all frequencies)				10.40			9.68

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Note that the normal level was below average for men of their age but 2 men of the group showed marked permanent hearing loss due to other causes. After 1 hour exposure the men were taken immediately to the sound room and in every case and for all frequencies, there was noted an acute loss of hearing. There was an average loss for the group of 10.4 decibels, which amounts to an increased loss of hearing of 9.68 percent. This loss following 1 hour exposure requires about 5 hours to return to the original normal level for the individual.

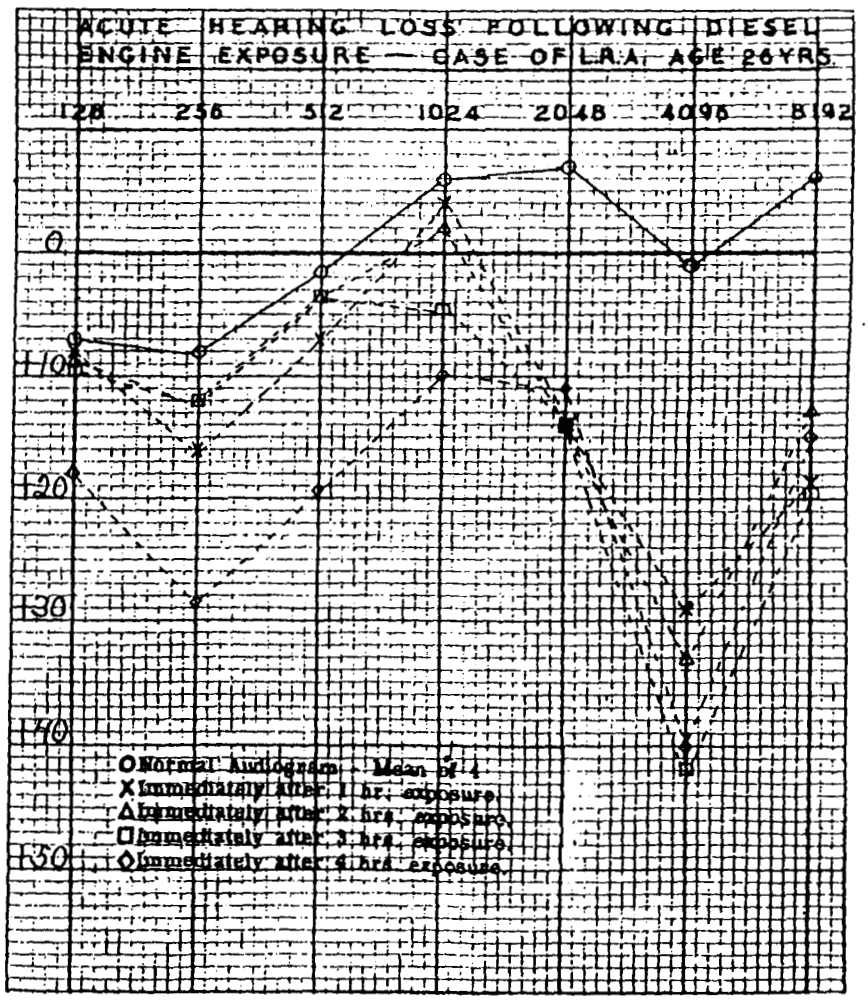

FIGURE 1.—Acute Hearing Loss Following Diesel Engine Exposure.

As seen in figure 1, the major part of the hearing loss is incurred during the first hour of exposure, with but a comparatively slight increase following the 2-, 3-, and 4-hour exposures. Yet, while hearing loss is only moderately increased, recovery time is greatly lengthened by increasing the time of exposure as is shown in figures 2 and 3. Following the 1 hour exposure (fig. 2), return to normal is practically

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complete in 5 hours; whereas, following the 2-, 3- (fig. 3), and 4-hour exposures, it is not complete even by the following morning or 20 hours later.

B. *Permanent loss.*—In determining the permanent loss of auditory acuity due to exposure to the noise of Diesel engines, all available machinist's mates on the submarines stationed here or on the Base itself, providing they had served on submarines previously, were given

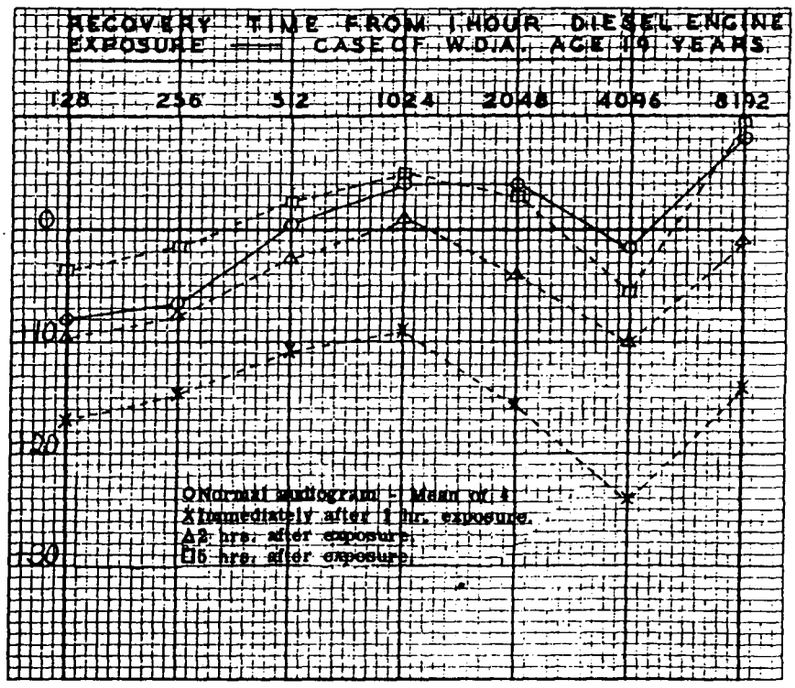

FIGURE 2.—Recovery Time From 1 Hour Diesel Engine Exposure.

audiometric and all of the other examinations described in paragraph A for "acute" loss. Men with acute colds, sore throat, etc., were excused until the condition had cleared in order that a true determination could be made.

A total number of 58 machinist's mates were thus examined. Of this number there were 22 who could be classified as "pure" inasmuch as they had no positive finding in their history other than service aboard submarines in the engine room. The remaining 36 were classified as "miscellaneous" machinist's mates since they had histories of disease, infection, accident or other conditions considered to have a possible bearing on their acuity of hearing.

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TABLE 2.—*Permanent damage, submarine Diesel engines*

	Ear	Frequency							
		56	128	256	512	1,024	2,048	4,096	8,192
Normal, ages 25-34	R	+0.5	−1.2	+4.8	+6.0	−0.2	+6.5	+10.1	+15.1
	L	+.9	−1.4	+2.9	+5.6	−.9	+5.3	+12.9	+14.9
Submarine machinist's mates "Pure", mean age 38.5	R	+6.9	+4.4	+12.2	+14.9	+7.7	+20.7	+44.3	+34.3
	L	+7.3	+4.7	+12.3	+13.9	+6.8	+21.2	+43.6	+33.4
Submarine machinist's mates "Miscellaneous", mean age 37.9	R	+7.2	+4.5	+12.0	+13.9	+5.9	+22.4	+43.5	+39.4
	L	+6.8	+3.3	+10.6	+11.8	+5.3	+25.4	+45.4	+38.0

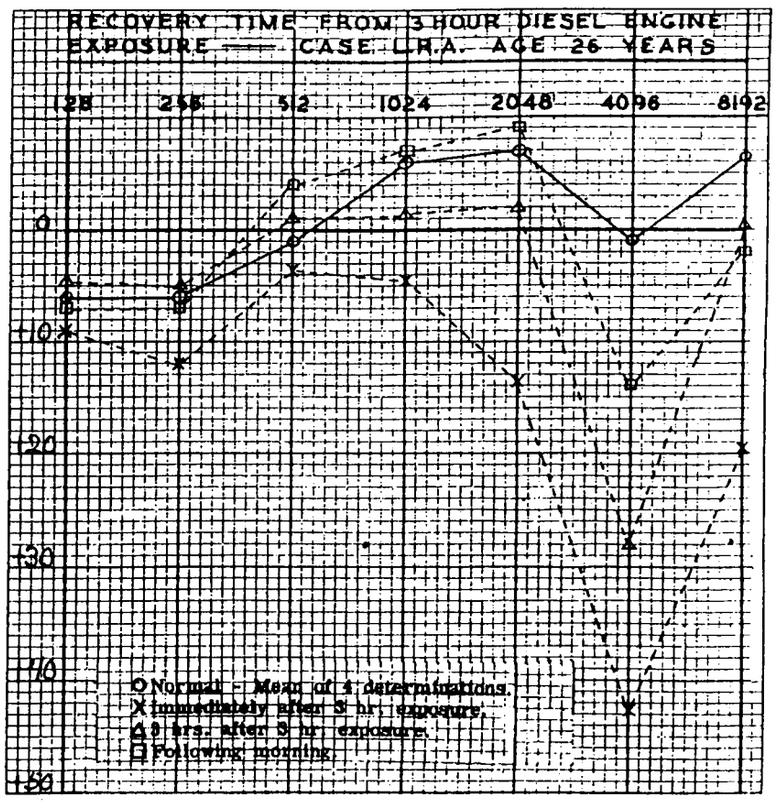

FIGURE 3.—Recovery Time From 3 Hour Diesel Engine Exposure.

Table 2 gives the arithmetic mean for the various frequencies for both the "pure" and "miscellaneous" groups and also as a comparison gives the mean for our group of normal subjects with an age range of 25 to 34 years; mean age 26.9 years; No. 23. This group gave negative answers to all of the questions in the history and had normal ears on otological physical examination and thus were used as the control or normal group. Our mean for the various frequencies was considerably less than that found for the same age group by the National

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Health Survey (1) on 10,418 ears, but their criterion for normal classification was only that the subject consider his hearing normal, thus their group was not so sharply selected as ours. Neither were their testing conditions as well controlled as to soundproof rooms as were ours.

Figure 4 is a composite showing the binaural mean position at each frequency of our "pure" and "miscellaneous" machinist's mates. In the same figure is a composite of our normal group for the ages 25–34 and that of Public Health (1)

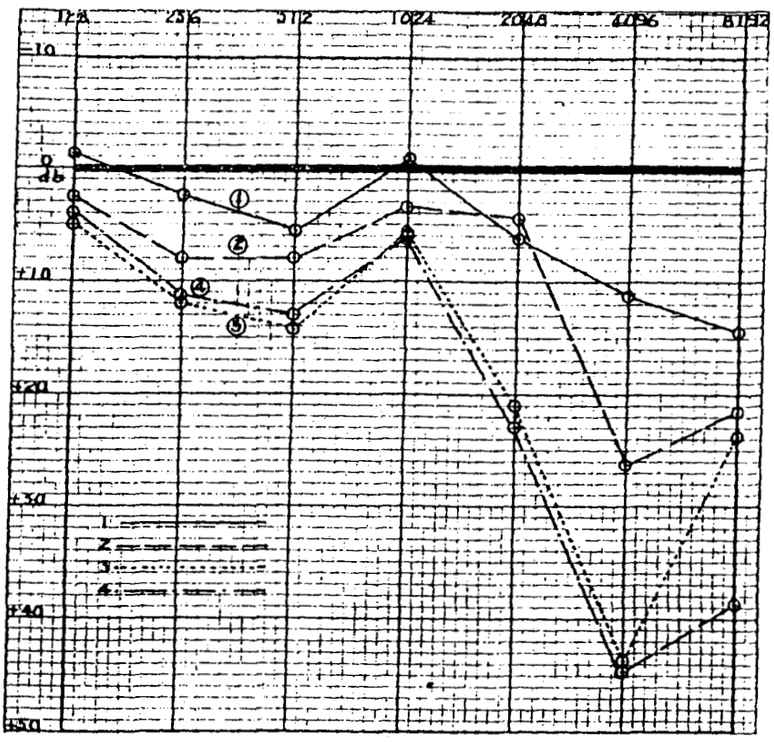

FIGURE 4.—A composite showing the binaural mean position at each frequency of our "pure" and "miscellaneous" machinist's mates.

1.—Our normal for 22 men, ages 25 to 34 years.
2.—Public Health normal for an unselected group, ages 35–44.
3.—Average of 22 "pure" cases—average age 38.5.
4. Average of 36 "miscellaneous" cases—average age 37.9.

in which the average age is 39.5. The average age for our "pure" group is 38.5 and for the "miscellaneous" 37.9. It is interesting to note that the loss for both groups runs parallel except for the 8,192 frequency in which there is a slight difference. In comparison with either normal there is shown additional loss of hearing for every frequency, which is exceptionally marked at 2,048, 4,096, and 8,192 frequencies. These composite audiograms of permanent loss show a remarkable resemblance to the audiograms of the men who had been given an acute exposure to the noise of Diesel engines.

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Figures 5 to 10, inclusive, are 6 typical audiograms of permanent damage in "pure" cases. The legend under each figure gives the necessary information in each case. They illustrate clearly the predilection to damage in the higher

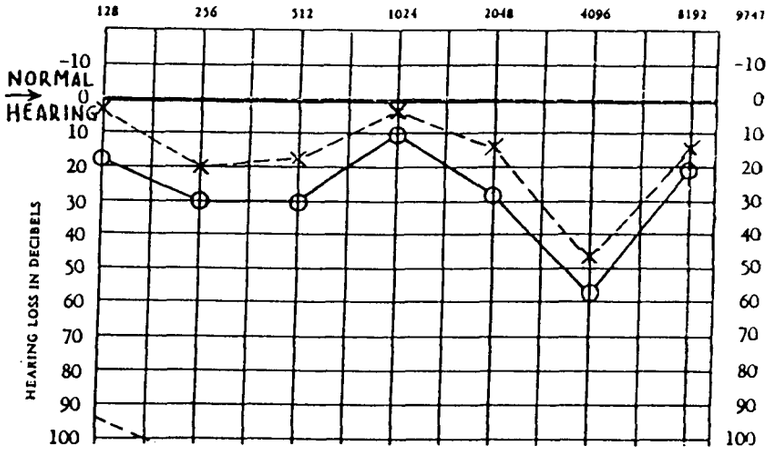

FIGURE 5.—R. T. W. Age 48 yrs. 20 yrs. Naval Service. 168 months with Nelsico, Busch Seltzer, and M. A. N. Diesel engines. Both ear drums thickened. Watch tick 14/40 both ears. Rinne positive. The remainder of the examination was negative.

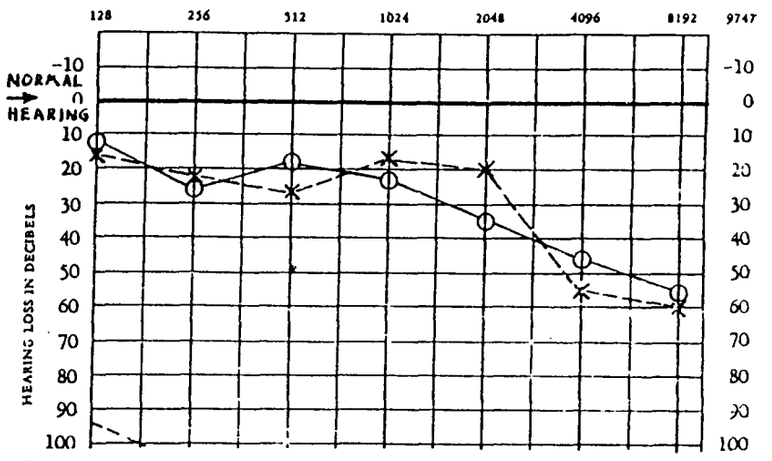

FIGURE 6.—T. H. C. Age 50 yrs. 20 yrs. Naval Service. 48 months with Nelsico and M. A. N. Diesel engines. Both drums thickened and dull. Watch tick—right 4/40, left 3/40. Whispered voice 13/15 both ears. Rinne positive. Remainder of the examination was negative.

frequencies. W. P. (fig. 8) is an excellent illustration of this for all frequencies approximate the normal except for 4,096 and 8,192 where the damage is extensive.

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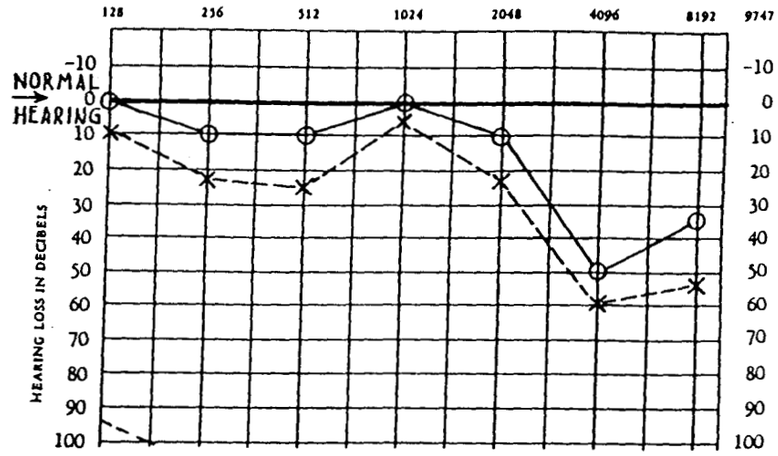

FIGURE 7.—J. E. F. Age 45 yrs. 20 yrs. Naval Service. 168 months with Nelsico and M. A. N. Diesel engines. Both drums dull. Watch tick—right 22/40, left 8/40. Rinne positive. Tinnitus left ear. The remainder of the examination was negative.

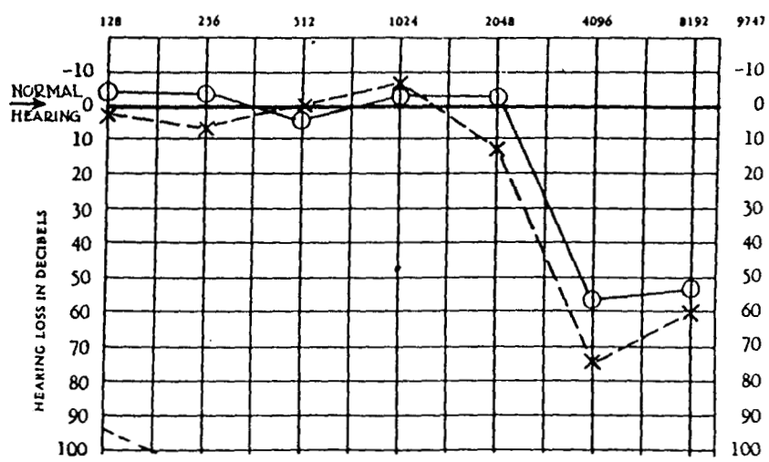

FIGURE 8.—W. P. Age 36 yrs. Naval Service 20 yrs. 156 months exposure to Diesel engines. Right drum large scar, dull and thickened. Watch tick—34/40 right and 32/40 left. Rinne positive. All other history and examination negative.

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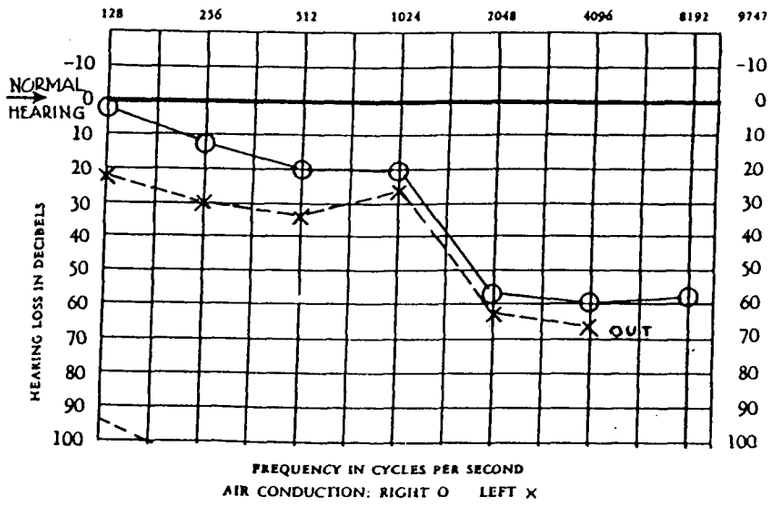

FIGURE 9.—F. A. D. Age 46 yrs. Naval Service 27 yrs. 24 months S/M Diesel engines. 36 months surface Diesel engines. 22 years engine room surface ships. Both drums slightly dull. Watch tick only on contact for both ears. Whispered voice, right 1/15, left 2/15. Spoken voice, right 10/15, left 12/15. Coin click, right 2/20, left 3/20. Rinne positive. Romberg slightly positive. History and physical otherwise negative.

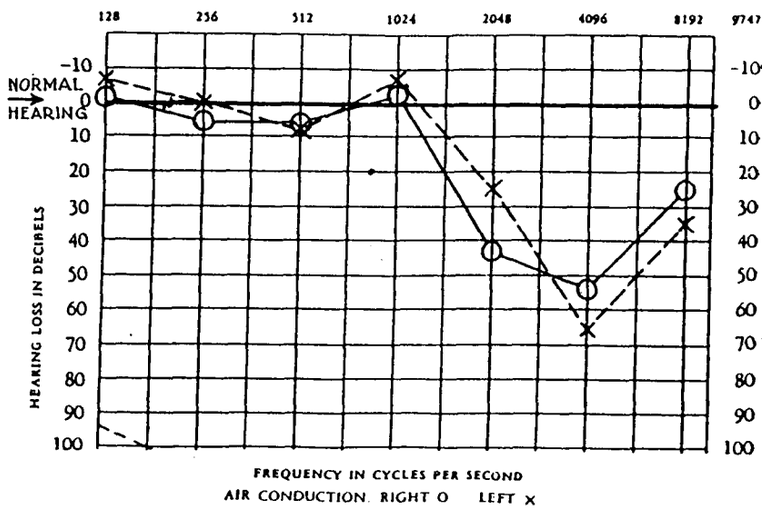

FIGURE 10.—G. E. W. Age 45 yrs. Naval service 20 yrs. 84 months Busch-Sulzer and Nelsico S/M Diesel engines. Remainder of time engine room surface ships. Both drums slightly thickened. Watch tick, right 18/40, left 3/40. Left ear, whispered voice 13/15, coin click 18/20. Rinne positive. History and physical otherwise negative.

(5)-Sheet 11

In figures 11 to 14, inclusive, we present 4 illustrative cases from our "miscellaneous" group. Again the legend under each figure is self-explanatory and gives a brief history of each case. The loss is the same for the individual cases as that noted in the composite shown in figure 4 where the predominate loss is for the 3 highest frequencies with 8,192 being completely inaudible on maximum power in several cases.

DISCUSSION

Data have been presented in paragraph A demonstrating the acute loss of hearing caused by exposure to the noise of Diesel engines. Bunch (2) says that, "The solution to the problem (proving the causal relationship between noise trauma and hearing loss) would be nearer if records of hearing tests before and after exposure to loud sounds were available; * * *." In our experiment on acute hearing loss such records are presented in tables and figures showing normal audiograms for each subject and then the audiograms showing the immediate acute damage and the follow-up audiograms showing the gradual return to the original normal level. Thus the relationship between the acute noise trauma produced by Diesel engines and loss of hearing is conclusively demonstrated.

In paragraph B, data have been presented demonstrating marked permanent loss of auditory acuity far in excess of any that could be accounted for by age or other factors. That oft repeated acute trauma causing the acute damage noted above has resulted in permanent and irreparable damage so far as auditory acuity is concerned can be the only logical conclusion.

There is quite general agreement among writers on this subject in describing the nature of traumatic deafness. Politzer (3) expresses it as follows, "In affections of the ear induced by the various trades, the results of the tuning forks are characteristic of a primary diseased condition of the nerves; * * *." Fowler (4) in 1929 stated that "It would appear that mid-high frequencies were particularly sensitive to various insults, especially acoustic trauma * * *." Bunch (2) presents several audiograms to illustrate the truth of these assertions. In both our acute and chronic cases there is ample confirmatory evidence that the damage is largely to the region of the cochlea involved in the reception of higher frequencies. That there is an associated actual nerve degeneration or destruction has been demonstrated by numerous pathological studies. Rosenblith (5) in 1941 reported on a survey conducted in France to determine the relationship between the "intensity and frequency distribution of industrial noises and the hearing loss which is commonly encountered in noisy professions * * *. It was possible to show that there was some proportionality between the average noise level and the temporary as well as the permanent hearing loss for corresponding groups of workers. However, all attempts to relate the frequency

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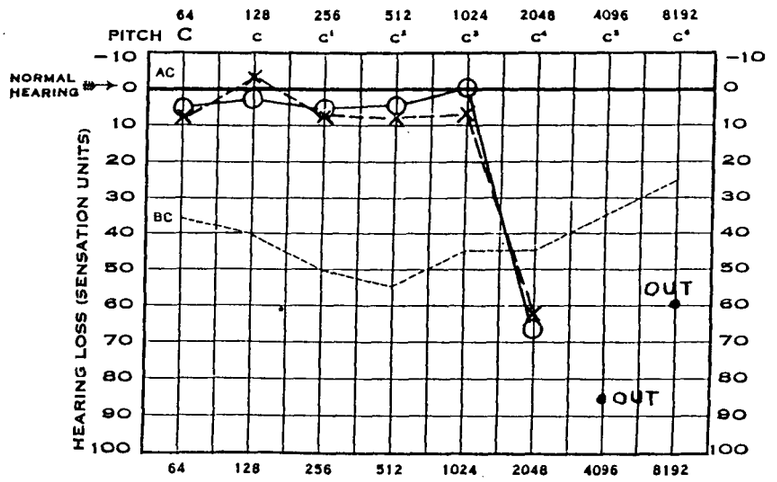

FIGURE 11.—S. J. C. Age 47 years. Naval Service 26½ yrs. In engine room on Eagle No. 55 for 11½ years and 7 years in the fire room under forced draft. Both drums dull. Watch tick contact only both ears. Whispered voice, 1/15 both ears. Coin click, 1/20 both ears. Rinne positive. History and examination otherwise negative.

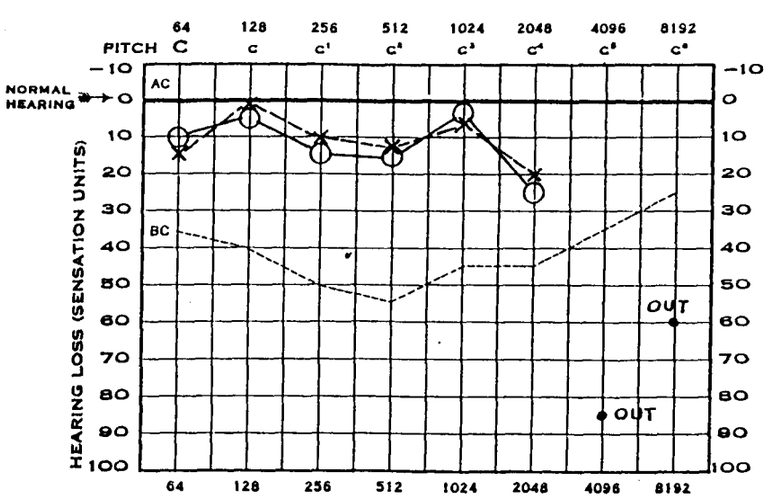

FIGURE 12.—L. B. W. Age 42 years. Naval Service 16 years. 20 months with Nelsico engines. Became overheated in engine room and became completely deaf for 2½ hours with but partial recovery, according to history. Both drums dull and thickened with evidence of chronic irritation in right. Watch tick, 1/40 both ears. Whispered voice, right 3/15, left 12/15. Coin click, right 2/20, left 3/20. Rinne positive. Weber to right. History and examination otherwise negative.

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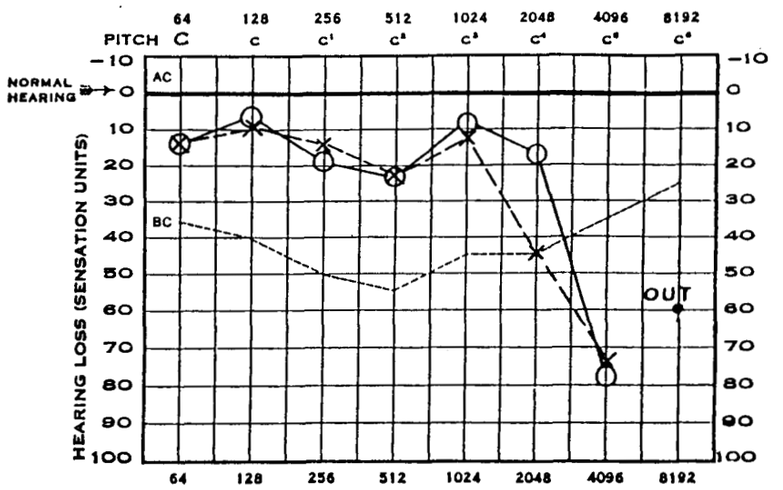

FIGURE 13.—N. T. W. Age 36 years. Naval Service 18 years. 143 months Nelsico and M. A. N. Diesel engines. Had diphtheria age 1 year. Well treated syphilis age 25 years. Left drum slightly dull. Watch tick 4/40 right ear and contact only on left ear. Coin click, 19/20 right and 17/20 left. Rinne positive. Weber to right side. History and physical otherwise negative.

FIGURE 14.—W. T. P. Age 38 years. Naval Service 16 years. 48 months with Nelsico engines. Aviation—13 hours in the air. Syphilis age 35 years, well treated. Ear drums slightly thickened. Watch tick, right 2/40 and left 4/40. Whispered voice, right 6/15 and left 10/15. Rinne positive. History and physical examination otherwise negative.

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spectrum of industrial noises to the corresponding hearing loss have failed so far, as the most important components of such noises are practically always below 1500 cycles while the hearing loss becomes severe for higher frequencies only." We find damage throughout the entire range with the major loss in higher frequencies. Certain other investigators also have reported this "high frequency deafness" after exposure to relatively "low frequency noises."

This loss of auditory acuity which we have shown, will of course reduce the efficiency of the individual so affected for communication by means of voice or sound and may lead to serious accident by failure to properly hear and execute orders or signals. Care should be taken to keep men who have become deaf out of positions where they will have to receive and relay or execute vital orders. Therefore, it is the opinion of the authors that the determination of auditory acuity should be given more weight in all physical examinations for selection of naval personnel. That there is marked slowing and loss of efficiency among personnel working under noisy conditions has been amply proven by many extensive studies such as the Aetna Life Insurance (1930) 2½-year test in which they found not only a general over-all increase in efficiency of 9 percent but an error reduction of 29 percent for the typists and of 52 percent for the comptometer clerks when the noise level was lowered. In a submarine there are many tasks more exacting than either of these and errors may be much more costly. Therefore, sound reduction assumes vital importance. The relationship between lowered efficiency and the production of fatigue by noise was amply demonstrated by Laird (6) where he showed an almost directly proportional relationship between the lowering of output and the increase in the loudness of the noise of the surroundings. General body fatigue is definitely increased by exposure to loud noises. There are other factors definitely connected with the problem of noise in a submarine which, while not within the scope of this paper are of unquestionable military significance; for example, the added protection against detection by sound devices.

In quieting the Diesel engines in submarines, weight, space, and cost are factors of such importance as may make such a procedure impractical or impossible. However, even though complete quieting was not accomplished, any reduction of noise would be splendidly worthwhile.

Ear defenders, such as are manufactured by the Mine Safety Appliance Co. and others are suggested as an alternative. These ear defenders are cheap and produce marked attenuation of noise (about 30 decibels) according to personal correspondence received from Vern O. Knudsen, without reducing the fidelity and provide

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(5)- Sheet 15

the necessary protection for the delicate mechanism of the ear from the trauma induced by the noise of Diesel engines operating in confined space.

SUMMARY

A technical introduction to a series of papers involving hearing losses due to exposure to various naval hazards has been presented.

Data have been presented illustrating the acute loss of hearing caused by exposure to Diesel engine noise.

Data have also been presented showing that this damage tends to accumulate and become permanent in those being constantly exposed over a period of years.

It has been pointed out that such hearing losses are to the detriment of the best interests of the Service.

The desirability of quieting the engines is suggested.

The wearing of ear defenders is advocated if quieting the engines is deemed impractical.

Further studies concerning naval hazards to hearing are in progress and will be presented as the work progresses.

(To be Continued)

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SILICOSIS AMONG NAVAL FOUNDRYMEN

By Captain E. W. Brown, Medical Corps, United States Navy, and Lieutenant Commander W. E. Klein, Medical Corps, United States Navy

INTRODUCTION

The main plan of the present study was a medical survey of the industrial personnel of the steel and the nonferrous foundries of the Naval Gun Factory of the Navy Yard, Washington, D. C., in order to ascertain the possible incidence of silicosis and tuberculosis. The principal objectives were: (1) to determine whether additional protective measures against silicosis were indicated in the foundries, (2) to remove men with silicosis from further harmful exposure, and (3) to

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are flooded to the sea wall with salt water, fewer cases are seen for awhile thereafter. There are also fewer cases seen during the winter; frost kills the larva. A number of cases are also encountered in workmen such as electricians, plumbers, and carpenters who come in contact with damp soil under houses. Wherever an infested domestic pet roams in suitable climate and soil, the infestation lurks.

The mode of transmission is larval skin penetration only. The disease is not communicable. The incubation period varies from hours to days. The dog and cat are potential carriers as long as they remain infested and continue to pollute soil. Susceptibility to infestation is universal. The more tender the skin, the greater the likelihood of infestment.

Creeping eruption is widely endemic in areas having favorable soil, temperature, and moisture for development. Prevalence of creeping eruption is rife in the areas above mentioned. Methods of control consist of prevention of soil pollution. Deny beach privileges to the domestic pet. Educate the bathers to use only that part of the beach which is washed by the tide. Treatment of the intermediate host with tetrachlorethylene is standard veterinary practice. Personal prophylaxis consists of wearing shoes and avoiding skin-soil contact in areas likely contaminated.

In the treatment of creeping eruption, two physical agents are specific, if properly applied: refrigeration and cautery. The former is accomplished by means of ethyl chloride spray or solid carbon dioxide. The parasite is localized 0.5 to 3 cm. in advance of the acutely inflamed end of the burrow. The spray is directed to this site, and application is continued beyond the blanching stage and until the skin treated feels like old leather between the palpating fingers. The tendency is to desist before sufficient refrigeration has taken place. A medical burn may be produced upon tender skin if the treatment is too prolonged, but this is not serious. Precaution should be taken concerning the inflammability of ethyl chloride. A container with a screw cap outlet permits better control and less waste. Solid carbon dioxide usually produces a more serious reaction but is, nevertheless, effective in topical application. Repetition of ethyl chloride treatment may be necessary, especially if the lesion occurs in the thick skin of the sole of the foot.

An alternate treatment is the actual use of the galvanic cautery. To locate the larva cleanse the skin with 70-percent alcohol and apply cedarwood oil to the suspected larval rest. Examine with a good hand lens or with a two-thirds inch objective lens of a dissecting microscope. The area surrounding the larva appears as a yellowish-white spherical mass of plasma or an accumulation of minute vesicles. Inject with a small sharp needle a few minims of 0.5 to 1 percent procaine to do-

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sensitize an area 1 cm. in diameter with the larva in the center. Apply cautery until a small burn is apparent. One application is sufficient. Except for the needle prick, this method is painless. Subsequent treatment may be that employed in any second-degree burn. We usually recommend boric acid solution soaks and boric acid ointment. Patients presenting gross lesions, particularly of the extremities, often require hospitalization.

CONCLUSION

1. Human skin infestation with the larvae of *Ankylostoma braziliense* (dog hookworm) causes a disease properly called creeping eruption.

2. Creeping eruption incapacitates an increasing number of personnel in our southern area of naval expansion.

3. The description, prophylaxis, and treatment of this highly aggravating infestation are reviewed.

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AUDITORY ACUITY IN SUBMARINE PERSONNEL

By Lieutenant Commander Charles W. Shilling, Medical Corps, United States Navy, and Chief Pharmacist's Mate Ira A. Everley, United States Navy

PART II[1]

HEARING LOSS DUE TO EXPOSURE TO RADIO UNDER SERVICE CONDITIONS

This is the second in a series of articles on auditory acuity in submarine personnel involving both acute and permanent loss of hearing due to various types of auditory trauma. In the first article (1) Diesel engine noise was conclusively demonstrated to be one of the causes of acute and permanent loss of hearing. In this article, we present a report on radiomen, both submarine and general service, and compare them to "normal groups" of like age. The technical operations and examinations for this section were conducted as detailed in the original article.

[1] Part 1. United States Naval Medical Bulletin. 42: 27–42, Jan. 1942.

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Opportunity for examining men suffering from acute loss due to exposure to sudden violent radio trauma did not present itself. However, although no cases were actually examined at the time of the acute exposure, many of the histories contained statements to the effect that while listening to a distant station, a nearby station suddenly came in with such power as to render the listener temporarily deaf, and in some cases, caused such shock that it was several minutes before recovery was sufficient to permit even routine work. Although but inconclusively demonstrated by our experiments, it is believed that this traumatism, especially when oft repeated, definitely leads to permanent loss of hearing.

TABLE No. 1—*Radiomen "pure"—permanent damage. Percent hearing loss*

Average length of exposure	Frequency (cycles)							
	64	128	256	512	1024	2048	4096	8192
30.3 months—ages 15–24	4.2	1.9	5.25	6.0	1.25	5.9	10.5	15.0
85.3 months—ages 25–34	8.33	2.5	6.9	10.2	4.0	9.8	23.27	23.5
148.2 months—ages 35–44	11.0	5.5	9.1	9.25	5.8	14.6	28.1	31.8

The permanent loss of hearing in radiomen is shown in tables 1 and 2. Table 1 demonstrates that hearing loss is significantly related to the duration of the exposure to radio work with ear phones. Thus, men of ages 15–24, averaging 30.3 months radio exposure, show an average hearing loss of 6.25 percent; men of ages 25–34, averaging 85.3 months, show an average loss of 11.6 percent; while men of ages 35–44, averaging 148.2 months, show an average hearing loss of 14.4 percent. This loss is apparent in the lower as well as the higher frequencies throughout the entire range tested. The loss is of significance when it is considered that these are "pure" cases, i. e., they give no history of disease, infection, injury or other trauma to account for the loss of hearing other than the exposure to the acoustic trauma of radio signals under service conditions, i. e., with ear phones. By comparing these groups with the normals given in table 2, it will be apparent that the loss is much greater than can be accounted for by age alone.

In table 2, we present "pure" radiomen divided into three groups as compared with three normal groups of the same age. Ages 15 to 24 and 25 to 34, inclusive, are compared with our normals for the same age. These normals, as explained in the first article, are those who gave no history of injury, infection, disease or any traumatism considered to be predisposing to loss of hearing. Ages 35 to 44 are compared to the Public Health normals referred to in the original article which, probably because they were not on selected subjects, tend to be higher than ours. Notwithstanding this, the radiomen show a

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significantly increased loss for every frequency. In the last two horizontal columns a compilation of all of the "pure" radiomen is given for comparison with all of the "miscellaneous" radiomen. As would be expected the additional trauma encountered by the latter group shows itself in an increased loss of hearing over the "pure" group in all frequencies.

TABLE No. 2.—*Radiomen—Permanent damage*

[Hearing loss in terms of decibels or sensation units]

	Frequency cycles							
	64	128	256	512	1024	2048	4096	8192
Our normal—ages 15–24	2.2	0.52	5.1	7.1	2.2	6.8	14.1	12.6
Radiomen (pure)—ages 15–24	2.5	1.7	5.9	7.5	1.7	7.4	12.4	14.4
Our normal—ages 25–34	1.5	1.2	4.7	7.2	−.4	5.6	14.0	16.3
Radiomen (pure)—ages 25–34	5.0	2.1	7.7	13.1	5.3	12.3	27.0	22.1
P. H. normal—ages 35–44	3.2	3.8	8.6	8.0	3.0	4.2	26.2	21.7
Radiomen (pure)—ages 35–44	6.4	4.9	10.1	11.7	5.5	18.7	32.7	29.7
Radiomen (pure)—all ages	5.5	1.1	9.0	11.3	4.6	16.2	28.6	27.3
Radiomen (miscellaneous)—all ages	4.6	3.9	11.3	13.4	6.1	19.2	33.1	29.9

In figures 1 to 4, inclusive, we present four individual audiograms of "pure" radiomen. It will be noted that but one had submarine duty, thus submarine service in itself is eliminated as the cause of this loss. It has been shown that age is not the controlling factor and since all other factors have been ruled out in these "pure" cases, the damage must be considered as unquestionably resulting from radio acoustical traumatism. Of particular interest is the loss of hearing in the mid-low frequencies as compared with the loss in the same frequencies resulting from exposure to diesel engine noise.

Significantly, the majority of earphones issued to the naval service are particularly resonant at these mid-low frequencies. This may be demonstrated by maintaining a constant input power level into the earphones and varying the frequency at this constant level. Pronounced resonance will be noted at about 400 to 500 cycles. This may account for the mid-low frequency hearing loss. Extreme loss in the high frequencies is also noted and is, particularly in the frequency 8192, greater than in exposure to diesel engine noise.

Two other specific cases are reported (figs. 5 and 6) from the "miscellaneous" radiomen group.

DISCUSSION

Data have been presented showing a permanent loss of hearing for radiomen in the naval service. As is to be expected, this loss has a high correlation to the length of service as radiomen. However, extreme loss of hearing is usually caused by some definite or oft-repeated acoustic trauma such as the "blasting" effect previously mentioned.

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PERMANENT LOSS—"PURE" RADIOMEN

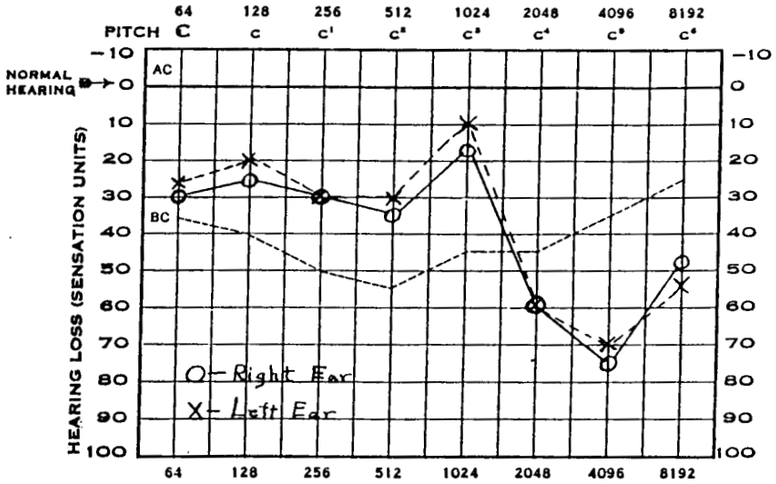

FIGURE 1.—W. M.—R. M. 1/c. Age 35 yrs. 16 yrs. naval service. 188 months wearing earphones. History otherwise negative. Watch tick right 8/40, left 28/40. Whispered voice right 4/15, left 4/15. Ear drums thickened. Physical otherwise negative.

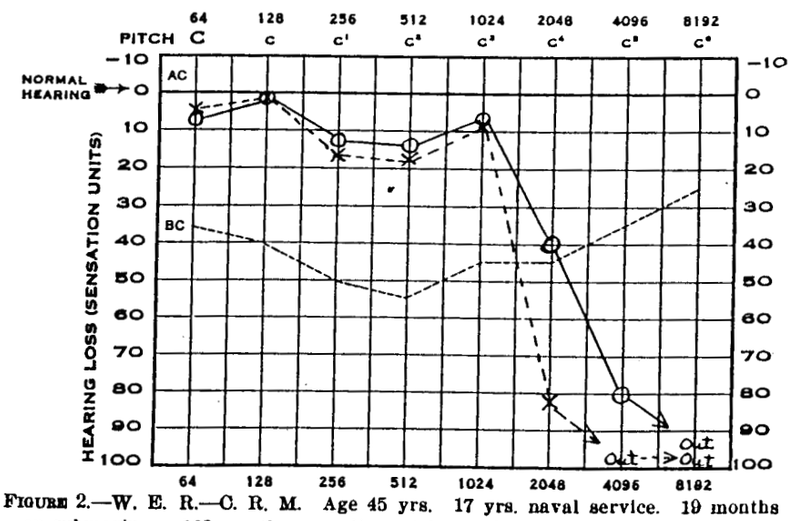

FIGURE 2.—W. E. R.—C. R. M. Age 45 yrs. 17 yrs. naval service. 19 months on submarines. 168 months as radio watch stander. History otherwise negative. Both drums slightly thickened. Watch tick contact only for both ears. Whispered voice right 6/15, left 8/15. Coin click 2/20 both ears. Weber lateralizes to the right. Physical otherwise negative.

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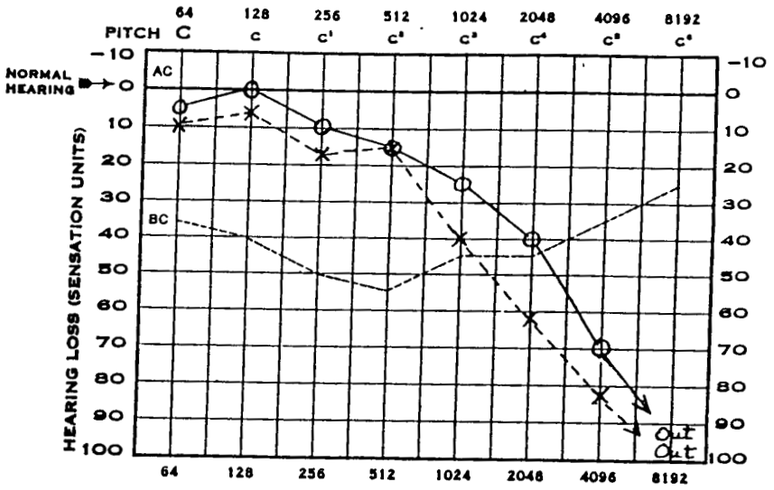

FIGURE 3.—J. W. P.—C. R. M. Age 40 yrs. 19 yrs. naval service. No submarine service. 216 months as radio watch stander. History otherwise negative. Left ear drum thickened. Watch tick right 4/40, left 2/40. Whispered voice right 7/15, left 1/15. Coin click right 18/20, left 2/20. Physical otherwise negative.

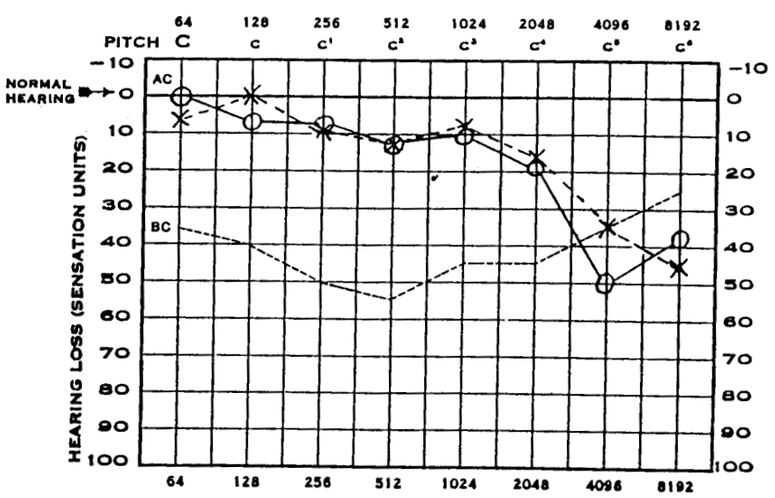

FIGURE 4.—J. L. E.—R. M. 1/c. 8 yrs. naval service. No submarine service. 60 months radio watch standing. History otherwise negative. Watch tick right 4/40, left 12/40. Physical examination otherwise negative.

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PERMANENT LOSS—"MISCELLANEOUS" RADIOMEN

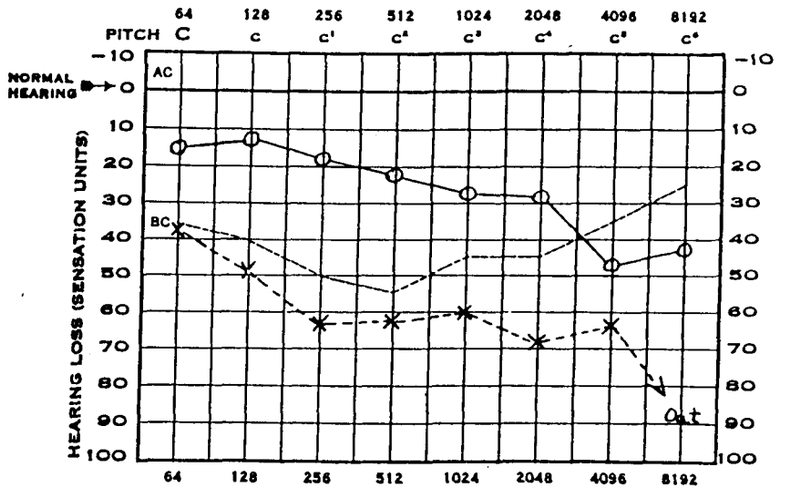

FIGURE 5.—H. A. M.—C. R. M. 20 yrs. naval service. 144 months submarine service. 168 months radio watch standing. Air pressure accident caused damage to left ear. Head colds cause partial temporary deafness. Examination right drum thickened and retracted, left drum scarred, thickened, retracted and numerous white plaques. Watch tick right contact, left 0/40. Whispered voice right 10/15, left 0/15. Spoken voice right 15/15, left 2/15. Coin click right 12/20, left 2/20. Weber lateralize to the right. Rinne positive on right, negative on left. Physical examination otherwise negative.

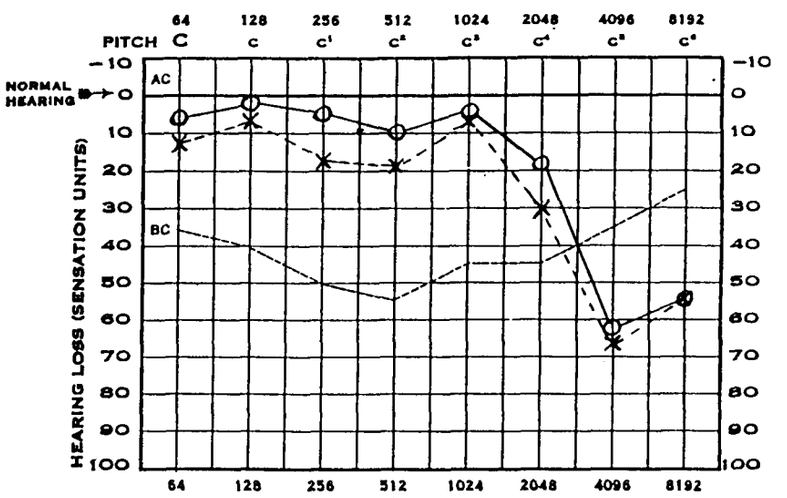

FIGURE 6.—J. S. L.—C. R. M. 17 years naval service. No submarine service. 84 months radio watch standing. Abscess left ear age 21 years, lanced, drained 3 weeks. History otherwise negative. Examinaion, right ear drum normal, left ear drum scar and thickened area 3 o'clock. Watch tick right 10/40, left 1/40. Whispered voice right 13/15, left 12/15. Coin click right 20/20, left 18/20.

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This trauma is not only significant from the viewpoint of loss of hearing but such acoustical trauma has been shown to have a marked effect in loss of efficiency and in increase in the number of errors made. Laird (2) demonstrated an increase in the speed of typing when the noise level was lowered as well as a reduction in the number of errors. Also of interest was the demonstration of the increase in metabolic rate associated with an elevation of the sound level, thus accounting for the early fatigue experienced when working under noisy conditions.

An investigation of the literature disclosed no reports on radiomen but Bunch (3) presented a review of the literature on "Deafness From the Use of the Telephone" and discussed six cases which he investigated and which tend to show that the mere use of the telephone in itself is not enough to cause permanent loss of hearing but that some definite acoustic shock, such as might result from lightning striking the line, etc., would definitely cause a marked permanent loss of hearing.

In this connection, our experiments demonstrate the fact that the exposure to the acoustical trauma in the wearing of earphones in radio work is sufficient to cause permanent loss of hearing. As in telephone work, extreme loss most often results from some oft-repeated trauma of a more or less violent nature.

It cannot be too strongly emphasized that all our radio equipment should be so constructed as to eliminate the possibility of such acoustic shock and trauma to our operators. Telephone companies and others in this field have long recognized this and have devised and installed various so-called guards. Of these, the "click" receiver is probably best adapted to navy use. The signal is not distorted, in fact intelligibility is improved. In this type, the shielding is done in the earphone itself. Some receiving sets are so constructed as to eliminate all peaks of noise and to cut in again automatically when the sound level becomes sufficiently reduced. Any feature tending to lower or eliminate the acoustical trauma is worth consideration.

The practice of many radio operators of wearing the ear phones behind the ears and increasing the volume is definitely wrong and should be discouraged as it ultimately leads to loss of hearing. The discomfort due to pressure on the ear is avoided by this practice but the acoustical trauma to the middle ear continues by way of bone conduction and because of the increased volume required for audibility may produce even greater injury.

It is readily seen from the data presented that it is not necessary that a man have a normal audiogram in order that he be a proficient radioman. Inasmuch as it is the practice on many ships for the radioman to be the "sound" operator as well, it was considered to be

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of interest to run audiograms on a group of men selected by their commanding officers as being excellent "sound" operators. This group was found to have audiograms which were below normal in every case and thus it seemed obvious that a normal audiogram is not a requirement for excellence as a "sound" operator.

The Manual of the Medical Department, paragraph 1535 (d) (3) prescribes that, "All officers and enlisted men of such ratings as may be assigned to listening duties shall be tested by the audiometer. The only permissible variation from the normal will be in the wave lengths of 128c and 4096c double frequencies."

Inasmuch as a majority of operators of demonstrated ability did not conform to the above requirements, we determined to find, if possible, some other method of selection which would be truly indicative of ability.

Ability in pitch discrimination being of primary importance for "sound" operators, a method of examining candidates for the sound school was set up and work is now in progress to determine the correlation between ability to discriminate pitch and demonstrated ability as sound operators. We determine pitch discrimination by an audio-oscillator at three frequencies—256, 1024, and 2048, which permits determinations to within one cycle above or below the reference notes mentioned. Controlled background noise levels are used in conjunction with these examinations to simulate actual conditions aboard ship.

SUMMARY

Data have been presented showing permanent loss of hearing due to radio acoustical traumatism.

It has been suggested that acute hearing loss probably follows acoustical shock and if repeated may result in permanent loss.

The desirability of some guard against this traumatism has been suggested and specific methods outlined for its prevention.

A supplementary examination for the selection of "sound" operators is offered in pitch discrimination. A study of this method is now in progress.

Further studies concerning naval hazards to hearing are in progress and will be presented as the work is completed.

To be Continued

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Auditory Acuity - Shilling & Everley:
Part III

⑤-Sheet 25

Complications.—Thirty-four patients out of this series made an apparent recovery and were returned to duty. Forty-six patients developed cardiac complications, and these were classified as follows; Mitral insufficiency, 40 cases; mitral stenosis, 4 cases; and pulmonary stenosis, 2 cases.

Two of the above patients during the acute stage developed a severe pericarditis with a large accumulation of pericardial fluid. Both cases with conservative treatment recovered, with complete absorption of the effusion, and a return of the heart borders to normal limits. Both cases had an accompanying myocarditis and endocarditis, which persisted, so that they were eventually separated from the service by reason of medical survey.

SUMMARY

The increased number of young recruits entering the Navy in this climate, and the acute throat and respiratory infections of winter, will undoubtedly lead to a sizable number of cases of acute rheumatic fever.

The care in diagnosis and treatment of this condition is of importance because of the serious complications which follow in its wake.

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HISTORY OF PSYCHOLOGICAL EXAMINING IN THE UNITED STATES NAVY [1] [2]

By Lieutenant Commander C. M. Louttit, United States Naval Reserve

While the famous psychological examining program of the Army during World War I was not adopted by the Navy, there was considerable activity by naval medical officers in the use of psychological tests in recruit selection. The earliest report on psychological examining

[1] C. M. Louttit, Lt. Comdr., D-V (S), USNR: Psychological examining in the United States Navy; an historical summary. Psychol. Bull. 39: 199–210, 1942.

[2] An abstract of the above named article for information for the medical officers of the Navy.

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was by H. Butts, who described a specially devised test in 1911. From that time until 1919 there were at least six additional tests used, of which three, by A. R. Shier, A. W. Stearns, and L. E. Bisch, were systematically developed and given to large numbers of men. Surprisingly, there seems to have been very little knowledge of what others were doing as there are no indications of any effort being made to utilize the results of the various studies for establishing a regular examination program in the Navy. After the war, in 1923, the Training Division of the Bureau of Navigation introduced the use of group classification tests at training stations, and in 1931 similar testing was started at recruiting stations. The influence of this program is suggested by a drop in percentage of recruits with mental ages below 11 years, from 17 in 1930 to 5 in 1931, a continuing decrease thereafter.

The second most frequently reported use of psychological examinations is in the selection of naval aviators. Here the first paper was published by R. P. Parsen, in 1918. In addition to this one paper, the most important reports are those of D. G. Sutton and C. G. De Foney describing an interview method of estimating personality characteristics.

Other reports describe phychological studies of officers, petty officers, fire-control plotters and listeners. The original paper includes a list of 57 references.

AUDITORY ACUITY IN SUBMARINE PERSONNEL

By Lieutenant Commander Charles W. Shilling, Medical Corps, United States Navy, and Chief Pharmacist's Mate Ira A. Everley, United States Navy

Part III

Rapid change in atmospheric pressure is often manifested by an inflammatory reaction in the middle ear, which, in turn, may lead to acute or permanent loss of auditory acuity. We have completed a study on each of these conditions, and because of their interrelationship, present them as section A and section B of part III of the series on *Auditory Acuity in Submarine Personnel.* Section A is a study of "Aero-otitis Media in Submarine Escape Training" and section B is "Hearing Loss Due to Exposure to Increased Air Pressure."

SECTION A

AERO-OTITIS MEDIA IN SURMARINE ESCAPE TRAINING [1]

At the Submarine Escape Training Tank, United States Submarine Base, New London, Conn., every candidate for "lung" training is sub-

[1] We wish to express our appreciation to Lt. Shirley H. Baron (MC), USNR, for his counsel and aid in interpreting the damage to the ears.

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jected to 50 pounds increased air pressure in the recompression chamber, as required by training regulations, prior to entering the water for actual training with the submarine escape appliance.

As the air pressure in the chamber is raised, a feeling of fullness on the ear drums is noted because of the inequality in pressure on the two sides of the drum caused by restricted air flow through the eustachian tube to the inner side of the drum in contrast to the more ready flow through the external auditory canal to the outer side of the drum.

The eustachian tube acts as a ventilating shaft and as a means of drainage for the middle ear. In the resting state its walls lie in apposition, but notwithstanding this, for the majority of those taking air pressure, it permits sufficiently rapid equalization so that no real difficulty is experienced. If any difficulty is experienced, the act of swallowing or yawning causes the dilator muscles to contract and thus the tube is opened which for many is all the additional help necessary to facilitate equalization of air pressure. Others find that by closing the mouth, holding the nose and "blowing against the ears" they can more readily facilitate the opening of the eustachian tubes and thus achieve the rapid equalization necessary in taking high-pressure air. An ear which is temporarily "blocked" may suddenly give way with a high pitched squeak which is audible to all those near the subject.

However, in some cases, none of these acts are effective in permitting equalization of pressure and if the application of air pressure is continued under these conditions, aero-otitis media results and it is with this condition that this paper is concerned.

Failure to properly ventilate the middle ear may be the result of ignorance or inexperience, but equalization or ventilation may be temporarily impossible according to Armstrong and Heim (1) because of any of the following conditions: "Stenosis of the eustachian tube as the result of acute and chronic infections of the upper part of the respiratory tract, nasal obstruction, sinusitis, tonsillitis, tumors of the nose and nasopharynx, paralysis of the soft palate or superior pharyngeal muscles, enlargement of the pharyngeal or tubal tonsil, inflammatory conditions of the eustachian tube or middle ear and scar tissue about the ostium of the eustachian tube." If such conditions exist the air pressure increase must be stopped and the subject returned to atmospheric air pressure (locked out) or there will be sharp pain in the ears accompanied by damage to the drum and middle ear.

This damage Armstrong and Heim (1) have called aero-otitis media

> * * * an acute or chronic traumatic inflammation of the middle ear caused by a pressure difference between the air in the tympanic cavity and that of the surrounding atmosphere, commonly occuring during changes of altitude

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in airplane flights and characterized by inflammation, discomfort, pain, tinnitus, and deafness.

Lovelace, Mayo, and Boothby (2) say:

Aero-otitis media is caused by the lack of ventilation of the middle ear during changes in atmospheric pressure to such an extent that traumatization occurs in the tympanic cavity.

At this point it might be well to note that whereas the pressure difference between atmospheric pressure (760 mm. Hg.) and 18,000 feet (380 mm. Hg.) is only 380 mm. of mercury, the difference between atmospheric pressure and 50 pounds (gage) increased air pressure is 2,585 mm. of mercury.

In our experience, the damage which can be noted with the otoscope ranges all the way from very slight congestion through marked congestion or inflammation, retraction, bleb formation caused by actual hemorrhrage into the drum membrane, to complete rupture of the drum with frank hemorrhage from both the external canal and the eustachian tube. To the uninitiated, it is truly alarming to look at an ear that a few minutes before was white, glistening and normal and see a fiery red drum so congested and retracted as to cause obliteration of all normal landmarks and covered with bubble-like bulges caused either by air or hemorrhage disecting the strata of the drum membrane. Often this active congestion and hemorrhage extends onto the walls of the external auditory canal and must also extend into the tympanic cavity for blood at times comes from the eustachian tube in the absence of a rupture of the drum membrane.

Manigan (3) found "a fully retracted drum", "ecchymotic hemorrhages into the drum" and "inflammation around the pharyngeal opening of the eustachian tube." He also reports, "hemorrhagic blebs in the external aural canal or on the drum membrane as the result of air trapped in the middle ear."

The individual complaints vary with the degree of damage from a mild feeling of fullness or "water in the ears" to excruciating pain. Deafness, either partial or complete, is an almost constant complaint. Tinnitus is a frequent complaint.

Some subjects experience severe pain in their sinuses, usually the frontal. This pain may be noted first when the pressure is being built up. It may be lancelike and momentary, but frequently is steady and severe enough to necessitate the pressure being stopped and the subject "locked out" to normal air pressure again.

Nosebleed is occasionally encountered probably because of excessive trauma when holding the nose and "blowing against the ears." Bleeding, of course, occasionally comes from sinuses. Cases of severe toothache have at times developed under pressure which were relieved

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upon return to atmospheric pressure. Hidden cavities and leaky fillings have been invariably found in these cases.

A few case histories may serve to illustrate more clearly the various types of damage encountered in attempting to take 50 pounds increased air pressure.

CASE REPORTS

Patient T.—January 13, 1941. Complained of pain in both ears, which was of such severity that air pressure increase was halted at 7 pounds and the subject put in the outer lock where the air pressure was slowly dropped to normal atmospheric pressure while the others in the main compartment continued to increase the pressure until reaching 50 pounds. Examination revealed moderate congestion of both drums. By next morning there was evidence of clearing of the condition and by the 16th of January he was considered to be ready to try it again.

Patient N.—December 23, 1940. Unable to take more than 20 pounds pressure so was "locked out" as described above. Complained of pain in the left ear only. Examination revealed right ear normal but left with marked congestion, retraction and bubblelike areas of hemorrhage into the drum membrane. Spit out considerable blood-streaked material draining from left eustachian tube. December 24.—Some lessening of congestion. December 26: clearing nicely with areas of hemorrhage becoming deep purple. December 27: clearing continues with areas of hemorrhage showing organization with change to orange brown color. January 22, 1941: left drum completely cleared of acute condition but dull, thickened and showing areas resembling scars.

Patient Ni.—January 6, 1941. "Locked out" of pressure at 12 pounds. Complained of pain in the region of the frontal and ethmoidal sinuses. The frontal sinuses were cloudy to translumination and by x-ray also showed involvement. January 7: Pain continues despite local heat and shrinkage of nasal mucous membrane. January 8: As pain continues patient turned in sick bay for continuous treatment. January 13: Discharged to duty, free from pain.

Patient C.—January 2, 1941. At the original ear examination both drums were dull, scarred and retracted, and the left had a large white plaque around the periphery and also a very thin translucent area just off center at about 4:30 o'clock. He was advised of the condition but since he was an officer candidate for Submarine School who had been sent a long-distance, he was allowed to attempt "lung training". While taking pressure, he noted pain in his left ear and then a feeling as if something had given away followed by relief of pain. He completed his training and reported to the Submarine Medical Examiner. A large perforation with ragged edges was found to have completely replaced the thin area noted prior to taking pressure. The ear remained clean and dry and the drum healed over by the 18th of January but the area of the scar is so large and thin that it will undoubtedly rupture again at the least pressure.

Patient D.—November 8, 1940. Took 50 pounds pressure without any difficulty but as the pressure was being dropped felt slight pain and there suddenly appeared a marked hemorrhage of the left ear and of the nose. Contrary to instructions this man "held his nose and blew" while pressure was being dropped, thus inhibiting equalization of pressure. Examination of left ear after cessation of hemorrhage and cleaning out of canal revealed a drum which was a deep purplish-red with a rupture of fair size on the periphery of the drum at 11:30 o'clock (pars flaccida), with blood still dripping from the perforation. Examination of the right ear showed marked congestion, bulging and evidence

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of hemorrhage into the drum membrane but no rupture. Because of the danger of infection, the man was turned in on the ward where the ward medical officer wanted to lance the right ear, refusing to believe that it had been normal upon examination less than an hour before. November 30: The right ear has cleared except for an area of organizing hemorrhage now brownish purple in color. The left ear drum however, is purplish-black in its entirety and devoid of the normal landmarks although the ruptured area has healed over. December 3: Both ears are almost normal except that the drums are dull and thickened and a brownish area still persists in the right ear.

Patient M.—January 8, 1941. Completed the pressure and the "lung" training but had continual pain in left ear since that time until reporting to sick bay on January 11 at which time there was marked bulging of drum with evidence of acute inflammation. Was given local treatment and general sedation but on January 12 condition was worse and a paracentesis was done with a heavy drainage of pus and marked relief of pain. Ear drained for a few days but eventually healed without complication. Although a mild upper respiratory infection was present at the time of admission on the 11th of January, it is believed that the otitis-media had its origin in the air pressure experience on the 8th as the pain had continued from that time.

Patient L.—Developed acute mastoiditis requiring immediate hospitalization. This developed almost immediately following a painful pressure exposure and there can be no doubt as to the etiology.

It is worthy of note that during the fiscal year July 1, 1940, to June 30, 1941, in which this study was undertaken, there were 4,333 officers and men examined for "lung" training. Of this number there were 256 turned down from the following defects: Catarrhal condition of upper respiratory tract, 109; otitis externa, 48; tachycardia, 35; hypertension, 38; other general causes, 24. There were an additional 222 who failed to equalize pressure and were thus, at least temporarily, prevented from completing training. These conditions were in the main, only temporary for there were but 19 who were permanently disqualified and taken off submarines; 9 because of failure to equalize pressure; and 10 because of defects, noted during the physical examination, of a nature serious enough to necessitate disqualification.

Two thousand seven hundred and fifty-one of the men taking the 50-pound pressure test were included in this study. Of these, 1,866 were taking pressure for the first time, 44 had tried before but never successfully completed the pressure test, and 941 had the pressure 1 or more times previously. Of the men taking pressure for the first time there were 152 men having ear trouble of sufficient severity to cause them to be "locked out" of the chamber before completing the test. This usually occurred before reaching 10 pounds. In addition, there were 139 men who had enough trouble to require the increase of air pressure to be stopped 1 or more times during the test. Of the experienced men taking pressure, there were 55 "locked out" and 25 who had to stop in order to equalize. Sinus pain forced a total of

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9 men to come out of the tank while, in addition, there were 26 who experienced pain while the air pressure was increasing, and 9 who experienced it during the dropping of the pressure. There were 40 men who experienced nosebleed during or immediately following the pressure test.

The clinical entity termed "areo-otitis media" is new only in its application to aviation medicine since traumatic pressure injury to the middle ear was observed and described as early as 1896 when Alt (4) reported three cases of "apoplectiform labyrinthitis" in caisson workers. However, his cases may have been due to compressed-air illness for as Anthony (5) says:

> There are two main types of ear trauma, one where the symptoms are part of the symptom complex of caisson disease and produced by nitrogen bubbles in the cochlear and vestibular apparatus, the other where they are directly due to the action of the compressed air.

We know that as early as 1900 this distinction was clearly understood for Heller, Mager, and von Schrotter (6) divided their cases of ear trauma in caisson workers into two groups. The first group consisted of cases of temporary deafness and vertigo caused by compression. The second group was composed of the cases which showed "Meniere's syndrome" and in which the aural lesions were thought to be due to nitrogen bubbles.

In 1909 Keays (7) reported on 3,692 cases of compressed-air illness. Of these, vertigo without other symptoms was noted in 113 cases, pains in the ears, hemorrhages from them and temporary deafness in 68 cases, Meniere's symptom-complex in 14 cases and apoplectiform deafness in 2 cases. Two years later Bassoe (8) reported that 87 men of a group of 161 caisson disease cases gave a history of ear affections, 33 complained of dizziness, and rupture of the drum occurred in 2 cases.

Silberstern (9) in 1912 reported on 190 cases of caisson disease including 11 cases of hyperemia of the ear drum, 12 of hemorrhage into the tympanum, 3 cases of myringitis and 1 case of suppurative otitis media. In the same year Hill (10) wrote his book on diving in which he says:

> The cases of ear trouble were of two kinds: 1. Cases of temporary deafness and vertigo, lasting not more than 8 to 14 days, and caused by nonequalization of the pressure on either side of the drum during compression. The tympanic membrane showed signs of congestion, and there appeared in some cases hemorrhages either in its substance or in the middle ear. Bloodstained sputum might be coughed up from the back of the throat, the blood coming from the Eustachian tube. 2. Cases of Menieres Complex, vertigo, vomiting and deafness—symptoms which might persist indefinitely, and were caused by lesions produced by air bubbles either in the central tracts of the cochlear vestibular nerve or in the internal labyrinth of the ear.

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Anthony (5) in his excellent study of 70 cases of compressed air injuries to the ears and accessory sinuses occurring in the Memphis tunnels reports that

> Pain occurred in each of the 70 cases of compressed air injuries that I have seen. Eighteen cases complained of coughing up bloody secretion or of having a bloody discharge from the nose, 19 cases complained of vertigo, 7 cases complained of severe tinnitus, 3 cases showed nystagmus which cleared up within 1 week, and 1 case complained of double vision, but the diplopia lasted only 2 or 3 days. Thirty-four cases complained of marked deafness in one or both ears. Fifty-five of these cases gave a history of having had an upper respiratory infection before entering the tunnel of compressed air, and on examination, I found that at least 95 percent of the cases had evidence of an upper respiratory infection.
>
> Sixty-nine of the seventy compressed air injuries had ear injuries. The injury was bilateral in 31 cases and affected only 1 ear in 38 cases. There were 52 cases of acute congestion of the ear drum, 23 cases of hemorrhage in the drum, 19 cases of perilabyrinthitis, 9 cases of otitis media, purulent acute, in each of which it was necessary to incise the ear drum, and 2 cases of acute mastoiditis.

The question of rupture of the tympanic membrane is one of great interest. All those working with compressed air have seen cases and those reporting in the literature all agree that it does occur. Dewatripont (11) reports that

> Because of too rapid compression and also decompression, 18 have suffered a rupture of both tympanic membrane, 3 of 1; at least the latter said to us that the blood drained from but 1 ear, but it is possible that the drum of the other was ruptured also without external drainage of the blood being produced.

This quotation brings up a most interesting problem, for he evidently is assuming that because there is frank hemorrhage from the external ear there must be a rupture of the tympanic membrane. This is in error, for it frequently occurs that there is a hemorrhage into the tympanic membrane with disection of either the very thin outer epithelial layer or the equally thin inner layer from the middle fibrous layer, and on occasions there is a rupture of either of these thin covering membranes allowing frank hemorrhage without a complete rupture through the entire tympanic membrane. As was noted above, Silberstern (9) reported "12 hemorrhages into the tympanum" but he does not mention a single case of complete rupture of the drum. As noted earlier in this paper, hemorrhagic blebs and air bubbles have often been observed in the drum membrane itself. Blood has been noted coming from the external canal or from a eustachian tube, and, upon examination, no complete perforation of the drum could be demonstrated. This is not to say that perforation cannot occur for it does; but it is simply a warning not to assume a complete perforation because of hemorrhage. Guttich (12), (13), (14) presents animal experimental work and observations on men to prove that in rupture of the ear drum while diving or swimming under water, there

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is a flow of water into the middle ear causing such marked dizziness and loss of balance that without outside help the individual would not be able to make his way to the surface and would drown. "That death due to this type of vestibular imbalance is possible in swimmers cannot be doubted." He advises great care in deep diving especially in cold water and the wearing of oiled cotton in the external auditory canals. Van Dishoeck (15) has developed a pneumophone for the measurement of resistance of eustachian tubes in caisson workers.

United States naval records on this condition are incomplete since many never report for treatment, others are treated as ambulatory patients and are not admitted to the sick list even for record, and others are given the disease diagnosis of Otitis Media. The proper diagnosis for these cases is rupture, traumatic, tympanum No. 2548, Speciality letter U, for diving and submarine escape appliance. The Annual Report of the Surgeon General, United States Navy lists no such injuries for 1935, 1936, 1937, and 1938 but does list two cases for 1939. Vail (16) in 1929 quoted from a letter from the Surgeon General of the Navy saying that there were "no admissions to the sick list for damage to the ears that could be considered due to diving activity." He also quotes Lt. Comdr. G. H. Mankin with whom we agree when he says:

> As is well known, the incidence of damage to the ear drums among diving personnel of the Navy is much greater than would appear from a study of the vital statistics published in the Surgeon General's annual report. This state of affairs obtains for one of two reasons: the condition is overshadowed by some other incident of diving more serious in nature or the ear damage is insufficient to warrant placing the diver on the sick list with the sending of the customary notice to the Bureau of Medicine and Surgery.

Vail himself reports two cases of complete rupture of the drum, one in three places with bleeding from the nose and from the affected ear. Proper recording and reporting of this condition is of extreme importance not only because of the danger of immediate complications but also because of the frequently associated diminution of auditory acuity.

As noted in the illustrative case histories; complications range from otitis media to mastoiditis but the most frequent and also the most serious complication of aero-otitis media is the associated loss of auditory acuity. This is completely considered in section B of this paper, but it is important at this time to emphasize that the loss may at times be sufficiently great to be disabling; and that it may take as much as a month to clear in favorable cases and in some cases may never return to normal.

Treatment of a conservative nature has been most effective in our series. In some of the first cases treated an attempt was made

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to equalize the air pressure by the use of an eustachian catheter or the Politzer bag but no more relief was obtained than by instillation of warm soothing oil to the ear. Anthony (5) tried inflation of the eustachian tubes in 25 percent of his cases but found no benefit and, in fact, says it is contra-indicated because of the frequently associated inflammation of the eustachian tube. At the present time "auralgan" in the external ears and shrinking of the mucous membrane of the nose by spraying with an ephedrine inhalant is used exclusively in the treatment of these ears with excellent results. Manigan (3) recommends conservative treatment and advises against inflation or myringotomy, even in the presence of a bulging drum membrane. For the restoration of normal hearing, time is the only treatment available, as it is necessary to await the organization and final absorption of the blood and serum in both the drum membrane itself and in the inner ear.

The alleviation of this condition by the inhalation of helium-oxygen mixtures was advocated in 1939 by Lovelace, Mayo, and Boothby (2) because of the increased speed with which it would diffuse through the eustachian tube into the middle ear. Crosson, Jones, and Sayers (17) in the work on the Queens Midtown Tunnel in New York City found that 82 out of 84 locked out because of blocked ears were able to reenter the pressure chamber without difficulty after breathing a helium-oxygen mixture for 3 minutes. Requarth (18) found not only that great immediate relief was obtained by breathing the helium-oxygen mixture but that he had much less "infection and suppuration" in the ears of the helium treated cases.

PREVENTION

Prevention rests largely upon careful physical examination to eliminate men suffering from any acute or chronic upper respiratory infection, common head cold, acute or chronic tonsillitis, pharyngitis, sinusitis, otitis, or marked obstruction of the nasal passages by polyps or deviated nasal septum.

The use of the helium-oxygen mixture during the taking of the pressure was advocated by the authors already quoted and by Hall (19) and has proven to be of undoubted value in assisting the men to take pressure without injury to the tympanic membrane.

Educational measures leading to a complete understanding of the value of swallowing, yawning and the use of the Valsalva inflation of the ear are of distinct value and should never be neglected.

If extensive pressure exposure is anticipated, a preexposure audiometric study should be made both as a safeguard to the workman and to the employer.

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SUMMARY

A study of 152 cases of aero-otitis media occurring in men undergoing submarine escape training is presented, with complete illustrative case histories.

The anatomy, physiology, etiology, symptomatology, pathology, treatment and phophylaxis are discussed in some detail.

Special mention is made of the necessity for accurate reporting of these cases because of the complication of diminished auditory acuity.

SECTION B

HEARING LOSS DUE TO EXPOSURE TO INCREASED AIR PRESSURE

A. Acute Loss.—The acute hearing loss as pointed out in section A, is usually part of the picture of aero-otitis media and results from damage to the middle ear occurring when the individual is unable to equalize the air pressure in the middle ear. This is most often caused by temporary or permanent nonpatency of the eustachian tube. In these cases, the hearing usually returns to normal within a few days but may be delayed for months in cases of severe damage and, in some cases, complete return to normal never occurs.

TABLE 1.—*Hearing loss in terms of decibels or sensation units*

Frequency (cycles)	128	256	512	1,024	2,048	4,096	8,192
Aero-Otitis Media	17.3	22.6	21.5	20.0	20.8	35.6	32.3
Our normal—Identical ages	−0.3	4.7	6.7	−0.3	8.1	9.7	8.6
Our normal—Entire group ages 25–34	1.2	4.7	7.1	−0.4	5.6	14.0	16.3

As will be noted by reference to table 1 and as is shown in figure 1, there is an almost uniform loss of 20 decibels for each frequency between the acute aero-otitis media cases and the normal groups. That this 20-decibel loss was of the conduction type of deafness was demonstrated by both audiometric and tuning-fork studies. Tinnitus was present in a number of cases. The degree of damage observed by otoscopic examination was not consistently reflected in the loss of hearing as determined by audiometry. However, it is probable that were it possible to see the midlde or inner ear, damage would be seen to more closely parallel the hearing loss. As pointed out by Requarth (18):

> In cases of more severe otitis the middle ear is filled with serosanguineous fluid, the drum is a dark bluish red and there is a middle-ear type of deafness. The less severe disorders subside in 24 to 48 hours, the drum resumes

[1] Part I. United States Naval Medical Bulletin. 40: 27–42, Jan. 1942; Part II. United States Naval Medical Bulletin. 40: April 1942.

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its normal appearance, and the hearing is unimpaired. Aero-otitis media associated with much fluid in the middle ear resolves slowly over a period of several days to several weeks. Hearing returns as the fluid resolves. In a significant number of patients the fluid becomes infected, perforation occurs, and typical suppurative otitis media results.

Hearing loss in a number of cases increased on the second and third days. This may be explained by coagulation of the extravasated blood in the ear drum and/or the middle ear, causing de-

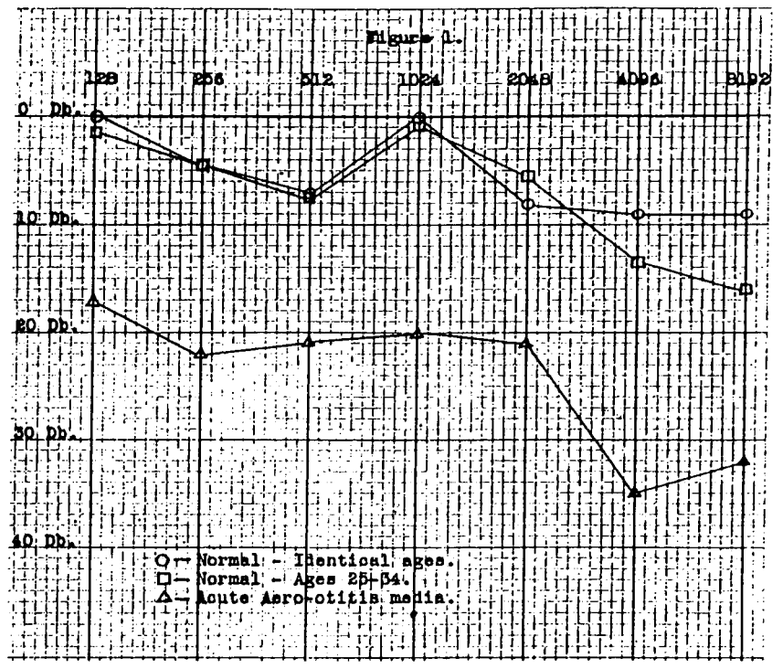

FIGURE 1.—Acute hearing loss associated with acute aero-otitis media as compared with normal groups. The "aero-otitis" curve is the average of 18 recent aero-otitis media cases tested for auditory acuity. The "same age" normal group is the average hearing found in a like number of men of identical ages taken from our general "normal" groups. The other normal group is our entire normal or control group for "ages 25–34."

creased mobility and difficulty of sound transmission. Another consideration is that damage to the drum and middle ear is caused by partial or complete blockage of the eustachian tube and in the attempt to take the pressure there is trauma which causes increased swelling of the mucosa in or around the naso-pharyngeal opening of the eustachian tube tending to produce complete occlusion. With this condition existing there will follow absorption of the oxygen from

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the air trapped in the middle ear, and this in turn will cause a cupping effect which will lead to further damage and contraction of the drum causing increased pressure on the ossicles. This may be severe enough to not only cause fixation of the chain but to jam the stapes into the oval window causing damage to the inner ear. The tinnitus, experienced by many, may be caused by this damage or may be an air-pressure phenomenon. This increased loss on the second and third day is well demonstrated in the case of M. L. W. shown in figure 2.

The case of J. D. S., figure 3, clearly demonstrates the fact that loss of auditory acuity is associated with aero-otitis media caused by failure to equalize air pressure, for in this case the right ear was not damaged in the least and suffered no auditory loss, whereas the left ear was damaged on three attempts at taking air pressure and showed marked loss of auditory acuity. Only the left ear is shown in figure 3.

That severe damage to the middle ear and the ear drum leads to marked loss of auditory acuity is shown by the cases of Dewatripont (11).

He reports 18 cases having suffered a rupture of both tympanic membranes and 3 of 1, due to "too rapid compression and also decompression." Of this group, "progressive deafness was started with all of them; 5 have a slight loss of hearing on 1 side and a medium or 5 percent loss on the other; 6 have a bilateral medium loss of 10 percent; 3 in 1 ear a medium loss and in the other a sharp loss, 15 percent; 2 having in 1 ear a sharp hearing loss and in the other a remarkable loss, 20 percent; 1 with marked tinnitus, 25 percent; 1 does not perceive in any manner the whispered voice at more than 10 centimeters and the conversational voice at more than 50 centimeters, therefore, attaining a bilateral deafness quite complete, 30 percent; 1 does not hear the watch nor the whispered voice, nor any tuning fork, nor even the conversational voice near to the ears and must be considered as attaining a complete bilateral deafness, 40 percent; and 1 has on 1 side a sharp hearing loss and on the other complete deafness, 50 percent; and also is subject to intense and frequent vertigo."

It should be noted that the diagnosis of perforation was made in several of these cases from a history of hemorrhage and we know that hemorrhage may occur in acute aero-otitis media without complete rupture of the drum.

Although in the cases presented in this paper the damage has been caused by pressure in excess of one atmosphere, it is equally likely to occur, as pointed out by Armstrong and Heim (1), in aviators upon too rapid return from a rarified atmosphere to atmospheric pressure. It seems certain that loss of auditory acuity must also be associated with damage to the ears under these conditions. In 1935, Armstrong (21) in reporting a free fall in space, reported an apparent diminution of hearing acuity probably due

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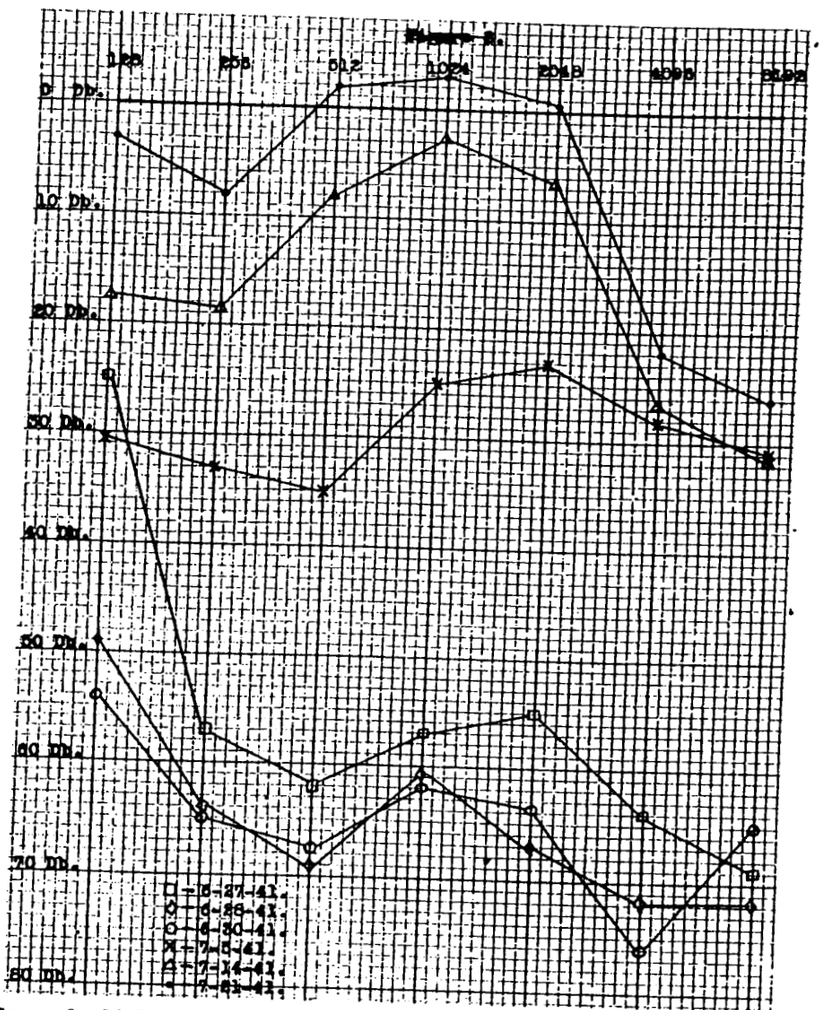

FIGURE 2.—M. L. W., Sea. 2c. Age 18 years. Six months naval service. No submarine duty and no history of previous acoustical trauma or predisposing disease. Failed in an attempt to take pressure on 6–27–41 because of pain in both ears, necessitating locking out at 22 pounds. Both ear drums showed marked congestion with engorgement of blood vessels and marked retraction. The original audiogram done on the same day shows an average loss of 55.6 db for all frequencies which is a remarkable loss but, on the second day (6–8–41), there was an additional loss amounting to an average of 9.1 db making a total average of 64.7 db for all frequencies. As will be noted, there was a substantial gain in auditory acuity during the first week; however, almost a month elapsed before return to normal and even then there was not complete recovery for the frequencies 4096 and 8192.

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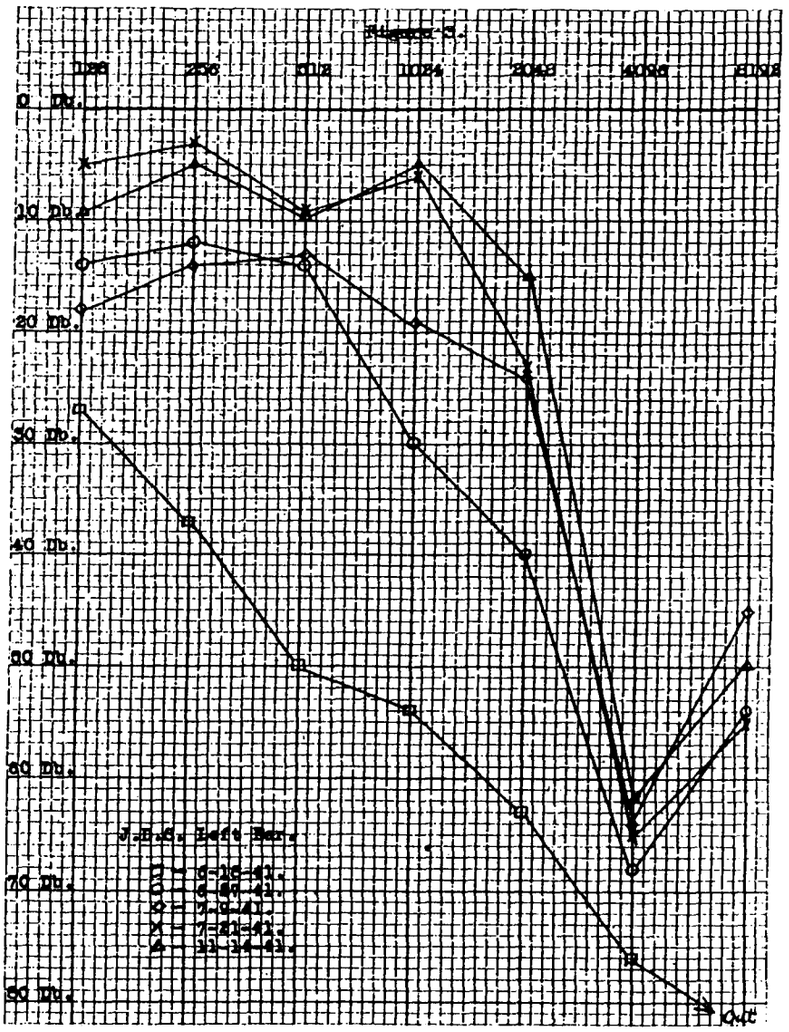

FIGURE 3.—J. D. S., Sea. 2c. Age 17 years. Six months naval service. No history of auditory trauma or predisposing disease. Failed pressure attempt 5–27–41 because of pain left ear. Failed second attempt 6–4–41 again pain left ear. Third attempt 6–17–41 failed as above. Left ear otoscopic examination revealed marked congestion, actual hemorrhage into drum and bubble formation. Tinnitus—frequency 9747 amplitude plus 10 db was an early and distressing symptom. The right ear remained normal at all times both otologically and by audiogram. This figure presents five of many audiograms taken in this case. It will be noted that although the recovery has been marked and is almost complete in the middle and lower frequencies, on the two higher frequencies marked loss still exists after a period of 5 months, and the prognosis is unfavorable for complete recovery.

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to "atmospheric conditions." In 16 cases presented by Lovelace, Mayo, and Boothby (2) experiencing difficulty with the ears during rapid descent from a high altitude, subjective deafness was a symptom in 7, 1 complained of tinnitus, and all experienced a feeling of fullness or pain in the ears. This loss of hearing in the aviators becomes of particular significance during flight when voice communication is necessary.

Great care should be exercised in all activities where individuals are exposed to high pressure air in order to preclude this damage. As stated in section A, careful physical examination, particularly of the ear, nose, and throat, and proper instruction in the methods of clearing the ears are of prime importance.

It is fully realized that no fine line of demarcation can be drawn between acute and chronic or permanent loss. Acute damage may result from aero-otitis media and if not severe it may clear quickly and completely. On the other hand, the damage may be sufficiently severe that permanent loss will result. In like manner the damage purported to occur as the result of compressed-air illness is usually reported in the literature to be acute or sudden in its onset, but by most authors is said to be more apt to result in permanent loss of hearing than the damage caused by too rapid compression. For this reason the subject of hearing loss due to compressed-air illness is discussed under the heading of permanent loss.

B. Permanent Loss.—As pointed out above, permanent damage to hearing, particularly in the higher frequencies, may result in any case where damage to the middle ear has been extensive. This is well illustrated by the two cases (figures 2 and 3) presented under acute loss. Boot (22) reports 13 cases of hearing loss in caisson workers and says:

> The most characteristic result of work under compressed air is a loss of the upper tone limit corresponding in type to the loss of hearing due to working in extremely noisy places such as, for instance, in boilermaking shops. It appears to be a slow degeneration that, starting at the upper limit of hearing, gradually extends downwards. The amount of deafness of this type occurring in caisson workers corresponds to some extent to the time the patient has spent working under complessed air.

He does report that some of the men were "blocked" several times, i. e., failure to equalize pressure resulting in aero-otitis media, but still credits routine pressure exposure as the cause of the deafness.

TABLE 2.—*Hearing loss in terms of decibels or sensation units*

Frequency (cycles)	128	256	512	1,024	2,048	4,096	8,192
Divers—"Pure" mean age 30.3 years	2.3	8.0	11.9	4.6	12.0	27.8	24.5
Our normal—Ages 25-34 years	1.2	4.7	7.1	−0.4	5.6	14.0	16.3
Divers—"Misc." mean age 37.3 years	6.0	14.7	17.0	9.2	21.3	46.3	39.3
P. H. normal—Ages 35-44 years	3.8	8.6	8.0	3.0	4.2	26.2	21.7

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Were permanent loss of hearing likely to occur from exposure to high-pressure air, *per se*, then deep-sea divers would show marked diminution of auditory acuity, for no group of individuals in the naval service are exposed to high-pressure air more frequently than are deep-sea divers. Yet, in our experience, they do not develop extensive loss of hearing, due undoubtedly to the fact that as a group they encounter little or no difficulty in equalizing air pressure and, therefore, do not develop aero-otitis media and its associated damage to the mechanism of hearing. This is illustrated by table 2

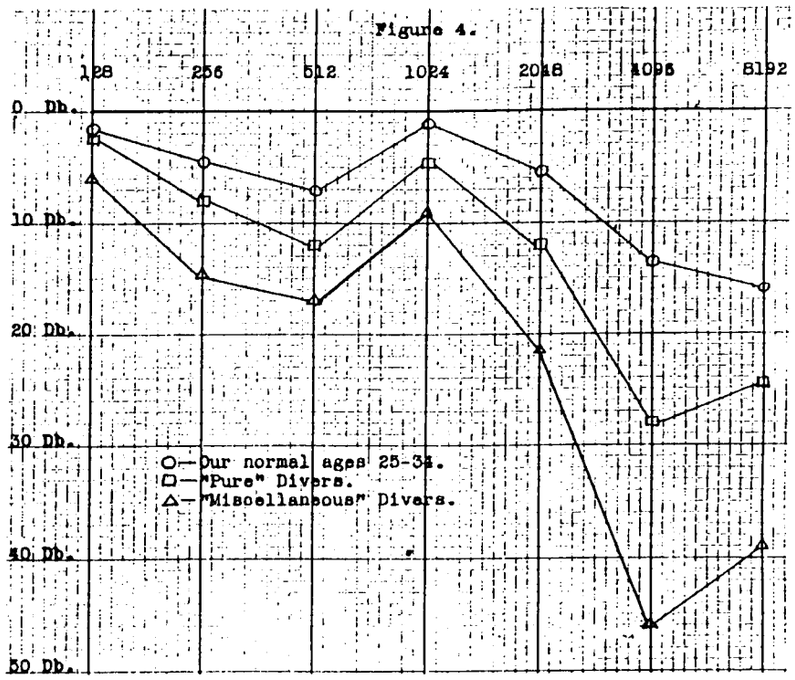

FIGURE 4.

and figure 4 where the loss of auditory acuity to the "pure" divers is very little greater than would be expected for their age alone. Even this slightly increased loss, we believe, is due to certain individuals in the group who have, on occasion, had difficulty in equalizing pressure and show considerable loss which, of course, adversely affects the general average for the divers' group as a whole. The "miscellaneous" group, as would be expected, because of additional trauma, infection, and disease, shows a somewhat greater loss.

The authors have, during the past 12 years, consistently been exposed to high-pressure air up to 10 atmospheres absolute and yet

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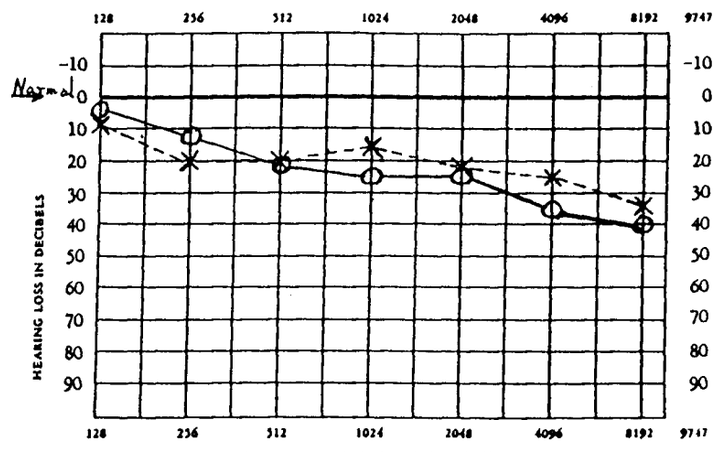
the average auditory acuity for one of us is 1.0 db above the normal for all frequencies and the other shows only an average loss of 5 db for all frequencies, which is less than would be expected for his age group. Thus, it is again demonstrated that the taking of pressure is, in itself, not the cause of loss of auditory acuity, but that such loss is associated with damage to the middle ear due to inability to equalize air pressure. The author, whose hearing is most acute, has had mild compressed-air illness on three occasions but has never had difficulty in taking air pressure; whereas, the other has, on two occasions, had slight aero-otitis media due to inability to equalize pressure and has never had compressed-air illness.

"Pure" cases showing permanent damage are presented in figures 5



AIR CONDUCTION: RIGHT O LEFT X

FIGURE 5.—Permanent loss "pure" diver.

A. J. V., T. M. 1c. Age 35 years. Seventeen years naval service. Ninety-six months diving duty. No submarine service. Had mild fungus infection left ear. Had no difficulty taking pressure at any time. Both ear drums dull. Watch tick right 32/40. Examination otherwise negative.

and 6. Neither of these cases shows very marked loss of hearing although by comparison with figure 4, it will be noted that both are below the average hearing loss for the entire group. The two "miscellaneous" cases presented in figures 7 and 8, as would be expected, show more marked loss. One of them, E. A. C., was dropped to a depth of 90 feet without being checked, and he suffered a severe injury to his right ear which undoubtedly caused the permanent loss of hearing in that ear. The other case, J. C. H., was also dropped, causing rupture of his left ear followed by acute otitis media. This is also reflected in extensive loss of hearing in the left ear. Both

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of these men must have suffered from acute aero-otitis media as a result of these accidents.

The association of deafness with compressed-air illness has for years been reported in the literature. However, differentiation between the damage caused to the ears by too rapid compression as compared with damage following the development of compressed air illness has not been clearly made. Among the earliest authors to make a clear distinction were Heller, Mager, and von Schrotter (6) who divided their cases of ear trauma in caisson workers into two groups. The first group consisted of cases of temporary deafness and vertigo caused by compression. The second group was com-

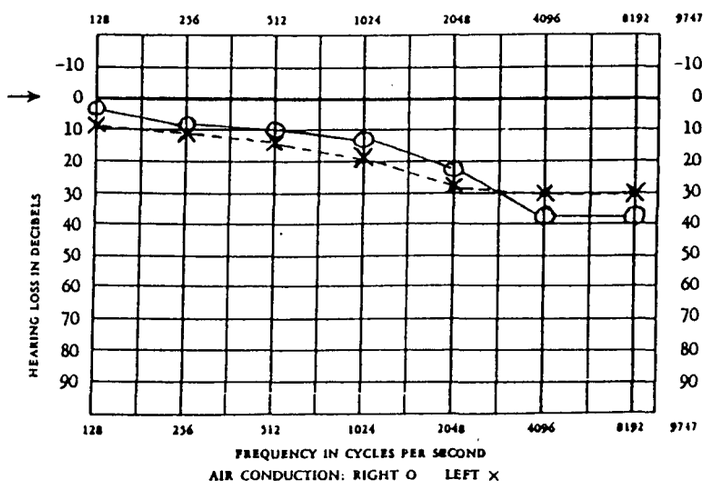

FIGURE 6.—Permanent loss "pure" diver.

C. N., B. M. 1c. Age 29 years. Twelve years' naval service. Sixty-six months' diving duty. No submarine service. Had no difficulty taking pressure at any time. "Lung" training twice. Both ear drums dull and retracted. Watch tick right 26/40. Left 28/40. Examination otherwise negative.

posed of the cases which showed "Meniere's syndrome" and in which the aural lesions were thought to be due to nitrogen bubbles.

Lestienne (23) reports a most interesting case which must be considered to be due to bubble formation:

> Worked 7 hrs. in a caisson depth 24 meters . . . decompression lasting 35 minutes . . . in free air 20 minutes . . . stricken sharply with intense vertigo . . . vomiting . . . violent tinnitis, especially left ear . . . rapidly progressive and bilateral deafness . . . could not hear yells.

His condition improved somewhat but in left ear 7 months later there was still marked deafness. Although he says that his cases are all due to errors in decompression, he points out that damage

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may be caused by injudicious compression but that these accidents are not either as common nor as serious in the production of deafness.

Bunch (24) reports two cases of almost total loss of hearing as caisson deafness but insofar as his report is concerned, neither compressed-air illness nor aero-otitis media were considered as causative factors. Vail (16) reports cases of deafness due to errors in both compression and decompression, and he says that in the first group the hearing loss may be temporary or permanent, whereas in the second group they are usually permanent. Malan (25) studied the acoustic function both before and after compression and reports the damage produced upon the physiological function of the ear.

In figures 9 and 10, we present two cases of men who have had

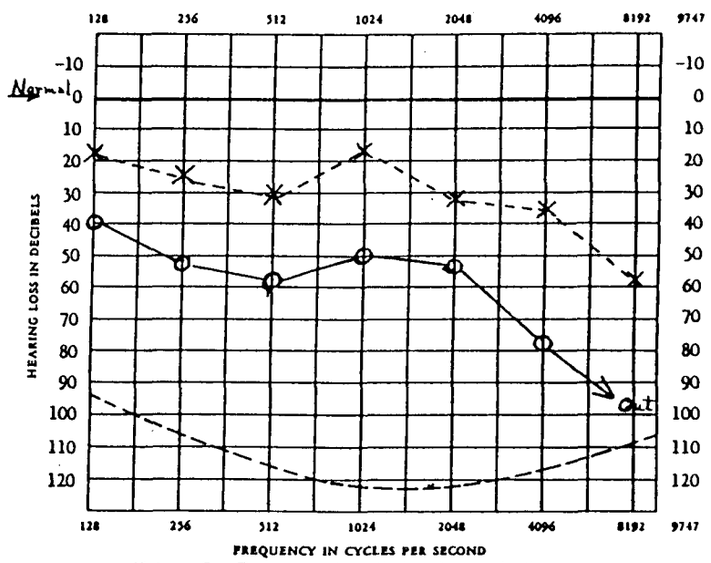

FIGURE 7.—Permanent loss "miscellaneous" diver.

E. A. C., C. T. M. Age 39 years. Seventeen years naval service. Four-inch gun fired over his station caused "ringing" and partial deafness for about 2 hours. Dropped to 90 feet by tenders—right ear bled and sometime later had "boil" in ear canal. Unable to take pressure only once and then quit diving. Right ear drum dull, scarred, retracted and thickened. Left drum dull and thickened. Watch tick right contact only, left 2/40. Whispered voice right 13/15. Otherwise normal.

most severe compressed-air illness several times and who have been exposed to high air pressure for periods of 7½ and 8 years, respectively, and yet show no general loss of auditory acuity, despite numerous complicating conditions reported in their histories. J. M. had serious difficulty in equalizing pressure once and shows a char-

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acteristic loss in frequencies 4,096 and 8,192. The two cases here presented still have serviceable hearing far better than most authors lead one to suspect would result from compressed-air illness such as these men have experienced, to say nothing of their long and oft-repeated exposures to compressed air up to and including 10 atmospheres. We also have other audiograms in our series of divers who have had extensive pressure exposure and whose audiograms approximate the normal throughout. These are included in table 2 and figure 4.

The extensive report of Keays (7) substantiates our contention

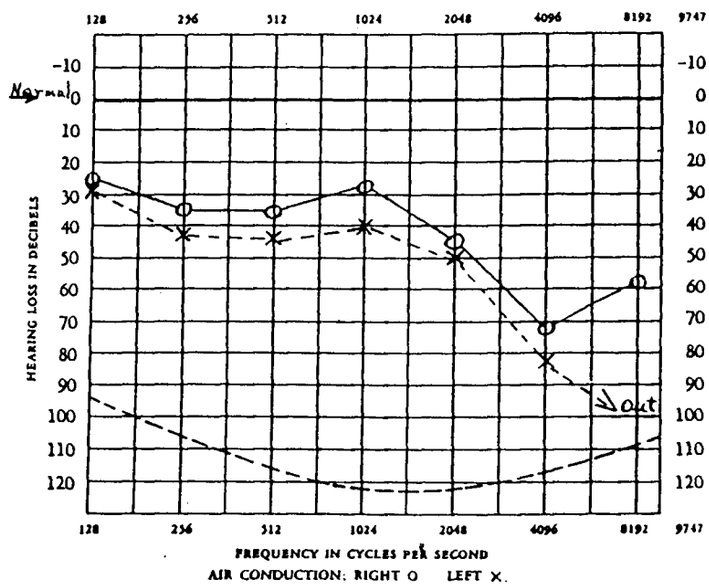

FIGURE 8.—Permanent loss "miscellaneous" diver.

J. G. N., C. T. M. Age 44 years. Twenty-five years naval service. Ten years diving duty. No submarine service. Father partially deaf at age 43. Dropped by tenders to bottom too rapidly causing rupture left ear drum—bled freely and afterward became infected. Some drainage for several years. Noted some deafness for past several years. Both ear drums dull and retracted. Left scarred. Romberg—slight sway. Weber lateralizes to the right. Watch tick right 5/40, left contact only. Whispered voice right 7/15, left 1/15. Spoken voice right 10/15, left 5/15. Coin click right 20/20, left 2/20. Physical examination otherwise negative.

that compressed-air illness rarely is responsible for deafness for in 3,692 cases of "caisson illness" vertigo without other symptoms was noted in 113, pain in the ears, hemorrhages from them and temporary deafness in 68 (aero-otitis media), Meniere's syndrome symptom-

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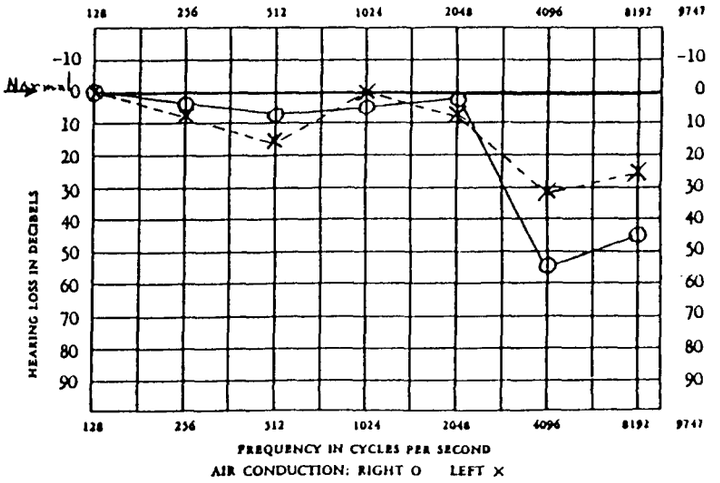

FIGURE 9.—Permanent loss (compressed-air illness) diver.

J. M., C. T. M. Age 29 years. Twelve years naval service. Ninety months diving duty. No submarine service. (Twenty-four months instructor in "Lung" training included in diving duty.) Deafened for a few minutes several times from gunfire. Difficulty in taking pressure only once. Abscess—left ear, ruptured spontaneously, no treatment. Compressed-air illness of a severe nature several times. Left ear dull and slightly retracted. Watch tick right 12/40, left 16/40. Examination otherwise negative.

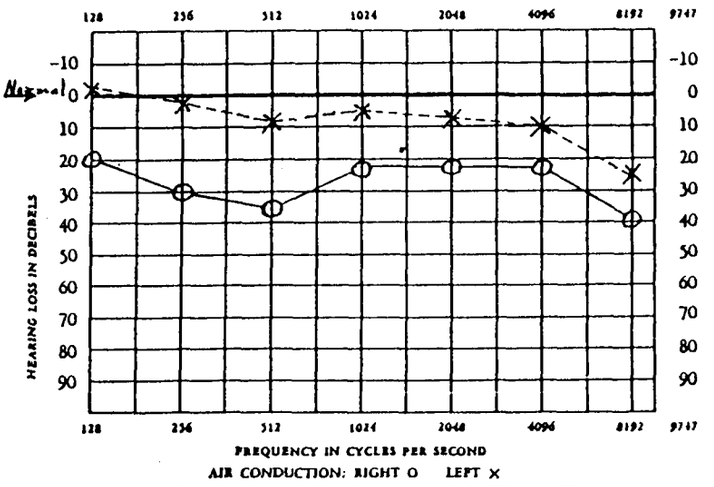

FIGURE 10.—Permanent loss (compressed-air illness) diver.

O. L. C., C. B. M. Age 37 years. Seventeen years naval service. Ninety-six months diving duty. No submarine service. (Twenty-four months "Lung" training instructor included in diving duty.) Deafened for 20–30 minutes several times from gunfire. Grandmother deaf in old age. Had compressed-air illness of a severe nature several times. Both ear drums normal. Watch tick right 20/40, left 20/40. Examination otherwise negative.

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complex in 14 and apoplectiform deafness in but 2 cases. Thus at the most but 16 cases out of 3,692 can be counted as having suffered loss of hearing due to compressed-air illness.

A report from the United States Navy experimental diving unit, (26) presented 46 cases of experimentally produced compressed-air illness in which every factor was completely studied and controlled. In this group there were no 2 cases alike and yet not 1 single case complained of or developed any loss of auditory acuity. This is not a large series but if deafness were such a common complication at least 1 case would be expected to occur.

The conclusion is inevitable that whereas deafness may result from compressed-air illness it is an extremely rare occurrence. It is also certain that exposure to compressed air in itself does not adversely affect the hearing. In other words most of the deafness found to be associated with work under compressed air is due to damage to the ears because of failure to properly equalize air pressure in the middle ear—aero-otitis media.

SUMMARY

Data have been presented showing acute loss of auditory acuity associated with aero-otitis media.

Exposure to air pressure, in itself, was shown to have little, if any, effect in producing loss of auditory acuity.

Compressed-air illness was shown to be a rare cause of loss of auditory acuity.

The positive relationship between loss of auditory acuity due to damage to the ears of divers during exposure to high pressure air and the same type of damage to aviators during too rapid return to atmospheric pressure from a rarified atmosphere was suggested.

The importance of great care in the physical examination and of proper instruction of the men prior to the "taking of pressure" was stressed.

Further studies concerning naval hazards to hearing are in progress and will be presented as the work is completed.

To be continued

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In civil life, I had, for some time been of the opinion that the choice between tannic acid and gentian violet solutions as an application to a burned surface was a matter of indifference. The use of gentian violet on this group of patients was partly to test this belief. The experience thus gained has forced me to the conclusion that the dye is definitely superior to tannic acid.

The eschar produced by tannic acid is thick, hard, and contracts very markedly—so much so that when it encircles an extremity, it often seriously impairs circulation. Gentian violet forms an eschar that is thinner, softer, and much less subject to contraction. It is more analgesic than tannic acid, and stops the pain of the burn almost at once. It is antiseptic, and I feel this is partly the reason for the complete absence of infection in my patients. It seems to encourage epithelization; at least the crust came off in all cases, leaving a healed surface, sooner than had been anticipated. Last, and perhaps most important, gentian violet is relatively harmless to the tissues.

I have long noticed, as doubtless others have also, that burns treated with tannic acid solution prove to be deeper than was at first apparent. Injuries, originally classified as second degree, often heal with scarring and other evidence of destruction of tissue. This has been attributed to the nature of a burn, which is assumed to injure tissue so severely that it later dies, though at first sight appearing viable. Recently, doubts have arisen in my mind as to the correctness of this assumption. I have wondered whether this delayed tissue destruction may not have been due to the treatment employed, rather than to the heat itself. From observations on this group of patients, and particularly on two of them, I feel sure that tannic acid solution causes tissue destruction beyond that caused by the burn.

The injuries sustained by the two patients were quite similar in character. Both were wounded, in the same engagement, by the flash of bursting high-explosive projectiles. Both had extensive second degree burns of the thighs and legs, coupled with other minor injuries. One man, who was slightly less extensively injured, had been thoroughly sprayed with tannic acid solution at a first-aid station, and firm eschars had already been formed on his admission to the hospital. The other had received no previous treatment. He was treated for shock, his wounds cleaned, and gentian violet solution applied.

To my surprise, the second case, who was the more seriously injured of the two, made an earlier recovery. His eschars came off, leaving smooth, well-healed surfaces underneath. The first case required about a week longer before the crusts loosened, and on removal there was found a granulating surface that required another week for complete epithelization to occur.

The only real objection to gentian violet solution is that it stains all fabrics an indelible blue when in contact. This fault can be avoided

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by protecting all bed linen with a rubber sheet; or certain bedding can be set aside for the use of burn patients, and allowed to remain stained. The color is unsightly, but causes no injury to the cloth.

In this paper, I do not consider the important subjects of shock, or of the constitutional reaction to extensive burns, which are factors not to be forgotten in the treatment; nor have I any experience with the sulfadiazine spray, which is still in the experimental stage and not available for general use.

CONCLUSION

The eschar produced on a burned area by gentian violet 2 percent solution is superior to that resulting from tannic acid, in that it is more analgesic, softer, and has very slight tendency to contract. The gentian violet causes little, if any, tissue destruction, but, on the contrary, stimulates epithelization.

An objection to the dye is that it permanently stains all fabrics with which it comes in contact.

AUDITORY ACUITY AMONG SUBMARINE PERSONNEL[1]

By Lieutenant Commander Charles W. Shilling, Medical Corps, United States Navy, and Pharmacist Ira A. Everley, United States Navy

Part IV[2,3,4]

HEARING LOSS DUE TO EXPOSURE TO GUNFIRE

This is the fourth in a series of articles on auditory acuity and presents permanent loss of hearing due to exposure to heavy gunfire. The physical examinations and the technical operations were conducted and the histories recorded as detailed in the first article of this series (1).

The men for this section were selected on the basis of a positive answer to the question, "Have you suffered loss of hearing and/or ringing in your ears lasting for over half an hour as a result of exposure to gunfire?" Almost every man in the United States Naval Service has, at one time or another, been at least temporarily deafened by exposure to gunfire; thus particular effort was made to elicit a true history on this point, so as to be certain there was significant loss of hearing or tinnitus definitely associated with gunfire. If the answer was in the affirmative, a detailed history was taken concerning type of guns, length of exposure, wearing of cotton and any other pertinent facts. In this group we have included a man who had been in the im-

[1] Received for publication April 15, 1942.
[2] Part 1. United States Naval Medical Bulletin. 40: 27–42. Jan. 1942.
[3] Part 2. United States Naval Medical Bulletin. 40: 396–403. April 1942.
[4] Part 3. United States Naval Medical Bulletin. 40: 684–687. July 1942.

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mediate vicinity of an engine crank case explosion, and one who had been exposed to dynamiting. These cases were included in this category because the etiology and character of the resulting loss of hearing closely resembles that found in the gunfire cases.

The "pure" cases in this article are, as before, only those who gave no history of any disease or condition considered conducive to loss of hearing, other than exposure to gunfire as defined above. The "miscellaneous" gunfire cases were those whose history indicated that in addition to gunfire, they had suffered from infections, diseases, or acoustical trauma other than gunfire, which, in themselves, were predisposing to deafness.

Opportunity for examining men experiencing acute loss of auditory acuity due to exposure to gunfire did not present itself; but acute loss has been of such frequent incidence in both civil and military life that its occurrence cannot be questioned. Many of our subjects gave definite histories to this effect. For example, one man said, following exposure to 5-inch 51-caliber firing, "I just couldn't hear at all." Again, an officer reported that following discharge of a 45-caliber automatic pistol immediately beside his right ear, he was totally deaf in that ear for "many hours" and this deafness was associated with pain and tinnitus. Another man reported that he was "deaf in the right ear for a few days and had ringing and a dull ache for a week" following gunfire exposure. Another lost the cotton from his left ear on the first shot of a 4-inch 50-caliber gun with the result that after "cease firing" he had a complete rupture of his left drum with hemorrhage lasting for half an hour and complete deafness lasting for a day. The hearing gradually improved. This type of history was encountered so often that even though unsubstantiated by audiometry, there can be no doubt that gunfire causes loss of auditory acuity in many cases. A case showing marked acute loss due to exposure to a fire-cracker explosion, with subsequent recovery, was presented by Bunch (2). He also presents a number of cases of acute and permanent loss of auditory acuity associated with exposure to small arms firing (3).

Permanent loss of auditory acuity among men exposed to heavy gunfire is presented in table 1. In this table we present our "pure" cases whose mean age is 30.36 years, and, for comparison, give our

TABLE 1

Frequency	64	128	256	512	1024	2048	4096	8192
Normal, ages 25–34	+0.7	−1.3	+3.8	+5.8	−0.5	+5.9	+10.5	+15.0
Gunfire "pure," average age 30.36	+3.04	+1.84	+5.71	+9.92	+4.18	+19.02	+33.40	+35.04
Public Health 35–44	+3.2	+3.8	+8.6	+8.0	+3.0	+4.2	+21.2	+21.7
Gunfire "miscellaneous," average age 35.80	+11.18	+10.45	+17.12	+18.99	+11.85	+28.60	+49.46	+42.07
Gunfire "Ridout," ages 30–39	+4.8	+9.0	+15.4	+21.3	+26.4	+29.7	+40.3	+31.9

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normal group for ages 25 to 34 years. The loss for the four higher frequencies averages 15 decibels more than that of the normal group of the same age and for the two highest, i. e. 4096 and 8192, the average is 21.5 decibels greater. Neither group gave a positive history of any disease, injury or condition which might adversely affect the hearing, except that the "pure" group answered the gunfire question in the affirmative. The "miscellaneous" group, mean age 35.80 years, also presented in this table, shows a loss much greater than the "pure" group, which is to be expected because of the multiplicity of etiological factors. For comparison with this group we have presented the United States Public Health (4) normal for ages 35 to 44 years. Our "miscellaneous" group shows a total average loss 13.5 decibels greater than that of the Public Health normal even though the Public Health average age is considerably greater. The loss at 2048 is 22.6 decibels greater. In as much as the Public Health normal is on a relatively unselected group, as explained in Part I of this series, this extreme loss in our "miscellaneous" group assumes added significance. Also presented in this table (table 1) are the records for officers, ages 30

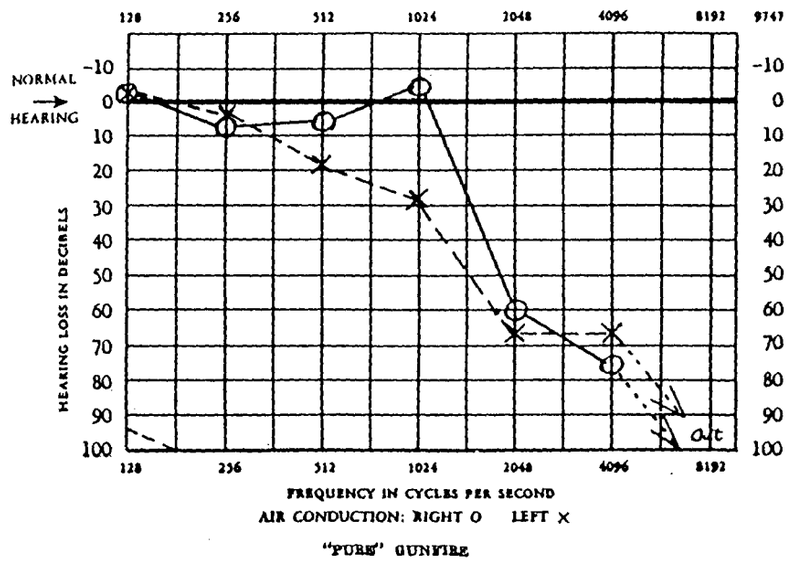

FIGURE 1.—G. E. B., C. B. M. Age 48 years. Naval service 16 years. No submarine duty. Was out of the service for 11 years, then recalled to active duty. Was exposed to heavy gunfire many times. On his first cruise noted some loss of hearing. He is convinced his loss of hearing is due to traumatism by gunfire. History otherwise negative. Both drums slightly retracted. Watch tick: right and left, contact only. Whispered voice: right 3/15, left 2/15. Coin click: 0/20 both ears. Physical examination otherwise negative.

(5)-Sheet 5J

to 39, exposed to gunfire, as reported by Ridout (5). Individual cases presenting the effect of gunfire trauma as evidenced by loss of auditory acuity are given in figures 1 to 8; figures 1 to 4 being "pure" cases and figures 5 to 8 "miscellaneous" cases. An additional case presented as figure 9 in this series illustrates the rather rare condition of hyperesthesia acoustica. Even a moderately loud sound is distressing and causes a feeling of actual pain in his ears. The condition was either precipitated by or first noticed following gunfire trauma, and for this reason the case is included in the gunfire section. This case resembles shellshock and his reactions are definitely neurotic, but the loss of auditory acuity is an actual loss and must be considered due to traumatism by gunfire. A detailed description accompanies each of these representative cases.

DISCUSSION

Deafness due to gunfire trauma is well known to military men and is expected to occur in the majority of cases in which the trauma is severe. Such deafness is of the perception or labyrinthine type.

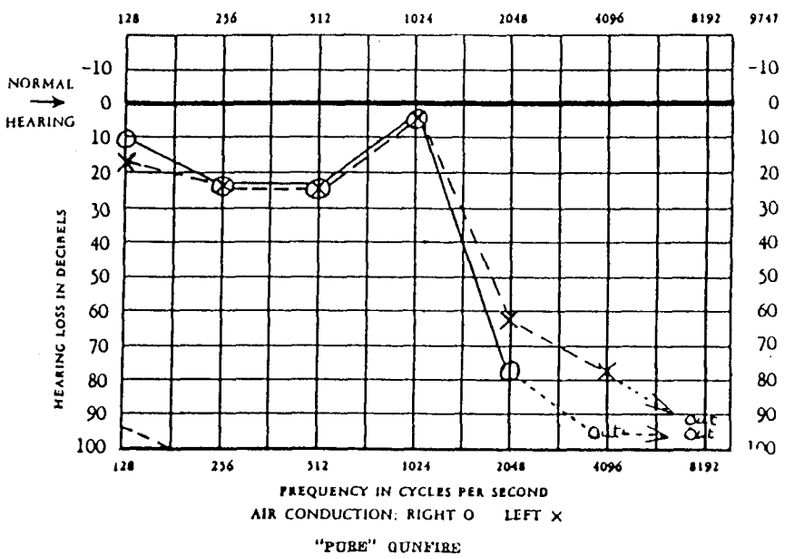

FIGURE 2.—C. H., Lt., U. S. C. G. Age 33 years. Naval service 8 years. Totally deaf for 2 days following exposure to 5" 51-caliber gunfire. "Just couldn't hear." History otherwise negative. Both drums dull and thickened. Watch tick: right ½/40, left contact only. Whispered voice: right 3/15, left 1/15. Spoken voice: right 15/15, left 10/15. Coin click: right 10/20, left 5/20. Rinne positive. Physical examination otherwise negative.

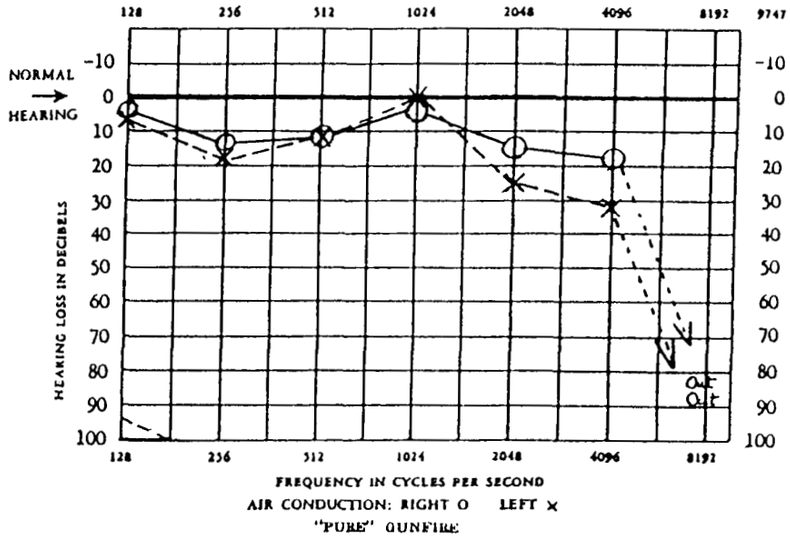

FIGURE 3.—P. L. K., C. G. M. Age 38 years. 20 years' naval service. Periodic firing of submarine 3'' guns for 15 years, wearing cotton in his ears. Says "It hasn't affected my hearing." History otherwise negative. Ear drums normal in appearance. Watch tick: left 30/40. Physical examination otherwise negative.

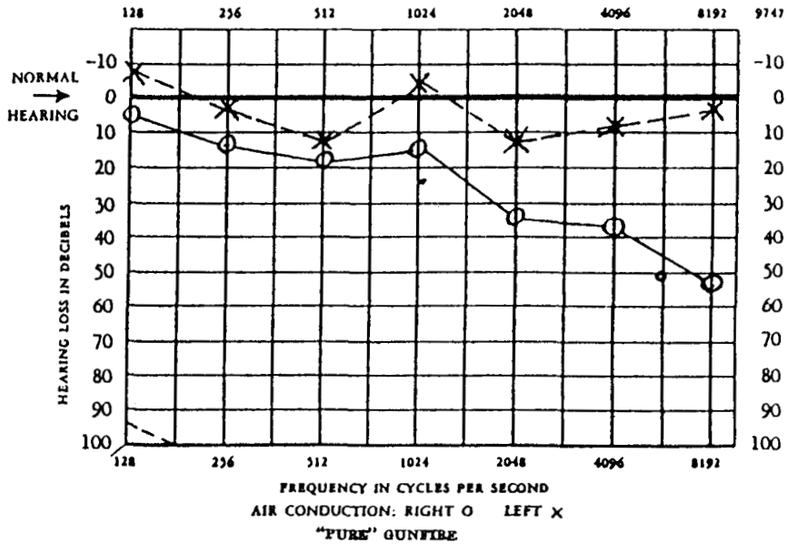

FIGURE 4.—R. S. T., Cox. Age 21 years. 3 years' naval service. One year prior to this examination was near a 5'' 25-caliber antiaircraft gun on "commence firing." Right ear deafened for a few days, ringing and dull ache for a week. No difficulty with left ear. History otherwise negative. Ear drums appear normal. Watch tick: right 12/40. Whispered voice: right 6/15. Physical examination otherwise negative.

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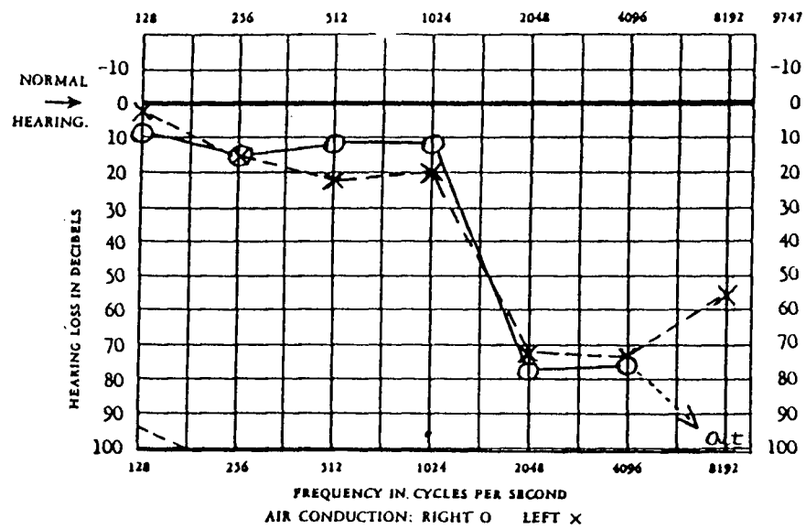
Got (6) describes loss of hearing due to gunfire as follows:

> The deafness is always of the labyrinthine type * * * there is abolition of cranial perception to the watch, abolition or considerable diminution of aerial perception, diminution of acuity more marked for high than for low tones, for whisper than for spoken voice. Rinne positive or barely negative; lateralization of the Weber test to the sound or the less affected side * * * if the deafness increases, it is on account of some intercurrent cause arising.

Nimier (7) in 1889, stated that much of the hearing loss caused by these explosions was due not to the trauma in the middle ear but to the effects on the nervous structures within the cochlea. It will be noted that our experiments confirm this fact. The loss in our cases is particularly marked in the higher frequencies, and is of the perception type. Others have reported losses predominantly in the fourth and fifth octaves, but, as seen in our figures, although we have noted some loss in



"MISCELLANEOUS" GUNFIRE

FIGURE 5.—C. E. O., C. M. M. Age 49 years. Naval service 18 years. During World War at age of 29 years was exposed for 1 year to firing of 155 mm. howitzers. Ears seemed continuously "stopped up". Was in U. S. Army Artillery 4 years. At age of 27 years had tinnitus for a week following Fourth of July celebration. Scarlet fever at age of 9 years. Syphilis at age 37 years, well treated. Father slightly deaf all of adult life. History otherwise negative. Physical examination: Ear drums slightly thickened. Watch tick: contact only. Whispered voice: 0/15 both ears. Spoken voice: right 15/15, left 13/15. Coin click: right 3/20, left 5/20. Physical examination otherwise negative.

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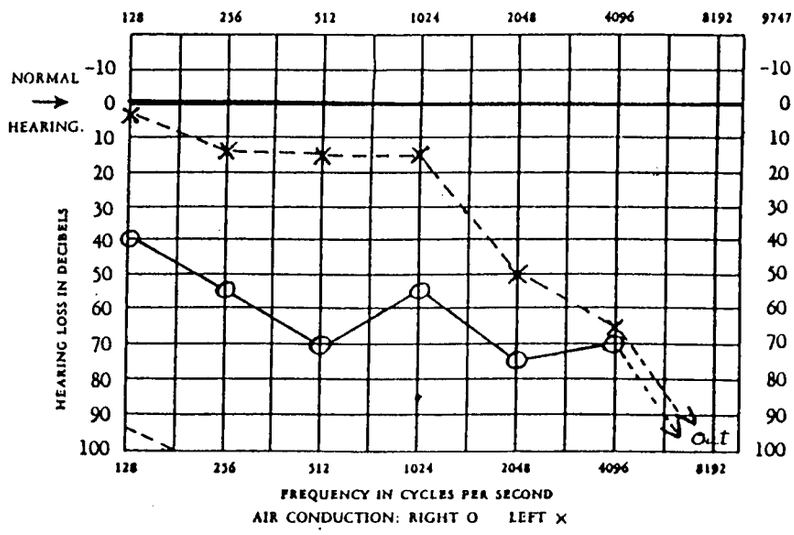
these frequencies, the more consistent and greater losses are in the seventh octave which includes the frequency 4096.

As a group, these cases also show a rather marked diminution of auditory acuity when tested by spoken voice, whispered voice, coin click, and watch tick. Tuning fork examinations demonstrated that air conduction was greater than bone conduction (positive Rinne). As a rule, the Weber test was negative.

PREVENTION

The cases presented are representative of many giving similar histories. Obviously, the prevention of this traumatism is of great importance and, since the use of cotton plugs, if properly applied, and if not removed until after all firing has been completed, has been



"MISCELLANEOUS" GUNFIRE

FIGURE 6.—J. J. M., M. M. 1c. Age 31 years. Naval service 13 years. On the U. S. S. *S-35* in 1931 experienced severe trauma while near the 4" guns. "Felt like I was hit with a sledge hammer." Ears "rang" for 2 weeks. Partial deafness continued. Subsequent tonsillectomy subjectively improved hearing, but still experiences tinnitus occasionally. Had syphilis in 1932, adequately treated. Submarine Diesel engines 96 months. History otherwise negative. Examination reveals marked thickening of right drum with white plaques around the inferior portion. Left normal. Watch tick: right: contact only, left, none. Whispered voice: right 0/15, left 2/15. Spoken voice: right 7/15, left 15/15. Coin click: right 0/20, left 3/20. Rinne: bone conduction greater than air conduction on the right. Physical examination otherwise negative.

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demonstrated as being a good safeguard, their use by all the ship's company should be made mandatory. Wax plugs and oil-impregnated cotton plugs have been used. Over-all "ear-muff-type" protective devices have also been used, but are expensive, clumsy, and less satisfactory in general. It is suggested that the use of ear defenders of the type mentioned in parts 1 and 2 of this series would be preferable to cotton plugs, particularly for members of gun crews who have little or no time to replace plugs if they fall out. These crews need added protection due to their proximity to the guns. Considerable work is now being done by various experimenters in the development of more satisfactory ear defenders. The principal defects in those now in use is that if worn for a long time they prove uncomfortable. Considering the possible incidence of bombings to civilian centers as well as military objectives, the following simple practices are recommended for the use of all hands: placing the finger over the external auditory meatus, or opening the mouth when an explosion is imminent. Authorities generally agree as to the desirability of these practices.

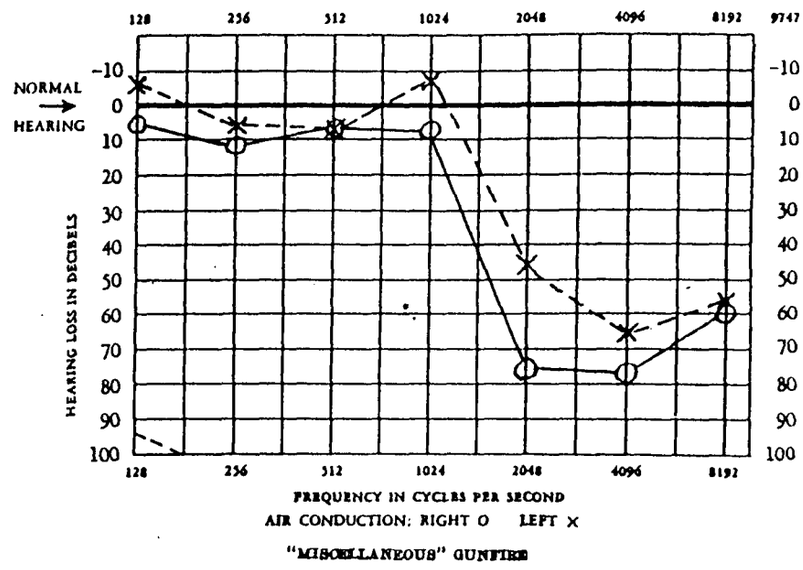

FIGURE 7.—F. M. V., M. M. 1c. Age 39 years. 16 years' naval service. Served 168 months in the engine room of a submarine. On the first burst of a 4" 50-caliber salvo, cotton blew out of his ears. Left ear drum ruptured. Deaf in both ears for a day. Cleared without infection. Progressive deafness for the past 10 years. History otherwise negative. Physical examination shows both drums thickened and retracted. Watch tick: both ears, contact only. Whispered voice: right 6/15, left 2/15. Spoken voice: 15/15 both ears. Coin click: right 8/20, left 10/20. Weber: lateralizes to the right. Physical examination otherwise negative.

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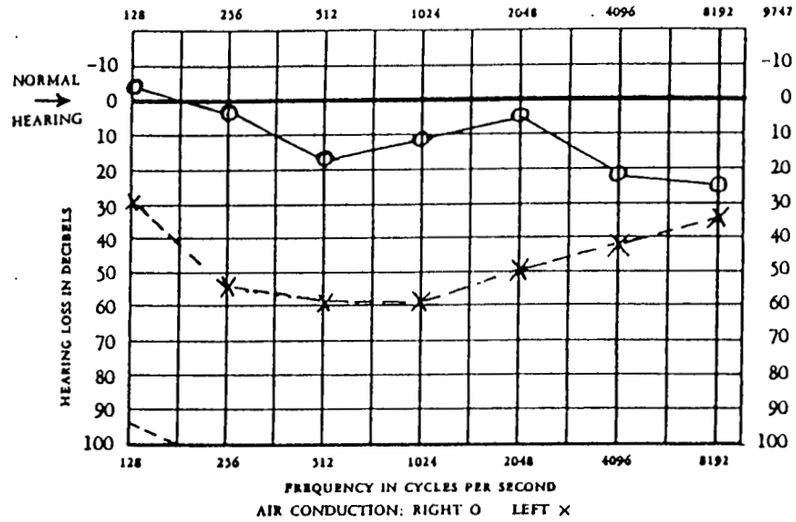

"Miscellaneous" Gunfire

FIGURE 8.—H. Y., M. M. 1c. Age 35 years. 14 years naval service. Served as a machinist's mate for 150 months on a submarine. Severe traumatism by crankcase explosion in 1934—unconscious for a few minutes. For 8 months following had tinnitus and partial deafness in left ear. History otherwise negative. Physical examination: both drums show thickening and marked retraction. Watch tick: right 32/40, left 1/40. Whispered voice: right 15/15, left 6/15. Spoken voice: right 15/15, left 12/15. Weber: marked lateralization to the left. Left bone conduction better than air conduction for 256, 512, 1024 and 2048 cycles. Physical examination otherwise negative.

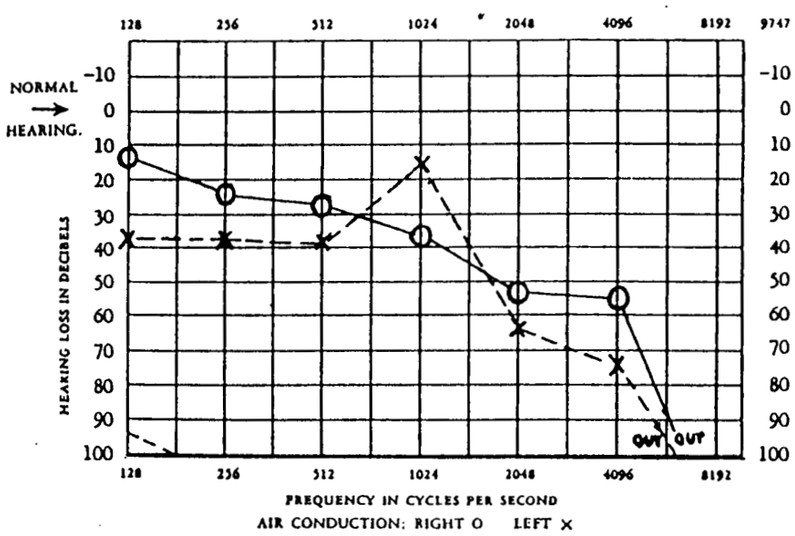

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FIGURE 9.—N. H. M., M. M. 2c. Age 26 years. Naval service 4½ years. Submarine duty 36 months. Patient gives a history of being observer in pits during 30-30 rifle fire; removed head phones thinking the firing was over; on another volley, experienced such severe trauma as to cause him to drop the phones and run. Reported to the officer in charge that the pain and ringing in his ears was so intense that he could not stand it. Returned to the ship, treated by the ship's medical officer for months. Eventually referred to a hospital where treatment was continued and tonsillectomy performed—no relief.

Present complaint: progressive deafness and marked tinnitus. Appeared considerably agitated during the examination and complained that he could not stand to listen to the higher frequencies, and that any loud noise was intolerable to him and "hurt his ear drums". He would not hold the receiver up to his ear if the tones were amplified much above his threshold level.

Physical examination: right drum slightly dull, the left dull and retracted. Watch tick 0/40 both ears; whispered voice: right 1/15, left, ½/15; spoken voice: right 15/15, left 6/15; coin click, right 1/20, left ½/20; Weber lateralizes to the right. Rinne positive on right, negative on left.

This case resembles "shell-shock" and seems definitely neurotic.

SUMMARY

A discussion of both "pure" and "miscellaneous" cases showing permanent loss of hearing due to exposure to gunfire has been presented.

Data have been reported showing the loss at the various frequencies and the resulting type of deafness.

Audiograms of individual cases demonstrating this loss are included.

Prevention of this hearing loss being in the best interest of the Navy, several preventive methods have been suggested and evaluated.

Further studies concerning naval hazards to hearing are in progress and will be presented subsequently.

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articles from
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Parts I, II, ~~III~~ & IV

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Naval Medical Bull.
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FACTORS PRODUCING OBSTRUCTION OF THE AUDITORY TUBE IN SUBMARINE PERSONNEL

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An important item in the instruction of submarine personnel is training in the use of the escape device. This involves exposure to 50 pounds of air pressure as a preliminary test; next, two escapes from the diving bell at 12 feet, and finally, two from the 18-foot lock of the training tank, using the escape device. Optionally they may also complete two escapes from the 50-foot lock and two from the 100-foot lock. The most common difficulty encountered in these tests is inability to equalize pressure in the ears due to obstruction of the eustachian tubes.

In certain instances pain is noted in the sinus area for the same reason—the inability to equalize pressure in the sinuses. Toothache is occasionally noted, the usual cause being a leaky filling. Psychologic difficulties are sometimes encountered and usually mark the individual as unfit for the submarine service. In the present discussion only the first condition mentioned will be considered.

In order to learn more about the factors causing obstruction of the eustachian tube in these men an investigation was carried out on four aspects of the subject.

1. The records of the training tank for a period of 1 year were reviewed to provide a basis of comparison and to determine the effect that weather might have on the condition.
2. One group of several hundred men was examined immediately after completing the tests.
3. In another group, routine ear, nose, and throat examinations were made both before and after the tests to determine the effect of various existing conditions in the nose and throat on the eustachian tube and ear.
4. The effect of various types of treatment on the patency of the tube was studied.

REVIEW OF TRAINING TANK RECORDS

Between 1 October 1941 and 1 October 1942, 5,110 men were given the routine tank tests. Of these, 271 were classed as failures because of inability to ventilate the ears spontaneously. Of this number, 147 were passed on a second, third, or fourth attempt. The remaining 124

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were disqualified, the total of those finally disqualified being 2.4 percent of the whole group.

The findings on the effects of weather on ear conditions are shown in table 1. The year was arbitrarily divided into two seasons, the period from 1 May to 1 October being designated as the warm season and the remainder of the year as the cold season.

TABLE 1.—*Seasonal comparison*

	Total	Passed	Failed	Percent
Cold weather group	2,501	2,335	166	6.6
Warm weather group	2,609	2,504	105	4

A difference of 2.6 percent appears to be statistically significant. It indicates that weather does play some role in influencing the factors responsible for obstruction of the eustachian tube. This is probably related to the greater number of upper respiratory infections during the cold season.

OTOSCOPIC FINDINGS AFTER COMPLETION OF TEST

The criterion for failing to pass the tank tests has been ear pain. During the period covered by this study many with tympanic perforations, hemotympanum and similar conditions passed, while others who failed were found to have minimal changes in the ear. It became evident that fear, anxiety, or a low pain threshold might lead to a loud complaint of pain, with very slight or no apparent changes in the ear. On the other hand a phlegmatic personality, great desire to pass the test, or fear of being considered a coward might cause lack of expression of even severe pain while actual otopathology exists.

It therefore seemed desirable to carry out routine otoscopy on a group of trainees in order to evaluate the adequacy of pain as a criterion and to ascertain the extent of ear damage. Accordingly, 708 men were examined otoscopically immediately after they had completed the various tank tests. No changes were made in the manner of selecting the men, of making the tests, or of adjudging failures. Ears were graded as follows: Grade 0, normal; grade 1, retraction with redness in Shrapnell's membrane and along the manubrium; grade 2, retraction with redness of the entire myringa; grade 3, same as grade 2 plus evidence of fluid in the tympanum; grade 4, hemotympanum, perforation of the myringa, or both.

Hearing loss was encountered in all grades except grade 0, as was also noted by Shilling and Everley (*1*). In both grades 1 and 2, the hearing is restored within a few hours, but in grades 3 and 4, weeks or even months may be required for recovery. In a few,

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hearing loss has been permanent. Shilling and Everley, and Campbell and Hargreaves (*2*) considered this loss of hearing as of the conduction type, but in some patients in this series, it was of the higher frequency, perception type. This was also the finding of Simpson (*3*). Tinnitus was mentioned by many of the men, but usually disappeared within a few days.

In addition to evidence of pathologic changes in the middle and inner ears, there was frequent evidence of damage in the external canal. The mildest form was a marked vascular congestion of the skin of the canal, most noticeable at the fundus. In more advanced cases there was hemorrhage, either into the lumen of the canal or forming a subcutaneous or intracutaneous hematoma. Small hemorrhagic blebs were occasionally seen on the myringa, and appeared to be due to a dissection of the layers of the membrane by extravasated blood. In a few cases these blebs ruptured and provided the only visible source of bleeding within the external canal. This would seem to indicate, as Shilling and Everley pointed out, that hemorrhage from the ear is not necessarily a criterion of tympanal perforation. In some instances, blood appeared to have burrowed from the tympanum underneath the attachment of the myringa to form a subcutaneous hematoma in the canal. These were never opened and none became infected.

PHYSIOLOGIC MECHANISM OF CHANGES

Close observation of these patients tended to indicate that at least 4 factors are responsible for the pathologic changes noted:

1. Negative pressure in the tympanum and tube.
2. Expansion of the blood vessels.
3. Vascular paresis.
4. Rupture of either myringa or blood vessels, or both.

If a person who cannot inflate his eustachian tubes were to be placed in a pressure chamber and the air pressure increased 2 pounds, a negative pressure, or vacuum, of 2 pounds in the tubotympanum would occur since equalization cannot take place. The result is the same as if a suction pump had been applied to the tubal ostium and a vacuum of 2 pounds created. The blood vessels of the tubotympanum, moreover, are under 2 pounds less pressure than those in other portions of the body; consequently they expand. The first area to exhibit this congestion is the membrana flaccida and manubrium mallei. The same change can be seen in the ear of a crying baby or in the ear of one who is attempting to inflate his tympanum when there is obstruction in the eustachian tube. This is the condition classified as grade-1 ear.

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If at this time the pressure is reduced to atmospheric, the congestion disappears within a short time, usually in an hour but sometimes in a few minutes. Application of a vasoconstrictor to the ostium of the tube will greatly hasten the resolution of congestion and relieve the pain, even though the myringa still appears retracted, probably due to partial absorption of the air originally in the middle ear. Despite this apparent return to normal very few people can perform the Valsalva maneuver immediately after an experience of this sort, and require considerably more time for functional recovery.

If, however, the individual remains in the pressure chamber, and the pressure is increased another 2 or 3 pounds, expansion of the blood vessels continues, affecting the entire tube, tympanum, and myringa, which now appears fiery red. This condition constitutes grade-2 ear. At this time application of a vasoconstrictor to the tubal ostium will not reduce the congestion of the drum, nor will it influence the pain. Apparently, then, the vessels have become expanded beyond the limit of nervous control and are temporarily paralyzed. Only time will bring about a return of function, which usually occurs in 8 to 72 hours, depending on the degree of vascular paresis.

Congestion of the tube increases the difficulty of spontaneous inflation, and the individual should be removed from the pressure chamber; otherwise the grade of damage increases with the length of time he remains inside the chamber. Congestion may occur at any time if equalization of air pressure fails. Individuals are frequently seen who easily equalize up to 20 or 30 pounds and then for some unknown reason stop. Then congestion quickly occurs with further increase in pressure, and the individual finds himself unable to equalize at all.

Pain in this type of otitis has usually been ascribed to external pressure on the myringa, but my observations lead to the conclusion that this is not entirely true. The myringa is well supplied with sensory corpuscles, but these are not responsive to all types of stimuli. For example, one can produce considerable pressure on the ear drum in the performance of the Gellé test without causing pain. Also, I have seen several patients with perforation of the myringa due to pressure, who stated that they had felt no pain and were unaware of the rupture. On the other hand the eustachian tube in most grade-2 ears can be easily catheterized, yet this inflation has no influence on either the congestion or the pain.

Hence it must be inferred that both pain and congestion are on the basis of vascular expansion and paresis. An analogy may be found in a toy rubber balloon which offers considerable resistance to inflation up to a certain point and then begins to expand very easily. Blood vessels likewise apparently have a critical point and when it is exceeded they temporarily lose their ability to contract.

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If the individual remains in the pressure chamber after this point is reached and the pressure is still further increased, the relative negative pressure in the tubotympanum likewise increases. In addition, some of the original air is absorbed, thus adding to the vacuum. As a result, a transudation of serum takes place, which may be noted as a fluid level, or as small droplets of fluid mixed with air. This is the condition classified as grade 3. Such an ear condition may require from 2 to 8 days for recovery, and myringotomy may be necessary. Inflation may be helpful after 1 or 2 days.

With further increase in air pressure, blood vessels of the tube or tympanum may rupture, induced occasionally by straining on the part of the individual. The entire tympanum may become filled with blood, in which case the ear drum appears solidly black, or there may be only scattered hemorrhages in various parts of the tympanum. Dissecting hemorrhages may occur in the myringa, or in the external canal, as already noted. Nasopharyngoscopy may reveal blood emerging from the ostium of one or both eustachian tubes. This condition is termed grade 4; it may require from 2 to 8 weeks for recovery.

Perforation of the myringa is also classed as grade 4, although admittedly in some instances it occurs very early owing to a previous weakening of the myringa. I have seen it occur before the drum has become congested. However it is usually a late manifestation occurring in either the flaccid or tense portion of the myringa. This latter represented the majority of perforations seen in this series. Many openings were rounded while a few were vertical slits. None received treatment of any kind and none became infected. The greater number healed quickly but a few remained patent after the lapse of several months.

If the perforation occurs early, the pain stops immediately, but if it occurs after vascular paresis has appeared, the pain may continue for several hours.

It would seem that although the term aero-otitis media expresses the etiology of this condition, the term salpingotympanitis would refer more specifically to the anatomic-pathologic changes in this condition, or if one wishes to include the etiologic factor in the nomenclature, one might use the term aero-salpingotympanitis.

Suppurative otitis and mastoiditis as complications of aero-otitis media were noted by Shilling and Everley. In this series, however, no such complication was seen. In 10 months at the submarine base, during which time more than 6,000 men were given the tests, no case of otorrhea was seen which was considered to have resulted from pressure damage to the ear.

Many textbooks mention auto-inflation as a cause of purulent otitis. Only 1 such instance was seen in this series. The man went through

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the tests without difficulty, and routine otoscopy yielded normal findings. Two hours later, however, he complained of pain in the left ear, which at this time was faintly pink but not retracted. He could still perform the Valsalva maneuver. Nose and throat findings were negative. The eustachian tube was treated with a vasoconstrictor and the patient dismissed. He returned 2 hours later complaining of severe pain. The ear drum was light red, bulging, and when it was incised a copious amount of seropurulent fluid was released. During the next 2 weeks, he had a very acute otomastoiditis, with high fever, but made a complete recovery. The acuity of the inflammatory process resembled frontal sinusitis after swimming. In both instances, soilage occurs on a clean, unprotected mucosa. This case indicates that the Valsalva maneuver may originate a suppurative otitis, but the occurrence of only 1 case in more than 6,000 men minimizes it as an etiologic factor.

TABLE 2.—*Analysis of data*

Total number of men in group	708	
Number classified as failures	47	(6.6%)
Number passed	661	
Number passed showing otopathologic changes	197	(30%)

As shown in table 2, 30 percent of the men who passed the tests had evidence of salpingotympanitis, although only 6.6 percent of the entire group had complained of pain and been classed as failures. In other words, nearly five times as many men had ear damage as complained of it. Questioning elicited a history of pain in all.

The percentage of failures in this group (6.6 percent) coincides with that of the cold weather period in group 1. (These observations were made in November and December.) All the failures occurred in the dry pressure tank. Forty-nine percent came out at pressures below 5 pounds; 25 percent came out at pressures of 6 to 12 pounds. This leaves only 26 percent who came out at pressures above 12 pounds, indicating that in the majority of cases, the eustachian tubes were obstructed before the tank was entered, and equalization never occurred.

Whether a man complained of pain at 1 or 2 pounds pressure or at 12 pounds, depended apparently on individual reactions. It was noted, however, that the longer a man stayed under pressure after pain began, the higher was the grade of his ear damage. Those who were able to equalize up to 12 or more pounds and then developed pain, in general were found to have stopped equalizing, and then after noting pain were no longer able to equalize. After instruction, the majority of these passed easily on a subsequent test. An analysis of the various grades of ear damage in this group is given in table 3.

6-Sheet 6

TABLE 3.—*Comparison of ear damage*

Grade of ear damage	0	1	2	3	4	Total
Passed	464	98	69	22	8	661
Failures	5	14	25	2	1	47
Total	469	112	94	24	9	708

With reference to the failures it should be noted first that 5 (11 percent) had normal hearing and normal appearing ears on emerging from the tank. Obviously, some other factor, as fear, general discomfort, tension and the like rather than actual otopathologic changes had induced them to complain of otalgia. Second, it should be noted that 39 (83 percent) had grades 1 and 2 ears, while only 3 (6 percent) had the more serious grades 3 and 4. On the other hand, of the 197 men who passed yet exhibited ear damage, 30 (15 percent) had grades 3 and 4 ears.

In other words, the men who complained of pain had less than half the percentage of grades 3 and 4 ears that were suffered by those who endured the pain and said nothing. From a statistical point of view, pain bears a reliable relationship to ear damage, but from a practical point of view, failure to admit pain makes it a very inadequate criterion of failure. Only routine otoscopy can determine the condition.

EVALUATION OF ETIOLOGIC FACTORS

To evaluate, if possible, the various factors which have in the past been held responsible for tubal obstruction, 858 men were examined before they started the pressure tests. Evidence of acute and chronic infections of the upper respiratory tract were noted, as well as the condition of tonsils and adenoids, clinical allergy, and obstructions of the nose due to septal deviations and spurs, hypertrophic turbinates and the like. Routine otoscopy was carried out on each man as soon as the pressure tests were completed.

Upper respiratory infections were graded as follows: No evidence of infection (0); slightly acute (s.a.); moderately acute (m.a.); slightly chronic (s.c.); and moderately chronic (m.c.). Men with severe infections were excused.

Tonsils were graded 1 to 4 on the basis of size and septic appearance. Adenoids were graded 0 if no adenoid tissue was observable; 1 if only a small midline mass was present; 2, lobes were well marked and touching the tubal labium; 3, larger mass encroaching upon the tubal ostium; and grade 4, a large, vegetative mass.

Septal obstructions were considered functional if they interfered with either sinal drainage, nasal breathing, or both. Obstructions below the middle meatus were generally considered nonfunctional.

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TABLE 4.—*Analysis of data*

Total number of men examined	858	
Number classed as failures	96	(11.2%)
Number passed	762	
Number passed with normal ears	553	(72.5%)
Number passed with evidence of otopathologic changes	209	(27.5%)

The 11.2 percent of the whole group classed as failures offers a contrast to the 6.6 percent of failures in group 2. The reason for this increase probably lies in the fact that more stress was laid on the need of indicating the presence of earache as a sign of trouble. In spite of this, however, practically the same percentage (27.5 percent) of the passed group showed signs of salpingotympanitis (aero-otitis media) as in group 2 (30 percent), again proving the inadequacy of pain as a criterion of ear damage. Table 5 gives a comparative analysis of the ear condition in the men of this group:

TABLE 5.—*Comparison of ear damage*

Grade of ear damage	0	1	2	3	4	Total
Passed	553	152	44	9	4	762
Failures	4	52	38	2	0	96
Total	557	204	82	11	4	858

It will be noted here, as in the second group studied, that 4 percent of the failures had normal ears and only 2 percent grades 3 and 4 ears. In the passed group with damaged ears, however, 13 (6 percent) had grades 3 and 4 ears. Thus the percentage of grades 3 and 4 ears among the failures was only one-third of that in the passed group.

Table 6 gives a brief analysis of the 96 failures in this third group studied, including findings on tonsils, adenoids and upper respiratory infection. Since the group is small, all grades of ear damage are considered together.

TABLE 6.—*Concurrent conditions*

Tonsils		Adenoids		Upper respiratory infection	
Grade	Cases	Grade	Cases	Grade	Cases
0	54	0	25	0	6
1	1	1	38	Slightly acute	62
2	28	2	31	Moderately acute	18
3	10	3	2	Slightly chronic	4
4	3	4	0	Moderately chronic	6
Total	96		96		96

Since according to this table, 54 of the failures had no enlarged tonsils and 25 no observable adenoids, it would appear that hyper-

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trophied tonsils and adenoids are not essential to the development of eustachian tube obstruction. It will be noted in addition that 29 men had grades 1 and 2 tonsils, and 69 had relatively small, grades 1 and 2 adenoids. When examined with the nasopharyngoscope however, practically all were seen to have adenoidal tissue in the eustachian tube, the fossa of Rosenmueller, or both.

The fact that only 6 percent were free from infection would indicate that infection is one of the factors operative in producing tubal obstruction; 80 patients had slight or moderately acute infections.

Tables 7, 8, and 9 correlate the findings in the third group studied and enable comparison between the groups with negative and positive otoscopic findings. Table 7 compares the grade of tonsils with the grade of ear damage:

TABLE 7.—*Comparison of tonsil grades with ear damage*

	Grades of tonsils					Total
	0	1	2	3	4	
Ear damage; grade:						
0	256	23	133	122	19	553
1	81	5	42	15	9	152
2	18	0	15	8	3	44
3	3	0	5	1	0	9
4	3	0	1	0	0	4
Total	361	28	196	146	31	762

Of this group, 361 did not exhibit enlarged tonsils and 224 showed grades 1 and 2 tonsils. Moreover the group with grade 4 tonsils had no ear involvement in 19 instances, grades 1 and 2 ears in 12 instances, and no grades 3 or 4 ears. In each tonsil grade there were far more negative than positive otic findings and the greatest number of damaged ears (105) was in the group with grade 0 tonsils. The conclusion that enlarged tonsils are not essential to the development of eustachian tube obstruction is thus confirmed.

Table 8 correlates grade of adenoid with grade of ear damage:

TABLE 8.—*Comparison of adenoid grades with ear damage*

	Grade of adenoid					Total
	0	1	2	3	4	
Ear damage, grade:						
0	184	184	171	14	0	553
1	48	56	46	2	0	152
2	17	12	12	3	0	44
3	3	4	2	0	0	9
4	2	1	1	0	0	4
Total	254	257	232	19	0	762

Table 8 indicates that 254 of a total of 762 men had no adenoidal involvement, and 489 had grades 1 and 2 adenoids. In the grade 3

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adenoid group, there were 14 men with negative ear findings, and only 5 with ear involvement. As with tonsils, there were far more negative than positive ear findings in each adenoid grade. In the grade 0 adenoid group, there were 70 men with ear involvement as contrasted with 73 in the grade 1 adenoid group. It may thus be concluded that enlarged adenoids are not the essential cause of eustachian tube obstruction. A large number of men with ear involvements did however on nasopharyngoscopic examination show evidence of growth of adenoidal tissue in the eustachian tubes.

Table 9 compares the grade of ear damage with upper respiratory infections:

TABLE 9.—*Comparison of upper respiratory infections with ear damage*

	Grade of upper respiratory infection					Total
	0	Slightly acute	Moderately acute	Slightly chronic	Moderately chronic	
Ear damage, grade:						
0	111	282	61	88	11	553
1	26	86	14	21	5	152
2	5	28	6	5	0	44
3	0	5	2	1	1	9
4	1	2	0	0	1	4
Total	143	403	83	115	18	62

From table 9 it is seen that while 442 of the group with normal ears had upper respiratory infections of some grade, 177 of the group with damaged ears also showed infection of some grade. This distribution would indicate that upper respiratory infection must play some part in the production of eustachian tube obstruction, although it is not the only factor.

Of 209 instances of ear damage (table 9), 143 were acute infections which usually were of relatively short duration. In most of these acute cases routine treatment restored the patency of the tube within a few days. Our treatment results however did not agree with those of Thorne (*4*) who noted immediate results in 21 percent of cases of "ear block." Thorne did not grade his cases, nor did he mention doing routine otoscopy on the men after they had taken pressure tests, consequently it is difficult to appraise his results. As he apparently relied on pain as a criterion of ear block, it is probable, from our experience, that he picked up only about one-fifth of the total number of cases.

EUSTACHIAN TUBE OBSTRUCTION

In many instances of upper respiratory infection the eustachian tubes were not patent even after the infection had entirely cleared. This finding, together with the fact that obstruction of the tubes

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occasionally occurred in the absence of any infection, pointed to a basic cause of such obstruction within the eustachian tube, and that while it could be influenced by infection, it still could operate independently. The number of men falling into this category constituted almost 3 percent of the total.

Farrior (*5*) has recently presented histologic evidence that acute and chronic infections in the eustachian tube may be responsible for tubal obstruction, as is also trauma from careless catheterization or massage. He has pointed out, as have others, that while lymphoid tissue is not normally present in the eustachian tube, it may develop there as a result of infection, spreading as far as the middle ear. In some instances gross nodules of lymphoid tissue can be seen in the labia of the tube and in Rosenmueller's fossa. In other instances there are no nodules and the presence of lymphoid tissue deeper in the tube can only be inferred. Since as Crowe (*6*) (*7*) (*8*) (*9*) (*10*) (*11*) and his associates have pointed out, this heterotopic lymphoid tissue may also be a cause of deafness, the deafness of which some of the patients in this study complained might well have been due to this cause rather than to pressure trauma.

ROLE OF NASAL OBSTRUCTION

Sixteen instances of deviated septum with obstruction were observed in group 3 in spite of selection methods. Of these men 3 failed, while 13 passed with negative ear findings. No instance of complete nasal obstruction due to hypertrophic turbinates or polyps was noted. It may therefore be concluded that nasal obstruction is not an important or frequent cause of obstruction of the eustachian tubes. The posterior end of the septum is on a frontal plane slightly anterior to the tubal ostium, so that it would be impossible for even an extensive septal deviation to involve the tubes, although bilateral nasal obstruction might so involve them. I believe that selective methods should lay more stress on patency of the eustachian tubes and less on septal deviations.

ROLE OF ALLERGY

It is to be regretted that the conditions under which this study was made did not permit much investigation of the important problem of allergy. Many of the patients were noted to have an allergic appearance in the nose, but since complete studies are lacking no statistics will be presented. Three men had nasal polyps although in each case there was clinical and roentgenologic evidence of sinus disease.

ROLE OF OTHER CONDITIONS

Nasopharyngeal tumors could easily obstruct the eustachian tube, but in this series no true tumors were recognized. Two cases of

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Thornwaldt cyst were seen, but in neither was the eustachian tube actually compressed.

Paralysis of the soft palate as well as scar tissue about the ostium of the tube have been mentioned as factors in producing tubal obstruction, but neither of these conditions was seen in this series. A number of cases were seen in which a previous otitis had produced scarring in the tympanum, and presumably in the tube, since some were unable to inflate the ear spontaneously.

Willhelmy (*12*) believed that overclosure of the mandible might affect the proper functioning of the tube. In this series, no such instance was recognized. With the nasopharyngoscope, I have in the past examined many people with overbite, and have not been convinced that the internal pterygoid muscle impinges on the eustachian tube to any greater extent than in the normal. I doubt very much if this condition should be classed among the causes of eustachian tube obstruction.

PREVENTION

A large percentage of damaged ears among submarine personnel could be avoided by a routine check of the ability of each candidate to autoinflate his ears. This is done by having him perform the Valsalva maneuver while the examiner observes the ear drum. If air enters the ear, a slight bulging will be seen in the upper portion of the pars tensa just posterior to the short process. If the tube is blocked, the upper portion of the drum will redden while the candidate is straining, but no bulging will appear.

In my experience, in any group of 30 men 7 to 9 would be unable to inflate the ears. If examination of the nose and throat disclosed infection, the infection would be treated. In a week or 10 days the group would be tested again, and if then able to inflate the ears, would be allowed to take the tests. If not, more time would be given for recovery. Probably all but 1 or 2 would eventually pass, the small remainder requiring further treatment.

It is therefore not necessary to test the man under pressure to find out whether or not he can inflate his ears and equalize air pressure. It is my contention that if this program were carried out, the number of cases with otopathologic changes would be 2 percent or 3 percent rather than the present 25 percent or 30 percent.

THERAPY

Various types of treatment of the damaged ears have been carried out. Formerly a group of 30 men had been subjected to submucous resection, but only in a few instances was any improvement noted. Tonsillectomy and adenoidectomy were done in about 100 cases, also with very disappointing results. It was therefore concluded that if

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either of these operations was indicated on its own merits it should be done, but relief from obstruction of the eustachian tube should not be expected. As noted previously, acute infections were treated conservatively, using the various vasoconstricting drugs. Some chronic infections were found to be unresponsive to conservative measures, and various surgical procedures were done.

Spontaneous recovery of damaged ears is the rule. Grade 3 ears that are not clear within a week may need myringotomy, while tympanal hemorrhages should be left strictly alone. For relief of pain, I prefer rest and sedatives to the use of phenol-glycerin or other drops in the ear. If a perforation is present, absolutely nothing should be placed in the ear. Inflation by catheter is of no value; it occasionally increases the pain and may traumatize the tube and delay healing. Time will usually heal the deafness, but in some cases there is permanent loss of hearing.

As noted some 3 percent of the cases failed to respond to therapy, and in these instances it is felt that irradiation of the eustachian tube by either radium or x-ray should give relief. Crowe and his coworkers have shown that such therapy restores normal patency and hearing in many cases, and it is logical that it would be of value here. Radon was used by Crowe and his associates and by Jones (*13*) while Farrior and Richardson (*14*), Fowler (*15*), Emerson, Dowdy and Heatly (*16*), and Fisher (*17*) used radium. In both instances, the radiation was applied in a capsule through the nose. X-ray has been used successfully by many.

Radium and x-ray of sufficient penetration for treatment are lacking at this station, but a small group of men was treated for us by another Naval hospital. While the results to the present are very promising, the series is too small to warrant a statistical report.

CONCLUSION

Evidence has been presented to show that of the commonly stated causes of eustachian tube obstruction, only upper respiratory infection and possibly allergy are at all important. The heterotopic growth of adenoidal tissue in the tube appears to be a definite factor, although this may be influenced by other factors. Theoretically irradiation by radium or x-ray, as demonstrated by Crowe and associates, should be the proper therapy in such cases, and a limited clinical experience appears to support this hypothesis. It is hoped that further investigation on this point will be carried out by others.

Grateful acknowledgment is made of the cooperation of Captain C. W. Shilling (MC) U. S. N., and Commander T. L. Willmon (MC) U. S. N., without whose valuable assistance and advice this study could not have been made, and to Ens. N. R. Bartlett, H-V(S), U. S. N. R., who reviewed the statistical portions of the study and whose criticism and suggestions proved to be of great value.

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ABSORPTION AND EXCRETION OF METHYLSALICYLATE

Methylsalicylate upon cutaneous application exerts not only its long-established counterirritant influence (vasodilatation, decongestion, induction of active hyperemia), but also a systemic action which perforce must be analgesic, antipyretic, and antirheumatic, since these properties are common to the salicylates upon absorption.—Beutner, R.; Calesnick, B.; Powell, E.; and Bortin, L.: On the absorption and excretion of methylsalicylate administered by inunction. J. Lab. & Clin. Med. 28: 1655–1663, November 1943.

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Total of 14 pages Attached

Factors Producing Obstruction of the Auditory Tube in Submarine Personnel. Teed, R. Wallace. Naval Medical Bull, Vol 42 February 1944.

Memos on Conference with Dr. Stacy Guild, Johns Hopkins Hosp.,

26 May 1944, 2:00, Sound Laboratory.

Present: in addition to Doctor GUILD, Commander Yarbrough Captain Shilling, Commander Chrisman, Commander Teed, Lt. Comdr. Young, Lt. Comdr. Bacon, Dr. Harris (Spec.(X) 2/c) and Mrs. Kohl.

Doctor Guild visited the Escape Training Tank. He also visited the New Construction Training Pool.

At the Sound Laboratory, Harris demonstrated the group audiometer for Doctor Guild's benefit. At the conclusion of this demonstration, Doctor Guild suggested that it would be better to have the subject record "L", "S", or "F", "Loud", "Soft", or "Faint" instead of the present "X" and "O", --to foil the positive malingerer, the man who wants to pass badly enough to watch his neighbor and make a mark when he does. Dr. Harris agreed that this would be a good change, although we have had no trouble, as yet, with malingerers. This change would also allow for incorporation into a punhhcard and mechanical scorer system.

Harris asked Dr. Guild if we could eliminate the ~~Doctor Guild~~ asked ~~if Harris was using a~~ descending series? He said NO, as the after images are to numerous for reliability. We find that the ascending series is often 5 db better.

Doctor Shilling sketch the background of the Aero-Otitis-Media project that we propose doing here, --how he had called the attention of the air forces to his findings 2½ years ago, only to have the idea brushed aside as unimportant; how the problem has proved to be anything but unimportant in the practical experience of the bombing forces in Europe, to the extent that many pilots are grounded for this type of ear damage and the air chiefs are pressing for information on this problem and, if possible, a solution to it.

We propose to test a large number of men before they take pressure, and immediately after they have taken pressure. (It may mean that we have to train one or two additional people to run audiograms). We actually have three audiometers, --one might be run down at the tank, and the others in #156, or #125. Such a project would give us a volume of proven results as a background for this aero-ototis problem.

We will then try to get X-ray treatment for the cases showing certain types of aero-otitis, followed by hearing loss sufficient to incapacitate..

Doctor Shilling suggested that Doctor Teed arrange some sort of program that would not interfere with the routine training of these men, but would give us some information.

There was discussion of the study completed by Doctor Teed and the article on this subject that he contributed to the Naval Medical Bulletin. His suggestion of testing the men for tubal patency in an attempt to eliminate those who would not be able to clear their ears and so develop aero otitis was discussed at length.

The first question was "Could we spot these boys by such an examination". Dr. Teed, said, "Fairly well". "Of those examined and found to have patent tubes, 13% developed aero-otitis; of those haveing non-patent tubes, 46% developed otitis, --and with further observation and experience, we can possibly better that record, -- make the spread between the two groups still wider."

The second question concerned the second suggestion made by Doctor Teed on the attached preliminary rough draft of the proposed investigation, --that we reject all who give a history of otorrhea or mastoiditis AND who now show non-patent tubes. Dr. Guild suggested that this item should be re-worded before being send to Washington, so as to make it definitely clear that the history alone, does not disqualify, --only when it accompanies a set of non-patent tubes. Dr. Teed suggested the rejection because of the great opportunity presented in either condition for closure of the tubes by scar tissue. Many have closed tubes that can never be opened. The drums are retracted against the medial wall.

Dr. Guild asked, "How far back in the history do you consider these conditions relevant?" "In infancy?" Dr. Teed, said "Yes, any history (if it occurs plus non-patent tubes). There are many who have had otorrhea or mastoiditis and still have patent tubes. These latter will not be rejected.

Comment was made on the 13% who had patent tubes and still developed/Serious otitis. Various factors were cited to account for this: some are too lazy to contine equalization; some just didn't understand; and Doctor Guild suggested that a certain nervous tension would be very likely to develop in this unfamiliar situation and considering the speed at which the pressure is developed, and this could easily cause the men to momentarily forget to equalize. The pressure is built up to 50 pounds within the space of a minute or so.

The question was askedDoctor Guild, --had he heard the rumor that the Germans are deliberately puncturing ear drums to ease the pressure for dive-bombing pilots. He said he had heard it, but very seriously doubted it, because they have intelligent and skilled otologists who would know that they would have more pilots incapacitated by otitis media from this cause than from the rapid change of air pressure. It was brought out that there have been attempts to relieve the pressure by very fine needle punctures, but these have proved inadvisable because of the danger of developing purulent otitis, and besides this does not relieve either the pain or the pressure, because the mucosa has vwwn injured, --the damage has been done. Only time and conservative treatment will repair this damage.

The question of the necessity of doing routine audiograms on all the men was discussed. Captain Shilling felt that it would be valuable to have audiograms on a good sized group, in order to present authorative data. It was pointed out that the men who do develop this type of ear damage are incapacitated for six to eight weeks or longer. The are at least less efficient than normally. While it would not be absolutely essential to have audiograms before and after, it certainly would be nice to have a complete record on each case, and much more impressive and conclusive.

Dr. Teed pointed out that the first indication of non-patent tubes comes in children of school age.

Dr. Guild suggested that the old battery-powered type of audiometer, the 2-A we have is in some ways the best of the lot. He suggested that if we have difficulty inreplacing the batteries, try the State Health Department. Their Everready "B" batteries are excellent and they recently had some on hand.

Then came the question of what to do with these men after they have been disqualified. Dr. Teed suggested that we keep the non-patent group together and watch them much more carefully, (while pressure is being attempted), lock any that seem to be in trouble, that is, not let them go too far, In this way they might develop Grade I or II ears, but never be let go to the point of developing Grade IV.

The write-up of the routine of handling all this project will have to be expanded and rearranged before it goes to Washington.

It was pointed out that routine otiscopy should be done on ALL men after pressure, not only on those who complain. Any who have difficulty should not be allowed back in the Tank until they show tubal patency.

"What would you do with these men?" "Hold them from School?" Hold them from the Tank, --if they didn't finish the Tank, they would never get to School".

Many cases are missed if you look at only those that complain.

How long does the usual infection last? About ten days or two weeks.

Doctor Teed found that about 30% of the entire population experience some difficulty. It was estimated that about 5% of these would be stubborn cases that might go to irradiation. It was pointed out that it would take three months to get the full benefit of irradiation and the question was raised, would it be worth while. We are now tossing out those that fail the Tank at their third trial. However, it is now only a question of salvaging these men, personally, --Naval Aviation wants the answer from the standpoint of highly trained men (aviators) and in developing methods for selecting pilots, also salvaging pilots.

Since the answer to this problem is so badly needed, and since we will not be rushed for submarine men this summer, Dr. Shilling pointed out that he anticipated no trouble in holding some men this summer while we treat them, or test them. We can hold for irradiation only the really bad ones that need it worst.

The two problems can be separated: a random sample of all men taking pressure can be held for audiograms before and after, say every second and fifth man, --if 50 a day go through and we take every fifth one, ten audiograms before and after could be easily handled.

An experimental form (M&S Research Division Project Form X) will be prepared on this project on this basis and submitted to Captain E. W. Brown of the Research Section..

We expect to know the answer to the question of whether or not we can get the radium needed for irradiation by June 15th.

The question of what men are to return to the Tank should always be under MEDICAL control. Operate only on those men who present a functional obstruction.

Dr. Yarbrough who was visiting at this Base also sat in on this conference.

Dr. Guild pointed out that the results of this study should be very interesting to the congress of Amer. Academy of O and O in October at Chicago. Dr. Shilling has already been asked to speak at this meeting and it is hoped that the findings of this study will be complete so that they can be presented at this time.

PRESENT PROPOSAL FOR INVESTIGATING ANEO-OTITIS MEDIA AND ASSOCIATED AUDITORY DAMAGE.

1. PREVENTION:

a. Examine all subjects for patency (Table VII)

b. Reject all with non-patent tubes, with a history of otorrhea or mastoiditis.

c. Look out all who seem to be in trouble.

d. Routine otoscopy on all subjects.

2. TREATMENT:

a. Conservative treatment of nose and throat for 1-2 weeks.

b. Return to task only those who can show patency.

c. Surgical treatment, if indicated.

d. Radiation.

e. Disqualification.

TABLE VII:

Ear Damage, Grade	"Patent" Classification	"Non-Patent" Class.
0	365 (86.7%)	155 (53.5%)
1	20 (35.7%)	39 (29.5%)
2	19 (34%)	53 (39.2%)
3	11 (20%)	16 (11.1%)
4	6 (10.3%)	28 (20.7%)
Total	(56) 421 56 (13%)	(135) 290 135 (46.5%)

16 June 1944.

From: Commander A. S. Cherigman, (MC) U.S.Navy.
To : Chief of the Bureau of Medicine and Surgery, Navy Department, Washington, D.C.
Via : Commanding Officer.

Subject: Clinical Conference on Radium Irradiation for Prevention of Acute-Otitis Media, held at Mitchell Field, New York, on 8 June, 1944.

References: (a) Bufers Speedletter T-66225 of 1 June, 1944.

Enclosures: (A) Report entitled "Lymphoid Hyperplasia and Prevention of Otitis due to Barotrauma with Radon", by Major E. P. Fowler, Jr., (MC) Army of U.S.

(B) Report entitled "Description of a Radium-Containing Applicator Suitable for Treating the Nasopharynx", by Curtis F. Burnam, M.D.

1. In accordance with reference (a), the undersigned attended the subject-named clinical conference which began at Mitchell Field on 8 June, 1944.

2. This conference was purely clinical and consisted of demonstrations in the methods of nose and throat examination by the nasopharyngoscope and the use of radium-containing applicators for the treatment of lymphoid hyperplasia of the naso-pharynx. This part of the conference was directed by Dr. S. J. Crowe of the Johns Hopkins Hospital Medical School faculty.

3. The "background" talks concerning the problem of acute-otitis media were held at the War Department in Washington the week of May 29—June 3, 1944, before the group reported to Mitchell Field. This part of the conference was not attended by the undersigned.

4. Copies of two papers that were read to the conference have been obtained and are transmitted herewith as enclosures (A) and (B). These are believed to contain the main points that were brought out at this conference, aside from the purely clinical techniques demonstrated.

A. S. CHERIGMAN.

Description of a Radium-containing Applicator Suitable for Treating the Nasopharynx, along with a Brief Review of the Essentials of Radioactive Transformations and the Biological Effects of Exposure to the Rays Emitted by this Applicator.

By

Curtis F. Burnam, M.D.

The applicator has been designed to make effectual radiation of lymphoid tissue in the nasopharynx as simple a procedure as possible, with a minimum injury to normal contiguous tissues.

With each copy of this paper is furnished an empty, i.e., non-radium-containing applicator designed for use with radon. Its size, shape and construction can be seen at a glance. The instrument consists of a handle approximately 15 cm. long, which is screwed into a tubular head. The chamber containing the radon is 15 mm. long and 1.5 mm. in diameter. The wall thickness is one mm. The applicator can easily be introduced through the nose into the nasopharynx. Let it be kept in mind that this sample applicator is not identical with the one recommended for use in the Air Corps of the Army. The sample is made of brass while the Army applicators will be made of monel metal, which is more durable. The wall thickness of the radium containing chamber of the Army applicator is 0.3 mm instead of 1.0 mm. as in the sample. This change was made to permit the use of more Beta Rays and thereby shorten the time of the applications. Note that by this change in wall thickness the outside diameter is reduced, making it easier to pass along the floor of the nose into the nasopharynx. Finally, the handle of the radium applicator is solidly attached to the tube and not removable, as in the sample. This is important for two reasons: first, there is no danger of accidental separation of the two parts of the instrument, and second, the danger of loss of strength by leakage is minimized and, with careful handling, it might be said entirely removed.

Dosage:

The radium nasal applicator is to all intents and purposes a constant source of radiation. When its physical and biological dosage is once obtained, barring breakage, it can be counted on to give the same dosage indefinitely -- from month to month and from year to year. As a matter of fact, it does depreciate, going down at a constant rate which leads to half value in sixteen hundred years.

While radium, as X-ray, is measured by its ionizing effect on air it is not practical to state in ionization units the amount of dosage. It is essential to record the size and shape of the applicator, the amount of radium in milligrams, the duration of the application in seconds or minutes, the character of the screening, i.e., the material and its thickness (in the case of the nasal applicator .3 mm. of monel metal), and, when possible, the actual size of the volume to be radiated (in this case, the nasopharynx).

Each applicator is designed to contain 50 mg. of radium. Two applicators may be used at the same time, one through each nostril.

ENCLOSURE (A) (12)-Sheet 1

They may be separated by the use of adhesive tape attached to the end of the handles and to the skin on opposite sides of the face.

It has been empirically determined that a dosage of one gram twenty seconds with a single applicator is sufficient to destroy lymphoid tissue and not to injure the mucous membrane of one side of the nasopharynx. This often must be repeated twice, at four-week interval. An applicator containing one gram of radium is twenty times as strong as one containing fifty milligrams. Therefore, to obtain a dosage equivalent to one gram twenty seconds the duration of the application should be twenty times as long, or four hundred second, i.e., six minutes and forty seconds. For notation on the treatment sheet, it is only necessary to give the amount of radium and the duration of the application. Where both applicators are used simultaneously it should be so stated.

Should the applicator contain an appreciably smaller or greater amount of radium than fifty milligrams (one or two milligrams either way will make no difference) the time will have to be increased or decreased to approximately the desired dosage of one gram twenty seconds with each applicator. For example, if the applicator contains only forty milligrams the strength will be only one-twenty-fifth of a gram and the time should be increased to five hundred seconds or eight minutes and twenty seconds.

Accessory Arrangements

An alarm timeclock to control the duration of treatment.

A table in a separate room where the patient can lie comfortably during the treatment.

A heavy lead cylinder twenty cm. hight, with a central opening large enough to hold two applicators. From the top down this should be about fifteen cm. deep. A lining tube of glass or brass may be fitted into the cylinder and kept filled with alcohol. No top is necessary. The walls of the lead cylinder should be 25 mm. thick, which would make the diameter 50 mm., plus the diameter of the central opening, which would be approximately one cm.

The purpose of the lead carrying cylinder is to absorb all of the Beta rays and approximately ninety-three per cent of the Gamma rays emitted by the applicator. It is for the protection of the person giving the treatment and his assistants. The alcohol is used to sterilize the applicator. Lead is the cheapest effectual material available for the carrying cylinder and this is due to its high density.

More important even than the lead is distance in reducing radiation. The varies in intensity inversely with the square of the distance. At a distance of a foot or two the radiation from the nasal applicator can be considered as if from a point source. For example, at one foot the radiation is 1x 1 - 1, and we can call this intensity unity. At ten feet, 10 x 10 - 100, and the intensity is reduced to 1/100 of what it is at one foot. At twenty feet, 20 x 20 - 400, and the intensity is reduced to 1/400 of what it is at one foot.

When treatments are given the personnel should be at some distanc away. When not in use the applicators in the cylinder should be store in a safe place, as the radium is valuable.

A small hand truck should be available to carry the radium applicators in the load cylinders. During the treatment this can be kept next to the treatment table. When in storage the space should be large enough to take the truck and the container.

Local anesthetizing is rarely necessary and when necessary should be revealed by the preliminary nasopharyngoscopy.

As a lubricant, Boro-glycerine is most convenient. It can be washed off in a stream of water after each application.

Alcohol is a convenient means of sterilizing. Heat must never be used.

No one should ever touch the radium carrying tube at the end of the applicator. If this is done repeatedly, radiation changes may effect the skin of the fingers.

With this particular applicator, where there is so much Beta radiation, the wearing of rubber gloves should be helpful.

Protection to the Personnel Using Radium Applicator

If the precautions outlined are followed, there is no danger to the hands or fingers. The applicator should always be held at the end of the handle and away from the body. The placing of the applicator should be done rapidly and when treatment is completed the applicator should go back into the cylinder.

Over-radiation of the entire body daily for months will produce a drop in the white blood count. This is mainly in the lymphoid cells. One-tenth of an r. of Gamma radiation per diem is without any accumulative effect. Actually, in treating fifty patients a day and every day, if the precautions indicated are followed, the body would not be exposed to anything like this safe dose - probably not more than 1/100 r. per diem. There may be variations in tolerance - and it should be a routine practice to make a complete cell count of the blood in every doctor and nurse employed in these treatments. Counts might be made every two months. Individuals who at the onset, show a low white count should be excluded from the work.

Checking the Apparatus:

Radium itself is unstable and when radium is used it is in the form of a salt. For permanent radium applicators the insoluble sulfate is the best salt to use because in the event of a break there is much less danger of a loss. It should be kept in mind, however, that the applicator should always be handled as a delicate instrument.

On rare occasions a tube containing radium develops a microscopic fracture which can't be seen but which, nevertheless, allows radon,

the gas which is formed from radium, to escape. As will be explained later, if this occurs there is a loss of strength in the applicator. A simple method of determing whether such a break has occurred is by the use of a small inexpensive Alpha ray electroscope. If the applicator is put in the ionization chamber of such an electroscope and le: for a few minutes and then removed, there should be no change in the functioning of the electroscope. However, if radon is escaping the electroscope will be radio-active and cannot be charged for several hours. If this method of determing ionization or some other simple device is employed, the tube should be tested about once a week.

Sources of Radium

Widely distributed in the earth's crust and waters, radium occurs in almost infinitesimal quantities. It is found in recoverable amount in uranium-bearing ores, which are themselves rare, mixed with other minerals. Most minerals containing uranium are low-grade and not commercially valuable so far as the radium is concerned. Ores rich in uranium are exceedingly rare. The richest deposits so far uncovered have been in the Belgian Congo and in the Great Bear Lake region of Canada. Even when an ore consists of a pure uranium salt the proportion of radium to uranium is only one to four million. The popular movie, "Madame Curie", presents a very good picture of the general plan and difficulties encountered in separating radium from its ores. Since its first extraction by the Curies in 1898, there has been extracted perhaps as much as one thousand grams of radium. Most of this is in medical use, a considerable amount have been used in manufacturing luminous paints, and a modest amount employed for research in the physical laboratories.

General Facts

Radium's atomic weight is 226. It is an element and a metal.

It combines with acids to make stable salts, of which the commones are the chloride, the bromide and the sulfate. The first two are soluble and suitable for use in radon plants. The last, the sulfate, is best adapted for medical radium preparations.

Mme. Curie, by electrolysis of a fused salt, obtained pure radium which oxidizes rapidly. It melts at 700° C.

While sold in milligrams of pure radium it is not measured by a scale but by the amount of Gamma Rays emitted. A standard preparation of pure radium chloride containing 21.99 milligrams of radium chloride was prepared by Mme. Curie in 1912. The Bureau of Standards in Washington has one of the numerous subsidiary standards. A Gamma ray electroscope is employed in comparing the strength of an unknown preparation with the standard preparation.

Radio-activity is the process of spontaneously omitting rays.

Radio-active transformation is the name applied to the changes which occur in radio-active materials.

Kinds of Radiation from Radium

Rays or particles of matter are discharged from atoms undergoing radio-active transformation. These rays or particles in the case of radium, in equilibrium with its products, are of three kinds:

1. The Alpha particles are positively charged helium atoms. They carry most of the energy of radiation, have initial speeds of from 9,000 to 20,000 miles per second, and they weigh about eighteen hundred times as much as the Beta rays. Even those with highest speeds are absorbed by a few centimeters of air, a thin sheet of paper or glass and, of course, completely by all metal covers. They are not, therefore, to be considered in connection with the nasal applicator.

2. The Beta rays are true particles, negatively charged ions which are ejected from the atoms at speeds varying from 20,000 to 186,000 miles per second. They are almost completely absorbed by two centimeters of tissue. Under the heading of "Filters" their availability will be further considered.

3. The Gamma rays have no electrical charge and have the spee of light, 186,000 miles per second. Under modern physical conceptions, just as in the case of light, they have to be considered particles (quanta) traveling in wave forms. They have a very high capacity of traversing matter opaque to ordinary light and are identical with X-rays produced at voltages from 400,000 to 3,000,000.

Radio-active Transformations

Practically all spontaneously radio-active substances belong either to the uranium or thorium groups of elements. Artificial radio-activity in almost any element can now be produced by bombardment with neutrons. The discovery of the neutron has materially changed the idea as to the construction of the atom.

We need only to consider the uranium family of which radium is a member. This group of elements starts with Uranium I, atomic weight 238, and ends with lead, atom weight 206. Note that the atomic weight decreases. This is at the rate of four for each transformation - exactly the weight of an Alpha particle (helium atom). When lead is reached, also known as Radium G, stability is attained and there is no further transformation. Some of the group only give off Beta and Gamma rays. In this case, the new atom is called an isotope of that from which it is derived and has the same atomic weight but different chemical properties and is a true element.

Omitting from consideration the isotope, the uranium series consists of:

A. Uranium I, weight 238, which by sponstaeous transformation decreases to one-half in 4,670,000,000 years.

B. Uranium II, weight 234, whose half value is 2,000,000 years.

C. Ionium, weight 230, whose half value is 69,000 years.

D. Radium, weight 226, half value 1,600 years.

E. Radon, weight 222, half value 3.85 days.

F. Radium A, weight 218, half value 3 minutes.

G. Radium B and Radium C, weight 214, half value 26.8 minutes and 19.7 minutes, respectively.

H. Radium F, Polonium, weight 210, half value 136.3 days, and finally lead, weight 206.

All these elements are solids with the exception of radon, which is a gas.

A feeble Beta and Gamma radiation is given off by the isotopes of Uranium II and by the isotopes of Polonium.

The effectual Beta and Gamma rays from a radium-containing tube, are from Radium B and C.

Omitting from consideration the predecessors of Radium and the descendants of Radium B and C, there remains only Radium, Radon and Radium B and C of importance in the nasal applicator.

All three types of rays, Alpha, Beta and Gamma, have the property of ionizing gases. If their energies are measured by their ionizing power in small volumes of gas, the Alpha rays are ten thousand, the Beta rays one hundred, and the Gamma rays are one. This is a rough approximation. If the energy of each is measured by complete absorbtion, the Alpha rays carry 88.8%, the Beta rays 4.5%, and the Gamma rays 6.7% of the total energy.

Radio-active Equilibrium

Beta and Gamma rays are given off invaribly together. Only Radium B and C, very short-lived products, produce these rays. When Radium is sealed in a tube it begins to form Radon, and the Radon Radiums B and C. These products begin also to disintegrate, rapidly at first and then slower. It takes approximately thirty days for the radium tube to reach equilibrium, i.e., the point of maximum Radiums B and C content. When once attained it is, for our purposes, constant.

When Radon is sealed in a tube it reaches equilibrium in four hours and then begins to decrease at the rate of about one-sixth every day. There is no Radon and no Radiums B and C after about thirty days.

A milligram of Radium contains millions of atoms but only few undergo transformation in a unit of time. This rate is perfectly uniform and cannot be changed by any of the physical agents known at

this time.

Much higher concentrations of Radon are possible than in the case of Radium. In the same volume, at least forty times as active preparations are possible. The Radon is measured in the same way as Radium: A Curie of radon has the same energy as a gram of Radium and the same applies to fractions such as milligrams and millicuries.

What Happens when Radiation is Absorbed?

If the material traversed is thick enough there is complete absorption of all three types of rays. If an atom is pictured as composed of a central nucleus and orbital electrons (the nucleus containing protons, electrons and neutrons) it is simpler to visualize. Each proton carries one positive charge and each electron (Beta ray) one negative charge. A neutron is composed of a proton and an electron and has no charge. An Alpha ray may strike an atom, lose some of its energy, and release enormous electrons. Such electrons act as Beta rays do. Very infrequently, an Alpha ray strikes an atom solidly and causes it to lose a proton. This is artificial radio-transformation. It was first observed by Rutherford in the transformation of oxygen into nitrogen. With Lawrence's Cyclotron and the development of Neutrons this has been accomplished for many elements. The Alpha ray finally loses all its energy.

Beta rays, which are definite particles, also produce secondary electrons and characteristic X-rays. They act on the orbital electrons of the substance through which they pass and have most irregular paths, bounding from atom to atom. They vary in their energies and speeds-- the higher the energy the more the effect.

Gamma rays, as visible to light and X-rays, are imponderable, but are also absorbed and scattered. In passing through tissues they release electrons from atoms and also characteristic X-rays. Some of the observed phenomena are only explainable on the wave theory, while others demand the particle (quanta assumption) to be the understood. The manner of their action and their nature is still in doubt and had been argued pro and con since the time of Isaac Newton. It would seem that Gamma rays, like X-rays and like ordinary visible light, are particles of matter and proceed in the form of waves -- the higher the energy in the particle the shorter the wave length. In the production of X-rays the length of the wave is proportional to the voltage applied to the tube. One can, therefore, speak of Gamma waves of certain wave lengths as rays due to certain voltages.

The wave lengths can be estimated by the crystal defraction spectroscopic appearance and by the absorption methods.

Effect of Covers on Radium Preparation

As already pointed out, screening, or filtration, markedly changes the amount and character of the radiation used in treatments. For various reasons, mainly, however, controlled by the aim to limit the dosage to the tissue to be treated, it is advantageous to use different screens for different purposes.

With a homogenious radiation, i.e., in the case of Gamma rays, all of the same wavelength, or, in the case of Beta rays with the same speed or energy in any material the absorption is exponential, i.e., in a unit of thickness of the absorbed, there is the same percentage of absorption.

The Beta and Gamma rays from Radium are not homogenious but are in bands. When analyzed they are not in a continous spectrum as is the case with X-rays. When considering Radium one speaks of soft and hard Gamma and Beta rays. The soft rays are more easily absorbed and have a higher coefficient of absorption than the hard rays. As a consequence, the total radiation drops rapidly with the first thin filter and only becomes exponential when the radiation becomes homogenious from the disappearance of the softer rays.

The absorption capacity of a filter is proportional to its density. To absorb all the Beta rays only about .5mm. of platinum, gold or tungsten is required, one mm. for lead or silver, two mm. for brass or monel metal, 10 mm. for aluminum, and twenty mm. for water and animal and human tissues, with the exception of bone which is about ten mm. Even when all the primary Beta radiation is absorbed there is a secondary Beta and Gamma radiation from the filter. This is most penetrating from the metals of high density. It is not large from monel metal; it is constant from a fixed source as in the case of the nasal applicator and, for the treatment of the nasopharynx, does not require a secondary screen of lighter material ordinarily used in deep treatments.

It is quite certain that all the Beta rays from the applicator are absorbed by the tissues of the nasopharynx. On the other hand, the proportion of absorption of the Gamma rays is small. At a given distance of the tube from the walls of the nasopharynx the most intense radiation is from the axis perpendicular to the center of the tube, and much less at the ends. This is because of the inverse square law. The radium in the tube may be considered as a line of points.

The influence of filtration by monel metal is approximately as follows:

With .3 mm -	Beta rays	32%,	Gamma rays	70%
With .5 mm -	" "	25%,	" "	75%
With 1. mm -	" "	3%,	" "	97%
With 2. mm -	" "	0%,	" "	100%

This refers to the quality of the beam and not the total quantity of radiation.

The primary action of the radiation is directly on the atoms of the tissue and has already been described.

<u>Biological Effects of Radium</u>

Changes in living tissues and cells are directly proportional to the radiation absorbed. While this is true of a single exposure given in a short time, it may be modified very greatly by the reparative powers of tissues. A unit dose given at one sitting produces more

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effect than the same total dose in a period of a week with daily fractions being given each day. When the fractions are given at weekly intervals or a great many weeks, there may be neither macroscopic or microscopic changes demonstrable. All available evidence goes to show that the changes in tissues due to Gamma and Beta rays are identical, provided the amount of energy absorbed is identical and the time factor kept constant.

Not long after its discovery, some accidental burns occurred with those handling radium and these observations suggested its use as a therapeutic agent.

It was early observed that macroscopic changes occurred only after an interval of a number of days. This was termed the latent period. Microscopic changes can occur and be demonstrable even with small doses in a few hours. As the intensity and amount of dosage increases the latent period becomes shorter and shorter.

When dealing with normal tissues, it was soon recognized that they varied greatly in their ability to tolerate radiation. That the lymphoid tissues were injured by dosage that apparently had no effect on other tissues, was shown by Heinecke in 1904. This has been confirmed by every experimental study made since then and by countless clinical observations. Malignant, transformed cells were found to be less tolerant than the normal cells from which they are derived. It is this difference in tolerance which forms the basis for all irradiation therapy. What actually takes place is exceedingly complex and but very imperfectly understood. There are physico-chemical and chemical alterations immediately following the exposures. Whether these primary changes lead to the permanent changes, directly or indirectly, is unknown. There is abudant microscopic evidence of the final changes in growths and tissues, such as replacement by connective tissues of the parenchymal cells.

It is almost certain that the primary changes in a cell involves both nucleus and protoplasm. Which recovers first and what effect injury of one or the other may have on the other is not known. It is probably that the intracellular tissue is contributory to the changes. Edema is a constant change following radiation.

Bacteria, especially pathogenic ones, which cannot be destroyed in cultures, are destroyed by radiation of tissues in which they are located. This must be a secondary effect.

Cells definitely vary - depending on the stage they are in. They are most easily injured at the time of division and a very mild radiation may cause injury of the reproductive part of the cell alone.

Hyperplastic tissues are more easily injured than quiescent tissues.

The recovery period of the nasopharyngeal tissues, after a moderate radiation injury, takes about four weeks. It is because of this that the intervals between treatments has been fixed at this period.

The surroundings and physical conditions in all adenoids vary and exactly the same effects from a similar dosage cannot be expected in each case.

The aim of the treatment is to remove mechanical obstruction which prevents free ventilation through the Eustachian tubes, but perhaps more important is the relief of infection which cause hyperplasia of the lymphoid tissues and edema and swelling of the mucous membrane.

Biological dosage is a term applied to the dosage necessary to produce a desired effect. In this case, it might be called the adenoid dose. Filtration has marked effect in this connection, e.g., where a millimeter of brass, or its equivalent, monel metal, is employed this dose is two gram minutes on either side. If the filtration is reduced to .5 millimeters, the dosage becomes one gram forty seconds, and with the applicator we recommend .3 millimeters, one gram twenty seconds. The energy absorbed is approximately the same and, with the tissue we are dealing with, the results are nearly the same.

LYMPHOID HYPERPLASIA AND PREVENTION OF OTITIS DUE TO BAROTRAUMA (AEROTITIS) WITH RADON

Major Edmund P. Fowler, Jr., Medical Corps, Army of the United States.

Examination of American soldiers in England reveals that they are even more prone to develop pharyngeal lymphoid hyperplasia, secondary eustachian salphingitis and consequent otitis media on this island than in the United States. Whether this is due to climate, or living conditions, or something else, is difficult to say. A very high percentage of flying personnel come hospitals with a history of recurrent acute catarrhal otitis media. In one Genreral Hospital, .8% of ground personnel and 22% of flying personnel had a history of recent otitis when examined. Nearly all of them had sufficient excess lymphoid tissue around their eustachian tubes to account for this.

Since Crowe and Baylor's article (1) on the prevention of deafness in childhood using radon in the nasopharynx, the John Hopkins work has been repeated in New York (2) as well as several other cities (3) (4), It seemed reasonable to try radiation on soldiers, because their otitis occurred with excess lymphoid tissue which resembled that seen in children with the same condition. The use of radon appeared particularly applicable to airmen, because interference with normal tube function, by even a small amount of swollen tissue, is likely to cause trouble when they change altitude.

Through the asupices of Professor Barclay of Oxford, contact was made with Professor Russ of the Middlesex Hospital, who arranged for the delivery of radon at regular intervals, from the Central Radon Institute Barton-in-the-Clay, Berks. Treatments were begun in December 1942 and up to March 1944, 220 patients had been treated. The most convenient dose for the laboratory to ship and to put into the capsules provided was 75 millicuries per capsule. The capsules are made of platinum 0.65 mm thick and measure 3.5 mm by 15 mm. They are attached to a semi-maleable 18 gauge wire, 14 cm in length. The radon is inserted very much as is a nasopharyngoscope, the capsules (totalling 150 millicuries on the first day) are passed along the floor of the nose and then separated by placing a small piece of rubber tubing over the insertion wores outside the nostril (fig 1 & 2). They are left in place 25 minutes the first day. Since 150 millicuries is equivalent to 150 mg of radium element, 25 minutes gives a dosage of 66 mg. hrs. or two gram minutes; that is, approximately the dosage recommended by Crowe (1). The radon capsules as a rule lie very near exuberant lymphoid tissue on the medial side of the

torus. For convenience they are considered as a single source of emanation in estimating dosage. However, since the capsules are separated, the total effect of 66 mg. would not reach any area in the nasoparynx. The designation 66 mg. hrs. therefore slightly exaggerates the dosage that actually reaches the nasopharyngeal walls. The exact tissue dosage is not known because the applicators will necessarily lie at different distances from the tissue in different individuals so that the strength of the two applicators added together and the time that they lie in the naspharynx is used as the most reasonable and safest approximation of the dosage.

Since radon decreases one-half of its strength each 3.85 days, the time is increased every day until there is very little activity left in the radon, i.e. not over 10 days. Table 1. The treatments were originally given at 6 weeks' intervals until 4 to 6 doses had been given. There was rarely any evidence of improvement until after the 3rd treatment. If a patient had a cold or an active otitis at the time of his appointment for treatments, half the usual dosage was given, that is 33 mg. hrs. instead of 66 mg. hrs. Then if no reaction occurred, a second 33 mg. hrs. was given in 2 or 3 days. Occasionally there was increased stuffiness in the ears without objective signs following treatment, but twice in patients with active nasopharyngitis, definite acute catarrhal otitis media with fluid levels developed. Myringotomy was not needed in these cases and the fluid disappeared in a few days. When the interval between treatments was reduced to 3 weeks, there were not untoward results. This was expected, for much more extensive radiation is given to patients with neoplasm without permanent effect on normal tissue. A small series has been tried giving 100 mg. hrs. at 4 weeks' intervals, for two treatments. Sufficient folow-up has not yet been obtained on these patients for inclusion in this paper, but the method seems to be satisfactory.

Shrinkage of the nasal nucosa, even temperature and sunny weather, would undoubtedly have helped some of the cases treated with radon, but most of them had been treated extensively without relief before being sent to the 2nd General Hospital. Some of our airmen went to Africa and they were quite well until they came back. Succeeding attacks were often more persistent and more often resulted in suppuration than first attacks. Sulfonamides rarely had any effect on the sisease unless it was suppurative. Even when suppuration cleared there were many cases of residual catarrhal otitis following the use of sulfonamides. This seems to be particularly so if inadequate dosage was given or if the drug was not continued for a sufficiently long period, or if the adenoids were very large.

(13)-Sheet 2

Experience with deep X-ray therapy (2) has shown that it affects lymphoid hyperplasia in the nasopharynx very much as does radon, but patients must take many more treatments. X-ray takes longer and is more difficult to apply accurately to the eustachian tube region. It is more likely to involve surrounding tissue and produce other symptoms such as a mild parotitis, erythema of the skin or dryness of the throat. Radium element on the other hand can be used if available. The 25 or 50 mgm capsules often used in gynecological practice are convenient for this work (2).

The greatest difficulty in the Army has been to get the men back by appointment for enough treatments. They feel better and they don't come until a recommencement of their symptoms, or they move so that they are no longer evacuated for sickness to the original hospital before the course is finished. Many have been sent back to the United States becuase their nasopharyngitis or sinusitis seemed to be uncontrollable in this theater. These are the reasons so many cases have received incomplete treatment in our hands.

In these cases who have received sufficient dosage, and who are not plagued by chronic nasopharyngitis and sinusitis there has been a gratifying percentage of successes. (table I

Unfortunately, many medical officers and patients expect too much from the treatment. Radiation is not a "cure for deafness." It obviously will not improve the hearing very much if scars and adhesions interfere with the movement of the ossicles. It cannot be expected to work if a chronic sinusitis repeatedly bathes the orifices of the tubes with pus and reinfects the middle ears, or if a chronic purulent otitis is present although, at times, it does seem to help even these cases. It rarely is of benefit if severe allergic rhinitis is present.

Airmen with subacuts eustachian tube blockage can get along perfectly well on the ground or even at low altitudes, but as soon as they fly high, or are subjected to rapid changes of altitude their eustachian tubes close so that they cannot be opened. This otitis barotrauma produces anything from a mild catarrhal condition in the middle ear to an acute severe otitis with or without rupture, and may go on to an acute purulent process. None of these conditions wouldddevelope if the tubes had not malfunctioned in the first place. Most of the malfunction of the eustachian tubes is due to swollen tissue within the tube. This tissue is not always apparent at the orifice. In addition to lymphoid tissue, there is often swollen glands, oedomatousmucosa, or sub-mucosa, as well as hyper-secretion bleeking the tube. The cold air of high altitude often causes hyper-secretion in the nose which bathes the tubal

orifices and blocks or irritates them. Apparently radiation reduces activity of glands, shrinks the cedema and has, in addition, a specific effect on hyperplastic lymphoid tissue. It is probable that the radiation has a beneficid effect on the infection present as well as producing a shrinkage of the lymphoid tissue itself.

Some physicians assume that adenois are rare in adults. American soldiers after a few months in England often have so much excess lymphoid tissue that as soon as the mouth is opened it can be seen bulging from the posterior pharyngeal wall, or behind the posterior tonsilar pillars in heavy bands. It is particularly prominent following a virus pneumonia. When it can be seen on the phayyngeal wall below the pallate, it is inveriably present in the nasopharynx above. It is often difficult in the forces to obtain a smooth narrow metal tongue blade and the small well silvered mirror and good lighting necessary for proper indirect examination of the nasopharynx; likewise, it is often difficult ot obtain a good nasopharyngoscope with a wide field and upright image for a direct examination. If they are used in every case, it is surprising how many soldiers are found to have large lymphoid masses in and about the carilagenous portions of their eustachian tubes. Out of 2337 new patients in our Ear Nose and Throat Clinic well over 1/3 had swollen lymphoid tissue in the nasopharynx. Of these radon treatment was begun in 220. A summary of these cases is given in Table II. Other details are as follows: 24 had adenoidectomies because radon rays do not sufficiently reduce large masses of lymphoid hyperplasia in the midline in the dosage given. Of the 2337 patients, 62 recurrent otitis due to barotrauma sufficiently severe for them to be sent for special treatment. 9 of these have been sent back to the United States after one or two treatments, because in addition to otitis they had intractable nasopharyngitis or sinusitis. A few have been lost at follow-up, the remainder are still under treatment. 79% of the airmen who have had sufficient treatment are back on full flying status, (See Table II); that is, 79% of airmen who have had two or more episodes of severe difficulty clearing their ears are now quite comfortable and have not been grounded for two months or more. Most of them had aero-otitis after every flight before treatment. None of the flyers had much residual deafness by the time they readhed a general hospital, so that is ti difficult to give a graphic picture of their improvement. However, the fact that they are now flying several times per week, without trouble, is significant. Some of them are now dive bombing in fast planes. Of the 6 men who did not return to flying, 2 were enlisted men grounded for administrative reasons, and 2 had a residual nerve type deafness sufficiently severe to keep them from passing the hearing examination necessary for return to the air. Their non-suppurative otitis media cleared, but the high tone loss did not.

The chronic non-suppurative otitis did not subside completely in one case, although he was able to carry on in ground duty. One had had severe recurrent nasopharyngitis in this thearer and was boarded to the United States. It is probable that he would have flown here could he have stayed after the treatments were finished.

As for the control group, ground personnel, the results are not quite so clear out. It is difficult to be sure that some of the 75% who stopped having recurrent otitis would not have got well without treatment. It is also probable that eventually some of them will have recurrences. Almost 5 years of experience with recalcitrant upper respiratory diseases and secondary otitis media treated in this and other hospitals makes one certain clinically that radiation is the treatment of choice if adenoid tissue on the lateral nasopharyngeal walls blocks the eustachian tubes. There is also no question that if only cases without active severe nasopharyngitis of sinusitis had been selected that the percentage of improvement would have been better. The cases who had otosclerosis or nerve deafness were treated because these diagnoses are very difficult to make and occasionally some improvement was obtained even when these conditions were present. This is believed to be due to the subsidence of a superimposed tubal catarrh. In spite of the fact that no accidents have occurred with the relatively safe dosage used, it is believed unwise and dangerous for an otolaryngoligist to attempt radiotherapy of the nasopharynx without the continual quidance of a qualified radiotherapist. On the other hand, where such control is available, treatment of the lymphoid tissue about the eustachian tube with radon or radium is simple, relatively inexpensive and easily learned. It is infinitely more efficacious and permanent than catheterization, polizeration or bougienage. These should bereserved for the few cases in which they are indicated. (Farrior 4). Centers for the more extensive utilization of the radiation treatment for lymphoid hyperplasia in the nasopharynx should be set up.

A report is made at this time because experience with ground personnel and children has shown that lymphoid hyperplasia in the nasopharynx predisposes to otitis media which can be controlled with radiation. A limited experience of flying personnel shows, as might be expected, that this modality also tends to prevent recurrent otitis due to barotrauma (aerotitis) when it is due to swollen tissue in and about the eustachian tubes. In practice it has put men who had been previously grounded back in the air able to fight. We need them there NOW!

The author was assisted in the examination and treatment of these patients by Captain Paul M. Osmum, U. S. Medical Corps, and in the details of radiotherapy by Lt. Col. Robert P. Ball, Chief of the Radiology Service, 2nd General Hospital. To These men acknowledgement and thanks are herby rendered.

TABLE I

		66 mg. hrs	11 mg.hrs.
June 1	10 a.m.	26	39
1st Day	4 p.m.	27	42
June 2	10 a.m.	31	47
2nd day	4 p.m.	33	51
June 3	10 a.m.	38	57
3rd day	4 p.m.	40	60
June 4	10 a.m.	45	68
4th day	4 p.m.	48	72

Table I, showing increase in dosage time necessary each day with applicators containing 150 millicuries of radon, on the first day. Such a table is made up each time the radon is delivered so that proper dosage for each date is available without calculation.

TABLE II

Total Airmen with recurrent otitis media treated with 200 mg. hrs. or more and on whom follow up is complete.(all of these cases were aerotitis except 3)	29
Number back flying	23* - [illegible]
Total free of otitis	28 - [illegible]
* one pilot has been shot down by enemy action after several combat missions.	
Total Ground force treated with 200 mg. hrs. or more, and with at least 4 months follow up in the winter	59
Otitis media recurrent non-suppurative	40
Mixed deafnesses (Otosclerosis 3 - nerve deafness 9)	12
Recurrent suppurative	7
Free from otitis	35 [illegible]
Chronic suppurative, cases improved	3 [illegible]
Improved in hearing without recurrence of deafness, 15 to 40 db average for the speech range, for 4 months	40 [illegible]
Mixed deafness, improved in hearing, 15 to 20 db for low notes	3 [illegible]
Improvement in tinnitus	3 [illegible]

(13) - Sheet 7

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(1) Crowe, S. J., and Baylor, J. W.
The Prevention of Deafness, J. AMA 112, 535, Feb. 1939

(2) Fowler, E.P. Jr.
Non Surgical Treatment for Deafness. Laryngoscope 52, 204 March 1942.

(3)a Fisher, Gilbert E.
Recognition and Radium Treatment of Infected Lymphoid Tissue, etc. Arch. of Otolaryngology 37, 434, 1943.

(3)b Jones, Edler H.
Irradiation of the Nasopharynx in Officor Practice. Ibid. 37, 436, March 1943.

(4) Farrior, J. Brown
Histopathologic Considerations in Treatment of the Eustachian Tube. Ibid 37, 609, May 1943.

BUREAU OF MEDICINE AND SURGERY DATE: 10 July 1944

RESEARCH DIVISION PROJECT-FORM SECTION: Submarines

PROJECT: No. X-434 (Sub. No. 90)
~~(our designation a [illegible])~~

1. Title of proposal: AERO-OTITIS MEDIA: Its prediction, prevention, and treatment.

2. Date of inception: 1 August, 1944 - duration: approximately 5 months.

3. Location of study: Medical Research Department, Submarine Base, New London, Connecticut.

4. Objectives: (1) To classify by otomasokaryngoscopic examination, the condition of the ears, nose and throat, i.e. ear pathology; deviated nasal septum; hypertrophy of tonsils, both lingual and tubal; and Eustachian tube involvement - (Grades 1, 2, 3, 4, etc;
(2) To study and classify the effects of damage caused by exposure to 50-~~60~~-pounds air pressure on all men examined (about 70 men per day);
(3) To try corrective treatment and surgical measures as may be indicated by an analysis of results of item (2); and
(4) To classify and treat all pressure failures (about 10% of the group, i.e. 6 or 7 per day), according to the following outline: (a) one group, topical applications; (b) one group, placeboes; (c) one group, X-ray of Eustachian tubal tonsillar tissue, and finally, (d) one group with radium applicators.
(5) To study the auditory acuity loss entailed by the damage to the ear (aero-otitis media).

5. Requirements to be provided:

a. Subjects - none required, as 70 men per day are available routinely in submarine escaping and submarine escape training.

b. Material - (1) nasopharyngoscope
(2) two radium-containing applicators, similar to the ones now used by the U.S.Army. This applicator has a handle 15 cm. long, solidly attached to a tubular head. The head or radium-containing chamber is 15 mm. long and 1.5 mm. in diameter. The wall thickness is 0.3 mm. and is made of monel metal.
(3) 50 mg. of radium for each of above applicators.
(4) Alarm time-clock, calibrated in seconds.
(5) Heavy lead cylinder 20 cm. in height with eccentrical opening large enough for applicators. From the top down this measures 15 mm. deep. A lining tube of plane or brass should be fitted into the cylinder to be kept filled with alcohol. Below the opening, the wall of the lead cylinder should be 15 mm. thick, which would make the diameter 30 mm. plus the diameter of the central opening which should be approximately 1 cm.

BUMED PROJECT-FORM - SUBMITTED FOR APPROVAL - 10 July 1944

TITLE OF PROPOSAL: - AERO-OTITIS MEDIA: Its prediction, prevention, and treatment

- -

a. Funds - $500, in addition to radium applicators.

6. Individuals involved: and present station:

a. Principal investigator: Captain C. W. Shilling (MC) USN - Submarine Base, New London, Conn.

b. Collaborator: Dr. H. L. Haines, now at Johns Hopkins Hospital, not yet in uniform, however he has a Reserve commission in the Navy.

HARRIS, J.D., Spec.(X) 2/c - attached to Medical Research Laboratory, Submarine Base, New London.

7. Additional information.

A great deal of preliminary work has been accomplished, which definitely indicates the necessity for this final study. Work was done and published by Shilling and Everley, indicating the seriousness of the problem, and the danger to ears and the associated deafness when failure to equalize air pressure is encountered. Additiona work of over a year and a half was accomplished by Comdr. R. W. Teed, when he was at this submarine base, further indicating the type of damage and the preventive measures necessary, and suggested type of treatment. Request was made at that time for this extensive experiment, but this request was not granted.

Recent events in England have again called attention to the importance of the subject of aero-otitis media and its associated deafness, and aroused considerable interest both in the Army and the Navy. For that reason, it is requested that this experimental study be approved.

The materials listed are all that are necessary for the conduct of this experiment. It should be noted that the X-ray available locally on this base is not ideally suited for giving the type of X-ray treatment needed in these cases, but can be used.

In order to accomplish this experiment, it will be absolutely necessary for us to have on duty a doctor trained in the technique of radium application in order that he may properly treat the group chosen for that type of treatment. This doctor will of course have to do the routine examination of the 70 men a day both before and after pressure, as well as the treatment by the various methods outlined above. Such a doctor is available in the person of H. L. HAINES, now at Johns Hopkins Hospital and commission in the Naval Medical Corps, Reserve, but not yet called to active duty. If it would be possible to call him to active duty and assign him to this Medical Research Laboratory for the period of the experiment, he would be able to get his indoctrination in the Navy and at the same time accomplish the routine examination of submarine candidates, as well as the work required in connection with this study.

Dr. Haines attended the Clinical Conference on the Radium Treatment of Aero-Otitis Media, which was held at Mitchell Field, Long Island, N.Y. on 5 June, 1944 to 12 June 1944, in his capacity of assistant to Dr. S. J. Crowe of the Johns Hopkins Medical School faculty, who was in charge of this conference. Doctor Haines has recently made a trip to New London, at his own expense, to confer with Captain Shilling on this project, and is very much interested in the study and desirous of being called to active duty for this piece of work.

PROJECT NO.	SECTION	DATE
X-434 (Sub. No. 90)	II	9 August 1944

TITLE OF PROPOSAL

Aero-Otitis Media in Submarine Personnel: Prevention and Treatment of.

ESTIMATED DURATION

5 months

LOCATION(S) OF STUDY

Medical Research Laboratory, Submarine Base, New London, Connecticut

OBJECTIVE(S) AND EXPERIMENTAL DESIGN

(1) To study and classify the effects of damage caused by exposure to 50 pounds air pressure on all men examined (about 70 men per day);
(2) To apply corrective treatment as may be indicated by an analysis of results of item (1).
(3) To classify and treat all pressure failures (about 10% of the group, i.e. 6 or 7 per day) according to the following outline:
(a) one group, topical applications; (b) one group, placeboes; (c) one group, X-ray of tubal tonsillar tissue and finally (d) one group with radium application.
(4) To study the auditory acuity loss entailed by the damage to the ear.

REQUIREMENTS TO BE PROVIDED

SUBJECTS

70 Men per day will be available in submarine examining and submarine escape training.

MATERIEL (List separately)

(see attached sheet)

FUNDS (requiring allocation)

$500.00

PRINCIPAL INVESTIGATOR

Captain C. W. Shilling (MC) USN, Submarine Base, New London, Connecticut.

COLLABORATOR(S)

Lieutenant (jg) H. L. Haines (MC) V-(S) USNR
Harris, J.D., Spec. (X) 2/c

CONSULTANT(S)

none

ADDITIONAL INFORMATION (use additional sheets as required)

A great deal of preliminary work has been accomplished definitely indicating the necessity for this study. Work was done and published by Shilling and Everley, indicating the hazard to ears and the associated deafness when failure to equalize air pressure is encountered. Additional observations conducted by Comdr. R. W. Teed, (MC) USN when stationed at this submarine base, further indicated the type of damage the preventive measures necessary, and the type of treatment.

Recent events in England have again called attention to the importance of the subject of aero-otitis media and its associated deafness, and aroused considerable interest both in the Army and the Navy.

Requirements to be provided (cont'd)

Material: (1) nasopharyngoscope
(2) two radium-containing applicators, similar to the types now used by the U.S. Army. This applicator has a handle 15 cm. long, solidly attached to a tubular head. The head or radium-containing chamber is 15 mm. long and 1.5 mm. in diameter. The wall thickness is 0.3 mm. and is made of monel metal.
(3) 50 mg. of radium for each of above applicators.
(4) alarm time-clock.
(5) heavy lead cylinder 20 cm. in height with a central opening large enough to hold two applicators. From the top down, this should be 15 cm. deep. A lining tube of glass or brass should be fitted into the cylinder to be kept filled with alcohol. No. top is necessary. The walls of the lead cylinder should be 75 mm. thick, which would make the diameter 50 cm. plus the diameter of the central opening which should be approximately 1 cm.

For Log - Dr Haines

PROJECT FORM
NAVMED - 158 (Rev. 4/44)

BUREAU OF MEDICINE AND SURGERY
RESEARCH DIVISION

Approved 12 Sept. 1944

PROJECT NO.	SECTION	DATE
X-461 (Sub. No. 95)	II	11 Sept. 1944

TITLE OF PROPOSAL

Effect of Radon in the Nasopharynx on Ear Pathology, particularly in Aviators.

ESTIMATED DURATION

9 months

LOCATION(S) OF STUDY

U. S. Marine Corps Air Station, Cherry Point, North Carolina

OBJECTIVE(S) AND EXPERIMENTAL DESIGN

To study the effect of radium emanations applied in the nasopharynx on aural symptoms induced by lack of patency of the eustachian tubes.

REQUIREMENTS TO BE PROVIDED

SUBJECTS

Aviation personnel ground and flight

MATERIEL (List separately)

Radon

FUNDS (requiring allocation)

$350.00

PRINCIPAL INVESTIGATOR

Captain Page Northington, MC, USNR

COLLABORATOR(S)

none

CONSULTANT(S)

none

ADDITIONAL INFORMATION (use additional sheets as required)

This subject is of special interest in relation to the treatment of Aero-Otitis Media occurring in Aviation and Diving personnel.

(17) - Sheet 1

PRESSURE GROUP

NAME_____ AGE____ IQ____ RATE_____ DATE_____

Pre-pressure audiogram date _____
Post-pressure " " _____
Minutes after pressure before post-pressure audiogram _____
Comments on pressure _____

_____

D.C.
W.V. _____

Treatment: 1.
2.
3.
4.

First Follow-up audiogram date_____ Days after post-pressure _____

Comments_____

Second follow-up audiogram date _____ Days after first follow-up_____

Comments_____

Third follow-up audiogram date _____ Days after second follow-up_____

Comments_____

Right Ear:

	256	512	1024	2048	4096	8192
Pre-pressure	___	___	___	___	___	___
Post-pressure	___	___	___	___	___	___
Follow-up 1	___	___	___	___	___	___
Follow-up 2	___	___	___	___	___	___
Follow-up 3	___	___	___	___	___	___

Left Ear:

Pre-pressure	___	___	___	___	___	___
Post-pressure	___	___	___	___	___	___
Follow-up 1	___	___	___	___	___	___
Follow-up 2	___	___	___	___	___	___
Follow-up 3	___	___	___	___	___	___

ADDITIONAL DATA

HISTORY:

Number of colds per year _____

Allergy _____

Nasal obstruction _____

Sinusitis _____

Otitis media _____

Difficulty inflating ears _____

PHYSICAL EXAMINATION: (Pre-test)

Pharynx - tonsils out _____
lateral bands _____
Post. wall _____

Nasal obstruction -
if yes, cause: _____

_____

Ears: Tympanic membranes:

Scarring _____, Retraction of Shrapnel's membrane _____

Perforation _____, " of Pars tensa _____

Middle ear:	Spasm.	Treatment	Treatment	Treatment
Hyperemia				
Fluid				
Nasopharynx:				
Tubal orifice				
Fosse of Rosenmuller				
Posterior wall				

Chicago Office
Marshall Field Annex Building

RADIUM CHEMICAL COMPANY INC.

570 LEXINGTON AVENUE

NEW YORK 22, N.Y.

Radium Sales Department
Radium Leasing Department

October 24, 1944

Lt. H. L. Haines
Medical Research Submarine Base
New London, Connecticut

Dear Lieutenant Haines:

I was pleased to have had the opportunity of meeting you at the recent Academy at Chicago.

As you probably already know, an order has been placed with us for two of the new-type naso-pharyngeal applicators for use at your base. We are giving the order preference, and I am quite sure that delivery will be completed at least a couple of weeks before the date specified in the contract.

With kindest regards, I remain,

Sincerely yours

George H. Loftus
Vice President

George H. Loftus
SM

AERO-OTITIS MEDIA AND AUDITORY ACUITY LOSS IN SUBMARINE ESCAPE TRAINING.

8 October 1944

Captain C. W. Shilling, (MC) USN
Medical Officer in Charge, Medical Research Dept.
U. S. Submarine Base, New London, Conn.

(20) - Sheet 1

AERO-OTITIS MEDIA AND AUDITORY ACUITY LOSS IN SUBMARINE ESCAPE TRAINING

--Captain Charles W. Shilling (MC)USN
U.S.Submarine Base
New London, Connecticut.

Thirty percent of the men undergoing submarine escape training at the U.S.Submarine Base, New London, Connecticut, have difficulty, leading to aero-otitis media and resultant loss of auditory acuity. In this training, every candidate for the Submarine School is subjected to fifty pounds of air pressure in a recompression chamber, which pressure is equivalent to 3.4 atmospheres. Successful completion of this training is a prerequisite for entrance into the Submarine School. Only those men who have passed the physical examination are sent to the Escape Training Tank. Because of the similarity between our problem and that of flying personnel, we feel that our findings are of particular interest. This paper presents an analysis of the extent of the damage associated with this training and outlines possible preventive and therapeutic procedures.

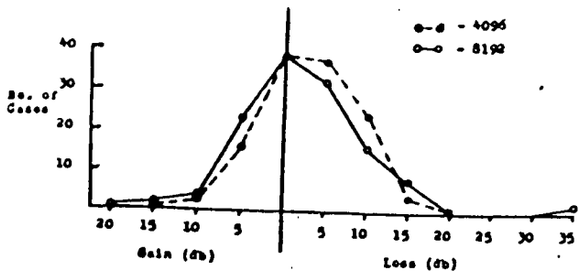
Some of the earlier findings were presented in a paper by Shilling and Everley, published in the Naval Medical Bulletin in July 1942. This was one of a series of articles concerning auditory loss, --this particular article dealing with the auditory loss encountered by men going through the Escape Training Tank. Ten percent of all subjects upon whom that report was based failed properly to ventilate the middle ear; upon otoscopy we noted resultant damage ranging "all the way from very slight congestion

.....to complete rupture of the drum with frank hemorrhage from both the external canals and the Eustachian tubes."

Of the 152 cases diagnosed as aero-otitis media in this series, 18 of the more acute cases showed an average drop in auditory acuity of 12.7 to 23.9 decibels, when compared with a control group equated for age and number. This is illustrated in Figure No.1.

Some of the auditory losses in this group were actually disabling, and it was pointed out in that paper that aviators, too, would experience trouble as the result of such pressure change. We were able to make such a prediction since it was our observation that subjects experienced their greatest difficulty with the first few pounds of pressure--usually no more than that to which aviators are subjected during certain maneuvers. This will be illustrated by Figure No.2, where it will be noted that over 82% of the failures occurred below the first eleven pounds of pressure. Of course, this is to be expected, for it is in this range that the greatest proportionate air pressure change occurs. This change follows a logarithmic curve, as pointed out by Haldane and others.

Our statements, as contained in the second part of our paper concerning auditory acuity, may be open to question, since it can be argued that comparison with normal control groups is not as satisfactory as taking pre- and post-pressure audiograms on the SAME individual and comparing these.



Distribution of Changes on Post-Pressure Test
(Those men reporting no difficulty with pressure)

Fig. 4

Fig 4

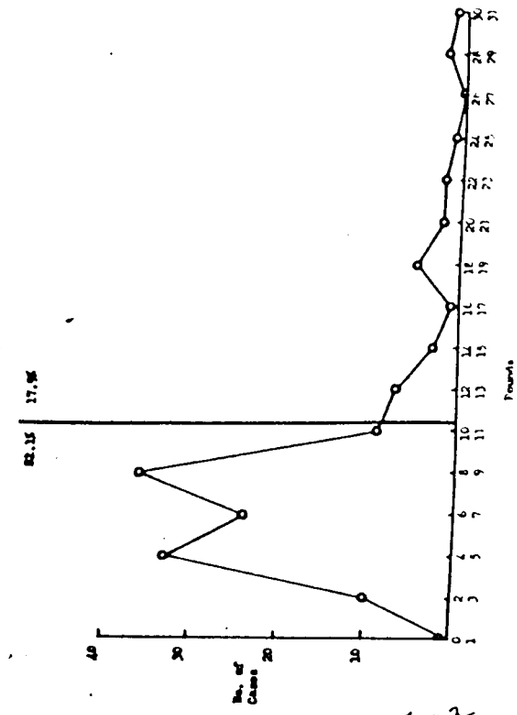
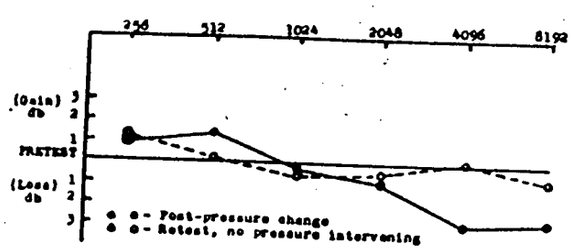


Fig 2

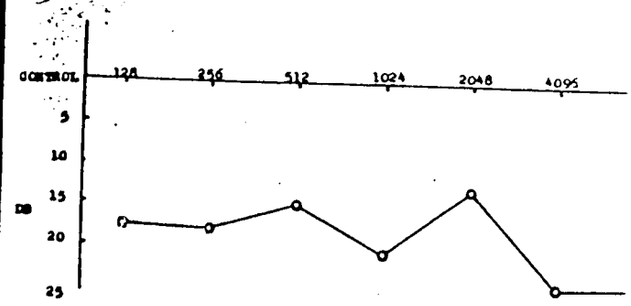
Fig 3



Mean Change in Audiogram

Fig. 3

Fig 1



Hearing Loss in Decibels

(18 acute Aero-Otitis Media compared
with 18 controls equated for age)

Fig. 1

(20) - Sheet 4

Dr. Teed of our laboratory, continued this study and found that by otoscopy and nasopharyngoscopy one could fairly well predict which ears would suffer damage during the fifty pound test, and if a thorough preselection examination were combined with a routine check of the ability of each subject to perform the Valsalva maneuver, it was his opinion that otpathology could be reduced to a mere 2-3% instead of the 27.5--30% he found in two separate groups of 858 and 708 men. Unfortunately, Doctor Teed was unable to provide pre- and post-pressure audiograms for his experimental groups, so that his statements concerning hearing loss are general in nature.

Following the two pieces of work just mentioned, a major change was instituted in the manner of giving pressure. Five points can be emphasized, which might be considered to reduce failures:

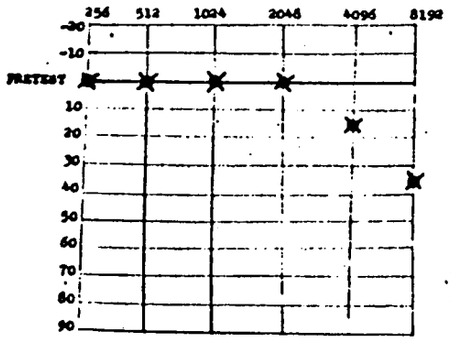
1. Careful selection from the standpoint of ear, nose and throat abnormalities,
2. Intelligence and emotional stability were more rigidly controlled in those individuals subjected to pressure.
3. All subjects were carefully instructed in the Valsalva maneuver and in the effect of swallowing, yawning, etc.,
4. Subjects were encouraged to discontinue pressure whenever discomfort became pronounced,
5. Pressure was increased with an eye to the comfort of subjects; it was stopped, or reversed when subjects showed discomfort.

The reduced percentage of disqualifications which we obtained may perhaps be referred to these factors, as well as to the fact that our experimental groups were tested in the summer months when upper-respiratory infections are at a minimum. In one of these groups of ninety subjects, chosen completely at random from candidates for Submarine School, audiograms were taken before and after the subjects were given pressure. In this experimental group, sixty-two subjects, persistently questioned, reported no noticeable pain in either ear. For these one hundred twenty-four ears, the test-retest audiogram change is presented in Figure No.3. As compared with a group in which NO pressure intervened, it is seen that the average change is generally negligible for subjects who report no discomfort.

Some change at 4096 and 8192 may, however, be noted even in this group, --due perhaps to subjects who refrained from reporting pain. Figure No.4 shows distributions for changes at these frequencies: the zero vertical represents no change in the post-pressure test; the preponderance of area under the curve on the "Loss" side of the zero indicates that even under the most favorable conditions, and with the subjects whose discomfort was only mild at worst, some damage may be expected. (The losses at these two frequencies, though small, are several times their own standard errors). Two or three audiograms will illustrate the sort of thing one finds in such a group: Figure No.5 shows some loss at high tones; (It

(20) -Sheet 6

Name: R.O.D. Date: 7/23/44



Testers: Harris

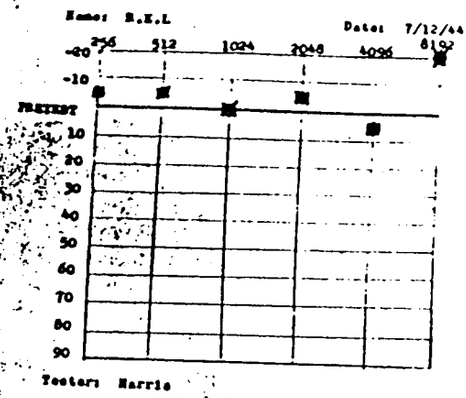
Remarks: Subject made no comment.
12' after pressure.

Shows specific frequency loss

Fig. 7

fig 7

Name: R.K.L Date: 7/12/44



Testers: Harris

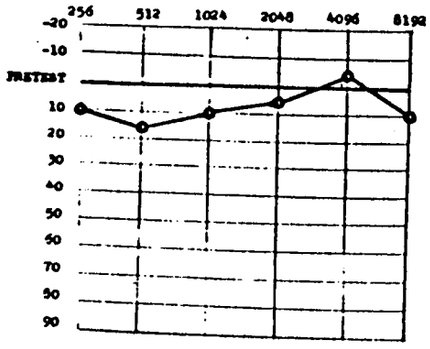
Remarks: Subject made no comment.
Shows improvement

Fig. 8

fig 8

fig 6

Name: R.W.M. Date: 8/22/44



Testers: Harris

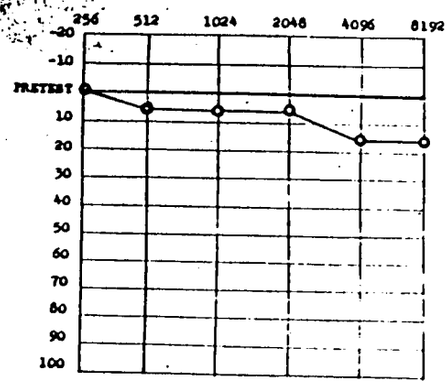
Remarks: Subject made no comment.
35' after pressure.

Shows low tone loss

Fig. 6

fig 5

Name: W.A.S. Date: 7/19/44



Testers: Harris

Remarks: Subject made no comment.
75' after pressure.

Shows loss with no comment

Fig. 5

(20)- Sheet 7

will be noted that the normal base line is in all cases the pre-pressure test and the plot is the decibel difference between this and the post-pressure test.) Figure No.6 shows that low tones may be affected; Figure No.7 illustrates specific and, for this group, extreme loss. In some cases actual improvement may be found. Figure No.8 exemplifies such cases.

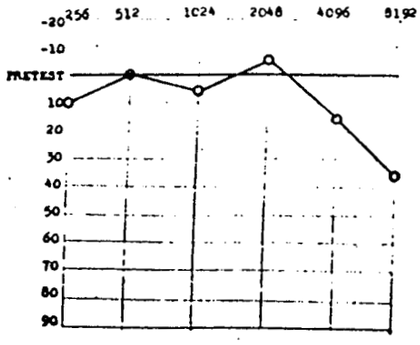
If now, we consider only those ears which gave so much discomfort that the subjects were willing to report it, or even to fail to complete the pressure test, we find that even under highly favorable conditions 12% of all ears are involved (22 out of 180).

Figure No.9 shows (for all 22 ears) the frequency distribution for change in acuity. As in Figure No.4, a shift to the right of the zero line indicates a loss of acuity. It is apparent that with these ears low tones were relatively unaffected; but for tones of 2046 and above, a loss of acuity is the rule. For example, at 4096, only two showed improvement whereas seven show five db loss; five showed ten db, and there were losses up to 25 db.

When we review individual cases, it is clear that great variability exists in ear damage. For some ears low tones are affected, as in Figure No.10; in others, high tones, as in Figure No.11; and in still others, generally over the entire range, -- Figure No.12.

(20) - Sheet 8

Name: M.P.N. Date: 8/22/44



Tester: Harris

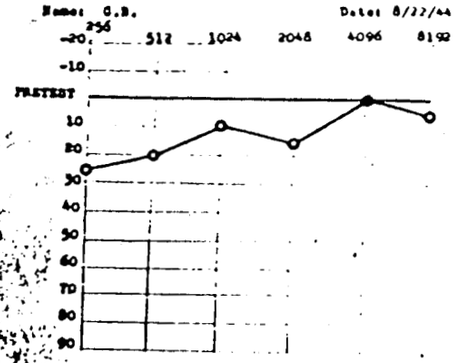
Remarks: 45' after pressure.

Ears hurt at first. Shows high tone loss.

Fig. 11

Fig 11

Name: G.B. Date: 8/22/44



Tester: Harris

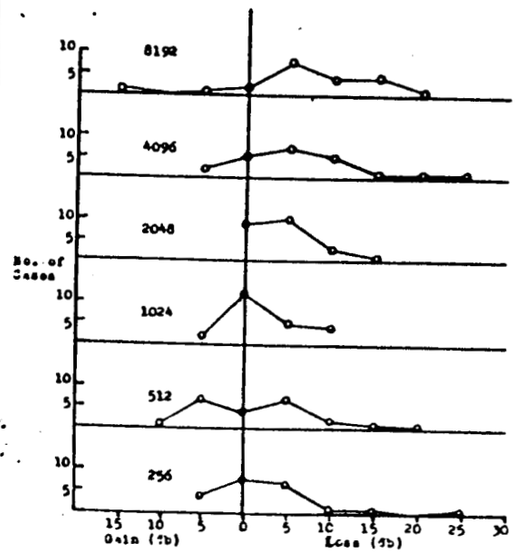
Remarks: 35' after pressure.
Ears hurt a little bit while taking pressure. Still buzzing.

Shows low tone loss

Fig. 10

Fig 10

Fig 9



No.	
Gain	Loss
2	16
2	15
0	14
2	8
8	11
4	10

Distributions of Changes in Post-pressure Test
(Those men reporting pain in ear)

Fig. 9

(20) - Sheet 9

One of the earlier cases in our files indicates the probability of permanent damage. In this case (Figure No.13), a month elapsed before anything like normal hearing was recovered and even then, high tones were somewhat depressed.

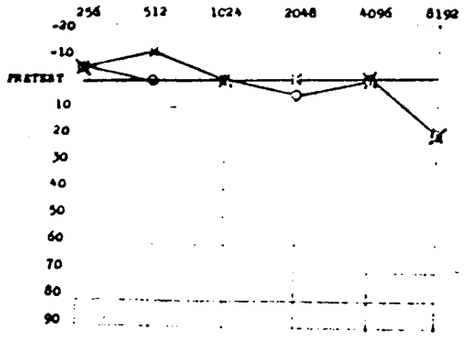
However, it is a somewhat surprising fact to note that with some ears suffering considerable otopathology, losses in acuity may be slight. Thus, with one ear rated Grade IV (worst category) after failing the pressure test at 7-pounds, losses over the range were negligible, (Figure No.14). Again, as in Figure No.15, with both ears rated Grade IV, only at 8192 is the loss apparent. Another case (Figure No.16) is of some interest, presenting an ear which pained quite a bit, --in the man's words, he "damn near walked out". However, he completed the 50-pound test and his losses were at the highest tones only. The following case (Figure No.17) illustrates loss at specific frequency. Cases like this may throw some light on the locus of the auditory dysfunction.

In summarizing otopathology on all our experimental subjects, we report something like 30% damage; as Teed found, we too discovered that of the 30% who suffer damage only one-third will report pain.

At the present time we are in the process of collecting a great deal of data on the effect of the 50-pound pressure test on otopathology and on auditory acuity, as well as making further

(20)-Sheet 1D

Name: G.E.W. Date: 8/24/44



Testers: Harris

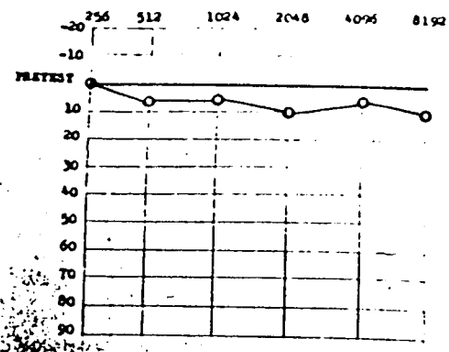
Remarks: Failed at 16d. 35' after pressure.
Both ears rated # 4.
Ears hurt during pressure and still hurting slightly.

Shows extreme damage but little loss

Fig. 15

Fig 15

Name: J.R.G. Date: 7/29/44



Testers: Harris

Remarks: Failed at 7 pounds. 40' after pressure.
Rating: # 4.

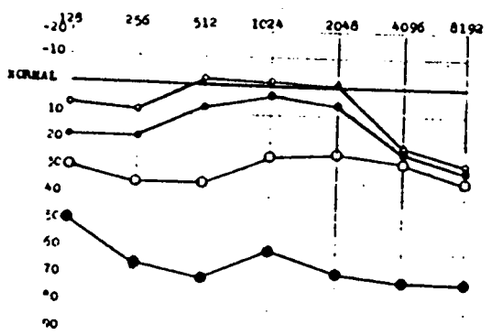
Shows extreme damage but little loss

Fig. 14

Fig 14

Fig 13

Name: W.L.W.



● 23 days after pressure
● 15 days after pressure
○ 7 days after pressure

● Immediately after pressure

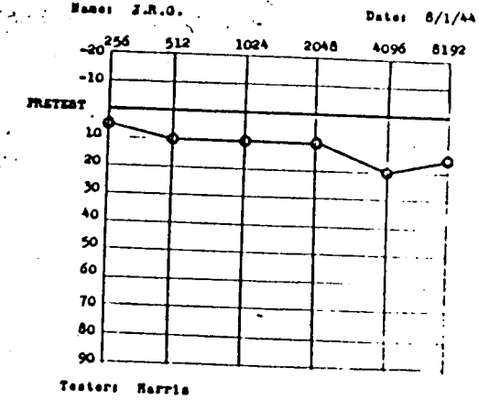
Remarks: Failed at 22 pounds.
Drum showed marked congestion with engorgement of blood vessels and marked retraction.

Shows substantial recovery in less than 1 mo.

Fig. 13

Fig 12

Name: J.R.G. Date: 8/1/44



Testers: Harris

Remarks: 15' after pressure.
Ear pained: failed at 5 pounds pressure.
Rating: #4

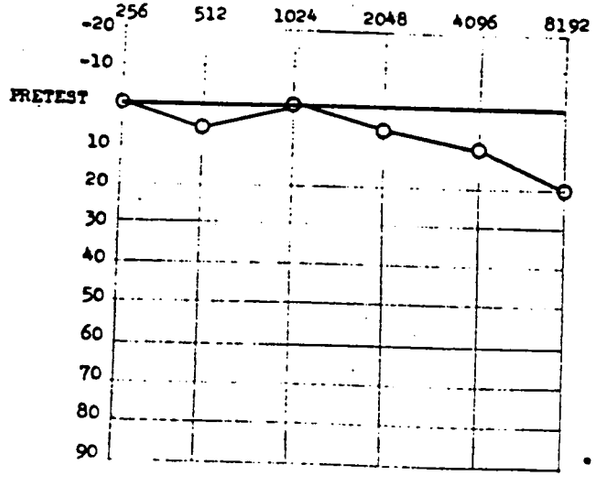
Shows loss at all bands

Fig. 12

(20) - Sheet 11

Fig 16

Name: C.A.S. Date: 7/24/44



Tester: Harris

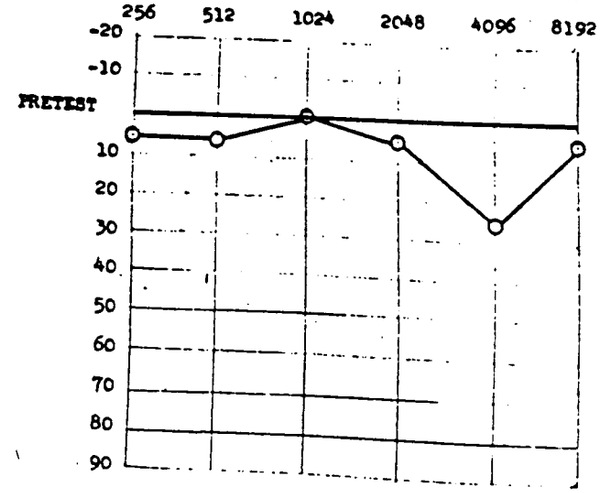
Remarks: 35' after pressure.
Subject claimed ear never did "pop".
Quite a bit of pain: "Damn near walked out".

Shows extreme pain, slight loss.

Fig. 16

Fig 17

Name: W.H.M. Date: 8/9/44



Tester: Harris

Remarks: 18' after pressure.
Ear slow to pop, but all right.

Shows loss at specific frequency.

Fig. 17

20-Sheet 12

observations on prediction, prevention and therapy of aero-otitis media. This work is being conducted in our laboratory by an oto-laryngologist, Dr. Henry L. Haines, and a sensory psychologist, Dr. J. Donald Harris, along the following lines. A careful and detailed examination is conducted and any pathology noted is classified according to the 4-point Teed scale, Grades I, II, III, IV. Each subject is given: a pre-pressure audiogram administered in a thoroughly sound-proof room where the error has been established to be at most 2-4 db; the pressure test under controlled conditions; an immediate post-pressure examination for resultant ear trauma; and a post-pressure audiogram. Those individuals with severe damage, Grade III and IV, will be treated by one or more of the following methods:

Radium, X-ray, Topical applications, Suggestion.

This group undergoing treatment will be followed by additional audiograms, additional examinations, and finally, with repeated pressure test.

Certain preliminary observations can be made and opinions hazarded at this time:

(1) All ears showing severe damage, Grades III and IV, have thus far been found to have flattened Eustachian orifices, due to lymphoid hyperplasia, and thus X-ray and radium should be of great benefit.

(2) This condition has been noted to be associated with a depressed pre-pressure audiogram.

(3) Under conditions of careful selection and proper administration of pressure, severe oto-pathology with associated hearing loss need not be as common as it has been.

(4) Since this type of trauma leads to acute auditory damage, then if the trauma is oft repeated (as in the case of aviation personnel) there may develop permanent auditory damage.

****

References:

1. Shilling, C. W., and Everley, I.A., Auditory acuity in submarine personnel. U. S. Navy Medical Bulletin, 1942, 40, 664-686.

2. Teed, R. W., Factors producing obstruction of the auditory tube in submarine personnel. U. S. Navy Medical Bulletin, 1944, 42, 293-306.

(20) - Total of 14 sheets Attached

PROJECT FORM
NAVMED - 158 (Rev. 8/44)

BUREAU OF MEDICINE AND SURGERY
RESEARCH DIVISION

PROJECT NO.	SECTION	DATE
X-434 (Sub. No. 90) (b)	II	24 Oct. 1944

TITLE OF PROPOSAL

Aero-Otitis Media in Submarine Personnel:
Relation of Dental defects and Malocclusion to Eustachian Tube Failure.

ESTIMATED DURATION

6 months

LOCATION(S) OF STUDY

Medical Research Laboratory, Submarine Base, New London, Connecticut.

OBJECTIVE(S) AND EXPERIMENTAL DESIGN

To study the relationship of dental defects and malocclusion to aero-otitis media and its associated signs, symptoms, and hearing loss. To apply corrective measures as may be indicated.

REQUIREMENTS TO BE PROVIDED

SUBJECTS

70 men per day will be available in submarine examining and submarine escape training.

MATERIEL (list separately)

To be procured locally.

FUNDS (requiring allocation)

$500.

PRINCIPAL INVESTIGATOR

KELLY, William J. Lieut.(DC) USNR

COLLABORATOR(S)

Captain, O. W. Shilling, (MC) USN
Lieut.(jg) H. L. Haines, (MC) USNR
Ens. J. D. Harris, H-V(S) USNR

CONSULTANT(S)

None

ADDITIONAL INFORMATION (use additional sheets as required)

The original project X-434(Sub.No.90) is in its preliminary stage and as can be ascertained by reference to it, the approved experimental project has to do with the pre-pressure examination, with the pressure test, and with the post-pressure examination and treatment of any resultant aero-otitis media. In considering every conceivable angle to be checked so as to leave no possible loop-holes, it was felt that attention should be given to malocclusion as related to Eustachian tube failure to equalize. Doctor Kelly has been doing work in this field previously, is anxious to continue his work here, and we are anxious to have him.

31 October 1944.

R.Admiral H. W. Smith, (MC) USN
Research Division
Bureau of Medicine and Surgery
Washington, D.C.

Dear Admiral Smith:

I believe that the enclosed Form X is entirely self-explanatory, as it covers the matter about which we spoke when we were last in Washington.

Anything you can do toward seeing that Doctor Kelly is transferred to this activity for duty with the Medical Research Laboratory, U.S.Submarine Base, New London, Conn., will be greatly appreciated.

Kindest personal regards.

Most sincerely,

C. W. Shilling
Captain, (MC), U.S.Navy

CWS:JWK

Enclosure

Dear Hank:

Sat. afternoon, late
11/18/44

[illegible]

[illegible] Major Herman Lemmon,
[illegible] Medical Auditorium, 7th St. and
[illegible] Washington 25, D.C.
[illegible] for had re-
[illegible] about ear
[illegible] line
[illegible] things.
[illegible] article
[illegible] the U.S. & the Navy
[illegible] distributed do
[illegible] well
[illegible] on the
[illegible] universally
[illegible] distribution is
[illegible] believe.)
[illegible] them
[illegible] pure
[illegible] heart
[illegible] things.

(23) - sheet 1 of 6

2) When a truly comfortable and effective ear plug is made available, it will need no advertising.

3. Please thank Captain Shilling for the copy of his Chicago paper and tell him neither Dr Crozier, who also read it with interest, nor I have any critical suggestions to offer. In fact, we think it a good report of what was done and observed, and our regret is only that neither Teed nor you have had any chance yet to show our these men what radium can accomplish. Also, keep up the pressure for an applicator! The AFF Surgeon and his office are thoroughly convinced of the efficacy of the treatment, and one reason we, locally, have been so busy the past month is because of the rush they are in to spread the use of the method. [They tell us the combat area line officers are putting the pressure on them, after seeing a few examples of the end result, namely, return to duty without trouble.] Sgt Chaint

(23) - Sheet 2 of 6

3) seen but 3 private patients in the last 3 weeks — and the 3 include Wizard H. and a doctor's wife. This last group were not ENT by training, so spent 10 days here (SPC was with them steadily each day from 9 AM to 5 PM) on basic, before going to Mitchel, where they finished yesterday. More such groups are to come, so don't wonder if there are few letters answered.

Gossip and News: As you have probably heard, the 18th (Babb and others) arrived in Assam a month ago — and presumably are busy at last. And 118 (Bardley & others) are believed to be near the Phillipines, if not actually thereon. A nice letter from Parr (whom I believe you will remember from the study on School Children) last week tells of experiences in France with a Hospital entirely in tents — in 3 months or more had not been in a room at any time. Mud and convoy dust, etc., but no

[illegible] ping. Improvised opn table a
[illegible] exam. Chair. It sounded like
young [illegible]'s enthusiasm for
snake-skin work. He's a Major,
supposedly in charge of ENT, but
says a lot plus most important
takes have requirements he
never learned in any medical school.
No nurses with this outfit, which
he says solves certain questions
more easily! Ned Fowler stayed
in Washington a week longer than he
had planned to (had orders "interpreted") but didn't get back over
here again — tho' he phoned a
couple of times, or rather. Not very
happy over the prospects for getting
good sections he's rare bones
he was to so much gains to get.
It's a darn shame — I'll tell you
the story some day.

Betty is in New Guinea — (23) - Sheet 4
at FEAF Hq. Not attached to the
WAC unit there, but from what I
gather, doing personnel or "orders"
work in Hq. like any other officer
in similar slants. Very long hours,
but seems to like it or think in it.
Her address is simply Capt. E. F., 430201, Hq. FEAF,
APO #925, c/o Postmaster, San Francisco, in

Thanks for the invitation — Lucille & I may both take it up sometime.
Best regards to everyone, including your good wife, please.
Sincerely, though faithfully,
Stacy Rizell

(23) - sheet 5 of 6

Continuation of study of problem of Aero-Otitis Media in Submarine personnel as started by Comdr. R. Wallace Teed.

1. To study and classify effects of auditory damage caused by exposure to 50 lbs. air pressure on all men examined - about 40 - 70 men daily.

2. To apply corrective treatment as may be indicated by analysis of results of item (1).

3. To classify and treat all pressure failures and those developing aero otitis media according to following outline:
   (a) one group with topical applications.
   (b) one group with placeboes and reassurance
   (c) one group with X-Ray of adenoid tissue about Eustachian tubal orifices
   (d) one group with radium applicator to adenoid tissue about tubal orifices.

4. To study auditory acuity loss entailed by the damage to the ear.

October

For this work and until Nov. 1st candidates are being sent to pressure regardless of ability to inflate ears, if free of cold, to obtain material for audiographic study. Now drop 1/2 lb pressure —

Monday - October 23 1944 - 53 men examined by Nasopharyngoscope and routine physical. All men sent fro pre-pressure audio. 38 through 50 lbs. pressure. 4 men of Sat. exam. group failed pressure - 2 at 3 lbs. 2 at 7 lbs. more showed damage to ears on post pressure exam. and were sent for audio.

Tuesday - October 24, 1944. - 38 men examined by Nasopharyngoscope and sent for pre-pressure audios. At pressure tank 31 took pressure. 5 men of Monday's exam group failed pressure. 1 at 12 lbs. - 4 at 4 lbs. more showed damage to ears on post pressure exam. and were sent for audio.

Wednesday - October 25, 1944. - 31 examined by nasopharyngoscope and sent for pre-pressure audio. At pressure tank 45 men took pressure. 2 failed due to ear damamge. 1 at 5 lbs. and 1 at 18 lbs. more showed damage to ears on post pressure exam and sent for audio. Talked with Dr. Hoff on Radium theraphy.and Aero Otitis Media both in Army and Navy Air force and submersables Letter from Radium Chemical Co. 570 Lexington Ave., N.Y.C. saying radium would be ready two weeks early. Talked with Captain Shilling. suggested XRay treatment at Norwich - could take 10-12 a week to Norwich.

Thursday - October 26, 1944 -
42 men examined with nasopharyngoscope and sent for pre-pressure Audiograms. 41 of Wednesday's group and 3 officers through pressure tank. - 10 failures - 4 with #3 ears, 3 bilat. and one unilat . Others #2 or #1. 4 of those passing showed post pressure damage of #3 ears and were sent for auidiogram. Some of these sent through with colds for check on damage and effects of damage to hearing.

Friday October 27, 1944.
20 examined with nasopharyngoscope and sent fon pre-pressure audio. 45 through pressure tank with 9 failures. 4 were less than #2 ears. One left tank due to misunderstanding - eager to try tomorrow. 5 showed #4 ear damage but passed pressure. Conference with Capt. Shilling and Comdr. Greenwood on officers for sound training.

Saturday - October 28 1944.
15 examined - Removed lead pencil point from candidate's left drum. perforated 5 days ago. No infection. Audio. showed 20 db. mean hearing loss. Tank - 19 men in pressure - 1 failure at 7 lbs.

Monday - October 30, 1944.
21 examined. No tank failures - Letter from L . Dyson on ear defenders.

Tuesday - October 31, 1944.
42 examined
60 through pressure chamber
3 out at 5 lbs.
5 out at 9 lbs.
1 out at 10 lbs.
1 out at 34 lbs. #3
sent for audiograms.

summer date!

(24) b

Wednesday - November 1, 1944.

55 examined - sent for pre-pressure audiogram
47 took pressure.
2 out at 6 lbs. with #2 ears left and right
1 out 24 lbs. with #2 ears bilat.

Groups having pressure for Nov. are screened as to otologist opinion as to ability to take pressure - failures should be less. For October pressures failures 7½% of about 800 through tank. Number disqualified was not determined but runs about 1% - 2%. Those believed unable to take pressure were given hearing checks and treated with nose drops.

Letter to Lt. Dyson answered by Dr. Haines.

Thursday, November 2, 1944.

44 examined with scope.
42 took pressure
4 failed pressure - 3 with #2 ear damage
1 with #3 ear damage, out at 28 lbs.
4 passed pressure but with #4 ears -
All sent for post pressure audiograms.

Friday, November 3, 1944.

42 examined.
36 took pressure.
1 failed pressure 8 lbs. - Jones. #2 ear lt.
5 passed pressure with aero otitis
McManus } #2 lt.
Davis R.L. }
Shippherd } #3 each side
Langhton }
Davis. W.E. #1 Rt.

Saturday, November 4, 1944.

Routine physicals
12 prepressure audiograms
No men pressured today.
Conference with Dr. Harris on progress and system used.
Cecil Myers to call for candidates at Med. Res. and march them to Sound Lab. to avoid stragglers.

MONDAY, November 6, 1944

44 examined.
40 in pressure chamber
4 out at 47 (1 with no ear trans
Frightened (1 with 1 rt ear
(1 with #2 rt and #1 lt ear
(1 with #2 ear rt.
1 out 8 lbs. #2rt.
2 with otites passed pressure
1 with #1 ear Rt.
1 with #3 ear Rt.
All sent aero otitis media for post pressure audiogram.

Tuesday, November 7, 1944.

Dr. Shilling showed me Maj. Fowler's article on Radium for adenoidectomy in Army Aviators - in news letter.

42 examined
42 through pressure - 8 cases otitis
5 failures 1 with #2 ears out 7 lbs.
1 with #3 ears out 17 lbs.
3 with #1 ear out 7 lbs.

3 passed 2 with #1 ears
1 with #3 ears

Nov 14.

Dr. Chrisman and Dr. Haines to visit Norwich about cost of X Ray therapy to Adenoids also to Pat takes

Wednesday, November 8, 1944.

Depart. visited by Lt. Coun
Lt. Coun MC Air Surgeon, Lt. Clarke HC interested in sound and training of sound men.

42 men examined
30 through pressure - 8 cases of aero otitis media
3 failed pressure - Hoffman - out at 8 lbs. with #3 ears
Seaton - out at 8 lbs. with #3 rt. e
Lake - out at 8 lbs. with #2 rt. ear

Passed pressure:
Stephenson - #3 ears
Shannon - #2 Bilat.
Egan - #3 left. 0 rt.
Mullen - #2 left 0 rt.
Garniecki - #2 rt. #3 lt.

Thursday, November 9, 1944

Made trip on board USS CHUB.

Friday, November 10, 1944.

28 men examined.
51 thru pressure 13 cases otitis media

5 passed pressure
1 with #3 ear r.& l.
1 with #2 ears r. & l.
3 with #2 ear rt.
8 failed pressure
4 out 4 lbs. - all with #1 ears.
2 out 5 lbs. - 1 with #1 Lt. and #2 rt.
1 out 4 lbs. - 1 with #1 rt.
1 out 13 lbs. - #3 ears rt.

Letter from Dr. Crowe - He's to be at Mitchell Field for next 10 days on Aero Otitis project again.

Saturday, November 11, 1944.

Routine examinations
1 man has trouble hearing above 4096 with history deafness with cold and ruptured drums with gun fire. Has large adenoind obstructing both tubes. - X Ray therapy given
(Samuel Zahisrsky, 22. GM3c)
18 thru pressure - 6 cases aero otitis
2 failures
1 out 25 lbs. with #2 ears hilat.
1 out 5 lbs. with #1 ears hilat.
4 passed - al with #1 ears.

Monday, November 13, 1944.

No pressure today.
35 divers and mess boys examined.
12 pre.pres. audiograms.
Called Dr. Crowe at Mitchell Field. Our 900 Radium pts. a month at Westover Field. Dr. Hendricks and Dr. Leiberman working there. Wrote letter to Dr. Leiberman.

Tuesday, November 14, 1944.

Examined 25 from Bullhead - no pressure
42 from Spritz S/M acl.
Pressured 43 - 11 cases of aero otitis
7 failures.
3 out 5 lbs.
2 out 10 lbs.
1 out 20 lbs.
1 out 18 lbs.
4 passed pressure
Sanders with #3 rt.
Kittell with #3 rt.
Beeman with #3 both
Mc Cartener with #2 lt. and #3 rt.

Wednesday, 15 November 1944.

53 examined
24 through chamber - not checked
1 out 5 lbs. with #2 lt. ear.

Thursday, 16 November 1944.

39 examined and thru pressure.
13 cases aero otitis

9 failed Pressure
3 out 8 lbs. Shepherd #3 both
Sedary #2 lt.
Seaton #1 both
4 out 4 lbs. Kruegor #3 Lt.
Robinson #1 Rt.
Dalsopas #1 Rt.
Reynolds #1 Rt.
2 out 7 lbs. Barley with #1 Rt.
Stark with #2 both

4 passed pressure.
Brewsln with 3 rt.
Bailey #4 rt.
Boggs #3 both
Clark #3 both

Friday, November 17, 1944.

42 examined.
31 pressure - 4 cases of aero otitis media
2 failures : Gayda out 4 lbs. #1 both ears
Davis out 20 lbs. " 3 lt. ear.

Passed - Snell - #2 lt. ear
Hall - #2 Rt. ear

Saturday, November 18, 1944

42 examined
42 given pressure - 9 developed aero otitis
2 failed - Marigon out 6 lbs. with #2 R and L.
Rogan out 4 lbs. with #2 R and L.
marked scaring both drums.
7 passed-
Madison)
Heinemana) # 2 lt.
Hovery)
Rocker - #1 lt.
Edward - #2 rt.
Dow - #3 Rt.
Kundart - #3 lt.
all sent for post pressure audiogram
Received letter and report from [illegible]

Monday, November 20, 1944.

Gave lecture at Pharmarcist School.
35 given pressure - not checked for aero otitis
4 out 5 lbs. all with #1 ears.
1 out 14 lbs. with #1 lt.
1 out 21 lbs. with #2 lt.

Tuesday, November 21, 1944.

60 examined
20 given pressure - all passed
4 cases of aero otitis media
H. Pearson - #3 rt. #3 lt.
Reese - #3 rt.
Calver - #2 rt - 3 lt.
Wilson - #2 rt - 2 lt.

Wednesday, November 22, 1944.

60 examined
38 given pressure - 11 cases of aero otitis media
8 failed pressure - Kessler out 3 lbs. - No otitis - frightened
Buckley out 4 lbs. #2 rt. and lt.
Brown out 7 lbs. #2 rt and lt.
Austin out 7 lbs. #0 rt and #2 lt.
McCabe out 7 lbs. #2 rt and 0 lt.
Fritzson, out 8 lbs. #3 rt. #2 lft.
Mc Cullough out 12 lbs. #0 rt. #2 lt.
Gordon out 23 lbs. #3 rt. & 3 lt.

4 passed
Rowe with #2 rt. 2 lt.
Sears with #0 rt. and 3 lt.
Rogan with 0 rt. and 1 lt.
Shepard with 1 rt. and 1 lt.

Thursday, 23 November 1944.

McKay out 5 lbs with #1 ear lt.
Redington out 5 lbs. with #4 ear lt - bleeding- no perforation

Friday, November 24, 1944.

60 examined - given pressure - 15 cases aero otitis media
7 failed pressure - Whighan out 3 lbs. #1 lt.
Cowie out 7 lbs. #3 rt.- 3 lt.
Kineger out 7 lbs. -no damage - frightened
Helley out 20 lbs. #0rt. #3 lt.
Pamy out 6 lbs. #1 rt. & lt.
Yeager out 6 lbs. #1 rt. & 2 lt.
Harvey out 10 lbs. 0 & #1 lt.
8 passed - Kessler - rt. 3 lt. 3
Finley - rt 3 lt 3
Folensbee - rt. 3 lt. 3
Hoffman - 0 lt2.
Wilson - Rt. 3 - 0
Heize - Rt. 3 - 0
Pierce - 0 - Lt. 3
Walker - 0 - Lt. 2

Received letter from Dr. Stacey Guild at Johns Hopkins Otology Lb. in Baltimore.

Saturday, November 25, 1944.

30 examined
8 given pressure - all passed - 4 cases of aero otitis media.
Snyder - #4 Rt. - #2 lt.
Rebano - #0 rt. - #3 lt.
Keeney - #0 rt. - #3 lt.
Farmer - #3 rt. - #3 lt.

Monday, 27 November 1944.

20 examined - mess boys and divers
20 given pressure - 2 cases of otitis
R.L. Harrison failed at 15 lbs. with #3 lt.
G. P. Cole passed with # 3 lt.

Tuesday November 28 1944

12 from sub-school examined
no pressure today
Went to Norwich to see Dr. Kennedy about X-Ray theraphy to Ads. He can handle 5 a week - cost $15. a treatment with a course of 6 treatments spread over about 10 days - Letter sent for approval.

Wednesday, November 29 1944.

52 examined
43 given pressure - 12 cases of otitis media.
3 failures - R.C.Allen - out at 5 lbs. - #2 left
H. O. Tipton - out at 5 lbs. - #2 Right
H. L. Narigon - out at 9 lbs. #2 rt. #3 lt.
9 passed:
H.N.Kuchnle - #3 lt. #3 rt.
R.J.Smithisler - #3 lt.
E.H.Koenig - #2 rt. #1 lt
E. Savage - #3 rt. #3 lt
H. Meimier #1 rt, #2 lt.
C.L.Yeager - #3 rt, #2 lt.
J. Giordani - #3 rt, #3 lt.
M.H.Orkis - #3 rt #2 lt.
Fritzson - #2 rt, #2 lt. - on reaching surface developed cerebial air embolism - paralysis and lost consciousness - no cyanosis or resp. difficulty - B.P. elevated. - uneventful recovery - Dr Chrisinger reported
Brown - unable to airate middle ear. Has ads enormous flattened both Eust. tubes. Drums retracted.

Thursday, 30 November 1944.

44 examined.
44 given pressure - 8 cases aero-otitis media.
1 failure - A. O. Maki, S1c - out at 6 lbs. - #4 lt. - 0 rt. - has enormous adenoids fill nasopharynx.
7 passed - R. C. Aldrich, S2c - #4 rt - #1 lt. - very large adenoids - tubes not seen.
N. E. Walker, S1c - #3 rt - 0 lt. - tubes open - large midline ads - mucous.
L. D. Ferstle, F1c - #3 rt - #3 lt. - tubes closed - enormous adenoids - Fossa III.
N. L. Campbell, S2c - #3rt - #1 lt. - enormous adenoids - tubes closed.
E. F. Bodian, S1c - #2 rt - 0 lt. - small adenoids - tubes open - mucous.
M. J. Toney, F3c - #2 rt - #3 lt. - adenoids fill nasopharynx - tubes flattened.

Summary of November

NOVEMBER

All candidates during this month were thoroughly checked prior to taking lung training and their pressure tests. All with colds or acute upper resp. infections were delayed until well before taking test. Those who failed pressure test were advised to use 5 drops in each nostril of 1/4% neosynephrine every three hours when awake 24 hours prior to taking pressure. All were checked as to hearing on audiometer prior to and after pressure. 722 were given pressure and checked 166 cases of aero-otitis media of which 75 failed pressure. Since radium has not arrived and the okay for X-ray therapy has not been granted these cases are being treated by nose drops and suggestions. These measures are only temporary. About 25% of those taking pressure develop aero-otitis media.

Refer to:

NB7/P2(B)

Serial 4796

UNITED STATES SUBMARINE BASE
NEW LONDON, CONNECTICUT.

MAILED

2 December 1944.

FIRST ENDORSEMENT to Med. OinC,
MR Dept. ltr. dated 1 Dec. 1944

From: Commanding Officer, US Submarine Base.
To : Chief of the Bureau of Medicine and Surgery, Navy Department, Washington 25, D. C.

Subject: Authorization for Civilian Medical Treatment of Aero-Otitis Media Cases, Request for.

1. Forwarded.

H. H. McLEAN.

This was refused!! Dec 27, 44
New Port has only 150 KV machine which is overworked — Brooklyn Naval Hosp. next list.
(Spitted - Projected Ray Therapy dropped. 2-4-45 Dt.

CC: Senior Medical Officer.

6 passed - F. A. Skrok, S2c - #3 rt - #4 lt.-large ads. - tubes closed - Fossae III.
F. E. Davis, QM3c - #3 rt - #3 lt - small ads. - Fossae II - tubes narrowed open.
E. P. Stoner, S1c - 0 rt -#3 lt. - large ads. - tubes narrowed - rt. open.
W. O. Tipton, S2c - #3 rt - 0 lt. - small ads. - flatten both tubes.
H. L. Norigon, F1c - #4 rt - #4 lt - large ads. - tubes covered, flattened.

(31) - Sheet 1

Serial:

1 December 1944.

From: Medical Officer in Charge, Medical Research Department.

To : Chief of the Bureau of Medicine and Surgery, Navy Department, Washington 25, D.C.

Via : Commanding Officer.

Subject: Authorization for Civilian Medical Treatment of Aero-Otitis Media Cases, Request for.

Reference: (a) Research Project X-434 (Sub. No. 90) dated 10 July 1944 and Approved by Bureau of Medicine and Surgery.

1. The research project, reference (a) now being conducted at this activity relative to the prevention and treatment of aero-otitis media requires the use of deep x-ray therapy. Such therapy is not available at this activity.

2. The Backus Hospital in Norwich, Connecticut, has deep x-ray equipment and the superintendent has agreed to treat our cases that require this form of therapy.

3. The usual fee for such therapy is twenty-five dollars ($25.) for a complete course of six treatments. For this project, however, the superintendent has offered to reduce this fee to fifteen dollars ($15.) for each complete course of six treatments.

4. It is requested that this activity be authorized to have approximately five (5) cases of aero-otitis media treated each week for a period of approximately five (5) months at the Backus Hospital and to have the charges paid monthly by Form "U".

C. T. SHILLING.

CC: Senior Medical Officer.

6 passed - F. A. Skrok, S2c - #3 rt - #4 lt.-large ads. - tubes closed - Fossae III.
F. E. Davis, QM3c - #3 rt - #3 lt - small ads. - Fossae II - tubes narrowed open.
E. P. Stoner, S1c - 0 rt -#3 lt. - large ads. - tubes narrowed - rt. open.
W. O. Tipton, S2c - #3 rt - 0 lt. - small ads. - flatten both tubes.
H. L. Norigon, F1c - #4 rt - #4 lt - large ads. - tubes covered, flattened.

(31) - Sheet 2

Friday, 1 December 1944.

44 examined.
18 through pressure - 5 cases aero-otitis media.
0 failures
5 passed - M. F. Dornbug, S1c - #2 lt - 0 rt. - small adenoids - tubes flattened open.
E. S. Willy, F2c - 0 rt - #4 lt. - small adenoids - tubes closed - red - Fossa II.
B. S. Cowie, F2c - #1 rt - #4 lt. - very large ads. - tubes flattened.
J. L. Clark, S1c - #4 rt - #3 lt - small ads. - tubes closed.
H. T. Denning, S2c - #4 rt - 0 lt. - enormous adenoids - lt. narrowed oper - rt flattened.

Monday, 4 December 1944.

44 examined.
34 given pressure - 10 cases aero-otitis media.
4 failures - W. J. Rees, F1c - out at 8 lbs. - #1 rt - 0 lt. large adenoids - tubes open - Fossae II.
W. W. Kirchner, S1c - out at 4 lbs. - 0 rt - #1 lt. - large adenoids tubes flattened - open.
N. Bogart, F1c - out 19 lbs - #2 lt - #2 rt. large adenoids - flattened.
G. J. DeVries, S1c - out 4 lbs. - #1 rt - 0 lt. large adenoids mid line - tubes open.

6 passed - F. A. Skrok, S2c - #3 rt - #4 lt.-large ads. - tubes closed - Fossae III.
F. E. Davis, QM3c - #3 rt - #3 lt - small ads. - Fossae II - tubes narrowed open.
E. P. Stoner, S1c - 0 rt -#3 lt. - large ads. - tubes narrowed - rt. open.
W. O. Tipton, S2c - #3 rt - 0 lt. - small ads. - flatten both tubes.
H. L. Norigon, F1c - #4 rt - #4 lt - large ads. - tubes covered, flattened.

Tuesday, December 5, 1944.

44 examined
20 took pressure - 5 cases of aero otitis media
1 failed pressure
H. S. Reitz, S1c - out 9 lbs. #0Rt,#3 lt.
large amount red adenoids lt tube flat
right narrowed but open.
passed with a.o.m.
R. A. Hasson - RM2c - #2 rt #2 lt.
large ads. tubes closed -fassae xx
A. E. Amberson F1c, #2 rt #0 lt.
small ads. tubes open - narrowed - has
acute cold.

Wednesday, December 6, 1944.

44 examined
30 took pressure - 11 cases of aero otitis media.
5 failures - D.W. Richter - S2c out at 11 lbs. #4 rt #1 lt
Enormous Ads. tubes closed Fassae
xx
D. C. Marry S2c - out at 8 lbs. #2 rt. #2 lt.
Enormous ads. Tubes flattened Fassae
xxxx
J. B. Smith S1c - out at 5 lbs. 0 rt. 1 lt.
Large mid line ads. tubes flattened
open.
C. F. Pace S1c - out at 9 lbs. #1 rt. #0 lt.
small ads. mid line - tubes open
B. Solomons S1c - out at 9 lbs. 0 rt. #3 lt.
enormous ads. tubes flattened shut
fassae filled.
Those passing pressure:
L. E. Wallace S1c #4 rt #4 lt.
naroph. filled with ads. tubes closed
F. W. Farrington S2c 0 rt. #3 lt
enormous ads. tubes flattened closed
H. B. Carney S2c 0 rt #2 lt.
enormous ads. tubes flattened closed
R.M. Bean S1c - #3 rt #4 lt.
large ads. tubes flattened-more on lt.
B. C. Hollaway S1c 0 rt. #2 lt.
large mid line ads. tubes open rt. lt
is flat.
J. J. Mc Closky S1c - #4 rt. #4 lt.
Enormous ads. tubes flattened shut.

Thursday, 7 December 1944.

43 examined
50 took pressure - 14 cases Aero otitis media
3 failures: W. C. Mears S2c, out at 5 lbs. #2 rt. #2 lt. large amt. adenoids - tubes covered Fassae xxx
T. A. Basile Jr. F1c, out at 5 lbs. #2 rt. #2 lt. Has cold - Very little ads. tubes open.
B. C. Boyd S2c, out at 5 lbs. #3 rt. # lt. enormous ads. tubes covered not seen Fassae xxx

Passed:
S. Graham F1c, #2 rt #2 lt.
Enormous ads. tubes closed - Fassae xxxx
J. J. DeVries S1c. #2 rt. 0 lt. 2nd attempt (12.4
C. Newmark S2c, #1 rt. 0 lt.
small ads. tubes open- small and median lip
G. F. Galloway S2c, #3 rt, 0 lt.
mod. amt ads. flatten tubes, worse on rt.
T. F. Cleary S2c, #4 rt. 0 lt.
enormous ads. fills nasophary tubes open
A. J. Farrington F1c, #4 rt. 0 lt.
enormous ads. Rt tube closed
J. T. Simmons S1c, #3 rt. #1 lt.
enormous ads. tubes not seen Fassae xxxx
J. W. Cotton RT3c, #1 rt. #4 lt.
enormous ads. tubes flattened - worse on lt.
E. W. Blake SM2c, #3 rt #3 lt.
small ads. tubes open acute cold mild
P. R. Bartlett RT3c, 0 rt. #4 lt.
large amt. ads. flatten both tubes. rt. opens with swallowing, lt. closed.
A. O. Maki - #1 rt. see last week

Friday, 8 December 1944

No pressures checked.

Saturday, 9 December 1944.

47 examined -
31 given pressure - 10 cases of otitis media

2 failures: A.L. Zimmerman Jr. S1c. out at 25 lbs. #3 Rt. #2 lt.
small ads. tubes open- has slight cold.
G.H. House - S1c- out 4 lbs. #3 rt. #2 lt. has cold- very large mid line ads. Lt. tube open - Rt. tube flattened.

passed:
R.D. Clifford - S1c #0 rt. #2 lt.
enormous ads. mid line - tubes covered - open.
H.H. Fraser - S1c , #4 rt. #3 lt.
enormous ads. tubes closed -slt. cold.
N. Telsey, S1c - #2 rt. 0 lt.
small ads. tubes open - slt.cold
T.J.Jerson RT2c, 0 rt. #1 lt.
small ads. tubes open- slt cold
Adams - 2nd attempt - using nose drops. #1 rt. #1 lt.
Thomas Fisher T2c- 0 rt. #3 lt.
very large ads. tubes flattened
R.W. Keirns F2c - #1 rt. 0 lt.
very little ads. tubes wide open.
J.C. Kieffer S2c - #1 rt. 0 lt.
very large ads. in mid line - tubes open.

Monday, 11 December 1944

60 examinations
60 given pressure - 16 cases aero otitis media.

4 failures: R.R.Gregory S2c, out 3 lbs. #1 rt. 0 lt. small ads. tubes open - rt. flattened.
R. K.Harriott S2c, out 3 lbs. #1 rt. #2 lt. enormous ads. tubes covered flattened
R.J. Pope S1c, out 3 lbs. 0 rt. #1 lt. large amt ads. tubes narrowed flattened.
G.H.Hackett, MoMM2c, out 3 lbs. #1 rt. 0 lt. mod. amt. ads. tubes narrowed - open

Passed: L. Harris S1c - #0 rt. #2 lt. small ads. - rt. tube open. lt. closed slit.
Charles Slack F1c, #4 rt. 0 lt. large amt. ads. tubes covered Lt. open.
W.J. Earls - S1c - #4 rt. 0 lt. mod. amt. ads. tubes flattened.
W.B. Deal S2c, #3 rt. 0 lt. mod. amt. ads. tubes flat - pen with swallowing.
H.M. Moore F1c, #3 rt. #3 lt. small ads. tubes flat - closed narrowed.
E. Birkenhead S2c, #4 rt. #4 lt. large amt ads. tubes closed. bleeding from both.
R.Waterhouse S1c - #0 rt. #1 lt. enormous ads. tubes free - open sltly cover lt. tube.
F.D. Colston S1c - #0 rt. #4 lt. very large ads. rt. tube free. lt. covered.
1-12-45 R1 2-9-45 R2 B.H. Smith S2c, #4 rt. #4 lt. mod. amt. ads. tubes covered, flattened.
J.G. Fox Bkr.1c #0 rt. #2 lt. mod. amt. ads. tubes covered. rt. opens with swallowing
G.A. Sedory SM3c - #4 rt. #4 lt. (3rd attempt) enormous ads. tubes flattened-closed
David Heiser - S1c #4 rt. 0 lt. enormous ads. tubes flattened.

Tuesday, 12 December 1944

45 examined
No pressure.

Wednesday, 13 December 1944.

47 examined
16 rechecks given pressure - 15 cases of aero otitis media. all are on nose drops and spray. all passed pressure.

R.R. Gregory S2c, #2 rt 0 lt.
A.L.Zimmerman S1c - #1 rt. 0 lt.
T.A. Basile F1c, #2 rt. 0 lt.
N. Bogart F1c, #3 rt. #3 lt.
D.W. Richter S2c, #4 rt. #1 lt.
P.C.Murray S2c, #3 rt. #1 lt.
J.B. Smith S1c, 0 rt. #1 lt.

S.E. Pace S1c , #1 rt. #1 lt.
G.H. Hackett MoMM2c, #1 rt. #1 lt.
R.J. Pope S1c, #0 rt. #2 lt.
B. Solomon S1c, #1 rt. 0 lt.
B.C. Boyd S2c #1 rt. 0 lt.
C. H. House S1c, #1 rt. # lt.
Only one #4 ear in the lot but all showed some damage.

Thursday, 14 December 1944.

45 examined
20 given pressure - 7 cases of aero otitis media.

no failures.

7 passed:
J.G. Kirby PhM2c, 0 rt. #1 lt.
small ads. tubes open - lt narrowed
W.B. Whitman PhM1c - #4 rt. 0 lt.
large red ads. rt. tube flattened, lt open
G.E. Timmons PhM2c - #3 rt. 0 lt.
large mid line ads. tubes narrowed-open on swallowing
G.H. McLain PhM2c - #2 rt. 0 lt.
small ads. tubes narrowed slit on rt.
James Doyle PhM2c - #4 rt. #4 lt.
small ads. cover and fill both tubes and fossae - mid line clear
D.S. Farrington PhM2c - #4 rt. # 4lt.
small ads. tubes closed & filled
L.B.Lockridge PhM2c- #3 rt. #4 lt.
very large ads. tubes flattened.

Friday, 15 December 1944.

29 pressured - 2 cases of aero-otitis media.

Failure* E.H. Yuchnanich S1c out at 12 lbs.
#4 rt. and lt.
enormous ads. rt takes closed lt. covered - seems to open with swallowing.

Passed: H. L. Eaton S1c - #4 rt. 0 lt.
small ads. rt. tube closed and surrounded with adenoid tissue. left is clear.

Saturday 16 December 1944

30 pressured - 9 cases of aero otitis media.

2 failures: R.L. Hofstedt TM2c out 9 lbs. #3 rt. 0 lt. large amt. ads. tubes slit like.
W. W. Sattig Flc, out 9 lbs. #4 rt. 0 lt. very little ads. tubes wide open.

Passed: W. F. Pfeifer Flc - #4 both very large ads. tubes flattened.
C. R. Brock Flc - #4 rt. small ads. both tubes flat. more on rt. can open lt. tubes.
A. K. Herring Slc - Lt. #4, rt. #4 mod. ads. tubes slit - lt. closed open rt.
L. R. Matthews S2c, Rt #1 lt. 0 enormous ads. mid line tube free.
W. T. Ritchie S2c, Lt #3. Mod. ads. tubes slit like, left closed rt. open.
R. E. Law S2c, Rt #4. mod. ads. tubes slit like.
R. J. Vise S2c - Rt. #4, Lt. #1. large amt. ads. tubes flat.

Very complete - [illegible] 9.8c

MD
Note: Review by Dr. Shilling

BUMED-X-BLW:II

15 December 1944

Washington 25, D.C.

Captain C. W. Shilling (MC) USN
U. S. Submarine Base
New London, Connecticut

Dear Shilling:

I mentioned in our conversation Wednesday that your recommendation that the deep X-ray therapy for Project X-434 be arranged with the Backus Hospital would be approved. However, I was in error as Admiral Smith took an opposite view as set forth in the enclosure.

I see no other alternative except the Newport Naval Hospital; obviously a cumbersome arrangement but essential to the success of the project. Perhaps you have a better suggestion.

I suggested to the Admiral that the experimental subjects sign a release, but he is of the opinion that this would not legally preclude a claim.

Very sincerely

/s/
E. W. BROWN
Captain (MC) USN

BUMED-X-BLW:II

14 December 1944

MEMORANDUM

TO: Head of Claims Section, BuMed
Building 1, Room 07.

Subj: Authorization for Civilian Medical Treatment of Aero-Otitis Media Cases, Request for.

Ref: (a) Ltr. from SubBase, New London, to Chief, BuMed dated 1 December 1944.

Encl: 1. (HW) Copy of Approved BuMed Project Form, X-434 (Sub. No. 90) of 9 August 1944.

1. Approval of a contract for civilian X-Ray facilities for experimental purposes is not recommended.

2. Deep X-Ray is not a harmless procedure, either in its immediate effects or possible late effects, and might be basis for claims and damages later.

3. A civilian contract would bring the use to general notice, with publicity always a threat.

H. W. SMITH
Rear Admiral (MC) USN

CC: Captain Shilling

18 December 1944.

Captain H. W. Brown, (MC) USN
Research Division
Bureau of Medicine and Surgery
Washington, D.C.

Dear Captain Brown:

Thank you for your letter with the copy of the advance endorsement of our request for civilian X-ray therapy. Inasmuch as this will undoubtedly be disapproved, we will have to take the men by ambulance to Newport and back. It is rather a long expensive trip, but will probably work out satisfactorily.

Kindest personal regards.

Most sincerely,

C. W. Shilling
Captain, (MC), U.S.Navy.

CWS:JWK

15 December 1944.

Comdr. E. E. Metcalfe, (MC) U.S.N.,
Bureau of Medicine and Surgery
Navy Department,
Washington, D. C.

Dear Earle:

Enjoyed talking with you the other afternoon and am glad to know that you are still in Washington.

I am enclosing a copy of our "Form X" for the aero-otitis media project that is now being conducted here. I believe this is going to contribute something worth while in the treatment and prevention of this disability.

As you now know, there was a "Clinical Conference on Radium Irradiation for Prevention of Aero-otitis Media" held at Mitchel Field beginning on 5 June 1944. Dr. Teed, the oto-laryngologist formerly on duty here, had planned to attend this conference as a Navy representative. He was transferred to foreign duty just before the conference was to be held and the Bureau ordered me to attend in his place.

This conference was conducted by Dr. S. J. Crowe of Johns Hopkins Medical School assisted by Dr. H. L. Haines, also on the Johns Hopkins' staff. Dr. Crowe is the Professor of Otolaryngology at Johns Hopkins and had offered his services to the Army for this project. He told me while at Mitchel Field that he had offered to do the same for the Navy and would be glad to cooperate in any way. I am sure it would be well worth while if you were to go over to Baltimore and discuss this problem with him.

Dr. Haines was commissioned in the Naval Reserve at the time of the Mitchel Field Conference but had been deferred from active duty. I discussed the problem of aero-otitis media with him and told him of our problems with it here and of the need for treatment and prevention for the men taking pressure in the escape tank here. Captain Shilling was already planning a research project on this and I succeeded in getting Dr. Haines interested in it. He made a trip to New London at his own expense and has since been ordered to active duty and is now conducting this project here. Captain Shilling was able to arrange for Dr. Haines being assigned here through Captain Brown of the Research Department of the Bureau of Medicine and Surgery.

I consider myself very fortunate in having had the opportunity of attending the Mitchel Field Conference. As it happened, I was the only Navy representative, a fact which rather surprised me. This is such a great and pressing problem with the Army Air Force that I rather expected to see the Naval Aviation Medical Department represented also. I feel sure that the Navy must also have this as a problem although probably less acutely because of the generally more favorable climatic conditions of our operating areas. Certainly we have had it to contend with in the pressure groups in the Submarine Service for sometime. Captain Shilling, the Medical Officer-in-Charge of the Medical Research Laboratory here, had some correspondence with Captain Poppen (MC), USN, of the Bureau of Aeronautics, relative to this condition as far back as December 1941. Captain Poppen did not think the question of aero-otitis media among flying personnel was very serious at that time. It is our feeling here that probably most of these cases do not show up in the statistics as most of them are treated as ambulatory cases over a period of time and are not admitted to the sick list. Perhaps you can tell us more about this. We would certainly appreciate any additional information you can give us as a matter of general interest.

I enclosed two articles on aero-otitis media with my report to the Surgeon General on the Mitchel Field Conference. Perhaps you have seen these. If not, I'll be glad to send them to you. The Army report should interest you a lot. I understood at the conference that the incidence of this disability was then even greater among flying personnel than the report indicated.

Our radium applicators are expected here in about two weeks. The project is well along except for these and the Bureau of Medicine and Surgery's approval of x-ray treatment for a part of these in a civilian hospital. I think you would be interested in seeing these cases and what is being done here. How about getting some additional duty orders and coming up for a few days? Don't let the Army get any further ahead of us on this than they are! ← To go to Medical M. Hop

I came back from the South Pacific in March of this year and have been stationed here as Assistant Medical Officer-in-Charge of Medical Research Laboratory since then. In addition I have been doing considerable traveling for Commander Submarines Atlantic doing personnel selection for the Submarine School. It isn't much fun traveling these days, but I think it is paying good dividends as far as the quality of the submarine personnel is concerned.

Eleanore joins me in best regards to you and Jeanette.

Sincerely,

A. S. CHRISMAN,
Comdr. (MC) USN.

NOTE REVIEW BY DR SHALLIC — (99)

Monday, 18 December 1944.

45 examined
No pressure.

Tuesday, 19 December 1944

45 examined
30 given pressure - 8 aero-otitis media
No failures.

Settle, H.E. S2c, #4 rt #4 lt.
small ads. tubes flat - closed.
Taylor, W.J., S2c, #4 rt #2 lt.
mod. ads. tubes flat - more on lt.
Stewart, K.C., S2c- #0 rt. #2 lt.
small ads. tubes narrowed - open
Verder, V.F., F2c, #4 rt #4 lt.
large ads. tubes closed.
Kogut, P.S., S1c, #o rt #4 lt.
mod. amt. ads. Lt tube plugged - Rt open.
Clark, H.E., F2c, #4 rt with perforation,
#4 lt. - small amt. ads. tubes plugged
with large nodules of ads.
Sisson, J.R. F1c, #4 rt. #4 lt.
mod. ads. tubes flattened - closed.
Presley, T.J., F2c, #4 rt. #4 lt.
mod. ads. tubes closed flattened (cold)

Wednesday, 20 December 1944.

45 examined
30 given pressure - 8 cases aero-otitis media
2 failures
McIntyre, J.M., S1c, out 6 lbs. #3 rt.
#3 lt.- small ads. tubes flat.
nodules in tubes.
Damon, P.J., F1c - out 6 lbs. #2 rt #2 lt.
small ads. cold - mucous plugs -
tubes open.

Passed-
Sather, R.J., MoMM1c - #0 rt. #4 lt.
large ads. both tubes flat. more on lt.
Burge, J.L., S2c - #0 rt. #2 lt.
enormous ads. both tubes not seen.
Davis, W.H., TM2c - #0 rt. #2 lt.
mod. amt. ads. tubes closed - slit like.
Kelly, J.H., S2c - #0 rt. #3 lt.
mod. amt. ads. tubes slit like.
Martin, R.G., MoMM1c - #4 rt. #3 lt.
small ads. tubes blocked - lt opens on
talking.

Rust, R.H., F1c - #1 rt. #4 lt.
large ads. block both tubes - worse
on left.

Dr. Chrisman reports radium is on its way.

Thursday, 21 December 1944.

45 examined
30 given pressure - 7 cases of aer-otitis media.
2 failures:

Kohl, E.I., RT3c, out 3 lbs. #2 rt. #2 lt. enormous ads. tubes covered.
Ausherman, T.F., F1c. out 5 lbs. #3 rt. #3 lt. - large ads. tubes covered. closed -(cold)

Passed:

Smith, H.W., F1c - #3 rt. #0 lt. mod. amt. ads. tubes narrowed - rt. flt.
Hood, B.D., F1c - #2 rt. #0 lt. mod. amt. ads. lt. tube wide open - rt. flat. open with swallowing.
Wales, D.W., S2c - #2 rt, #4 lt. Enormous ads. tubes covered - Lt closed.
1.25 R' Cournoyer, N.E., S2c - #0 rt. #2 lt. large ads. tubes covered - open with talking.
Brown, - No trouble - 4th try.

Friday, 22 December 1944.

56 examined
38 given pressure. - 8 cases of aero-otitis media.
3 failures:

Williams, G.D., S1c out 5 lbs. 0 rt. #4 lt. very large ads. tubes covered - Lt. closed.
Douglas, J.T. Jr., MM3c out 6 lbs. #2 rt. #4 lt. enormous ads. tubes closed.
Ryan, R.E., S2c out 19 lbs. #4 rt 0 lt. enormous ads. tubes closed on rt. left narrowed.

Passed:

Podolsky, J.G., F1c, 0 rt. #2 lt. mod. ads. tubes flat. open
Finegan, J.B., F1c, #4 rt 0 lt. large ads. tubes covered lt. open.
Lillis, J.W., S2c, #4 rt. #4 lt. enormous ads. tubes not seen.
Kratz, A.J. F1c - #4 rt. #4 lt. enormous ads. tubes not seen
Springer, R.E., S2c, #4 rt. #4 lt. enormous ads. tubes not seen.

Saturday, 23 December 1944

weather 15° cloudy

No exams.
30 given pressure - 5 aero-otitis media.

3 failures: Elfrank, F.H., F1c. out 6 lbs. #4 rt. #4 lt. small ads. tubes narrow - open - slight cold.
Auberg, H.E. S2c, out 6 lbs. #3 rt. #3 lt. small ads. tubes closed - cold.
Cornell, J.A. S2c, out 18 lbs. 0 rt. #3 lt. enormous ads. tubes blocked - cold.

Passed:

Merica, L.L., S1c - #4 rt. #2 lt. large ads. tubes closed & locked cold.
Lackey, J.R., S2c. #4 lt. #2 rt. enormous ads. both tubes blocked. cold.

Xmas Holiday.

Op-34-I/men

NAVY DEPARTMENT
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON

21 December 1944

Commander A. S. Chrisman (MC) USN
Assistant Medical Officer in Charge
Medical Research Laboratory
U. S. Submarine Base
New London, Connecticut

Dear Harry,

Thank you for your very informative letter of the fifteenth. I told the Surgeon General of our conversation the following day.

We have the two articles on aero-otitis media that you enclosed in your original report to the Surgeon General on the Mitchell Field Conference. I went to Cherry Point Tuesday and discussed the project there with Capt. Northington. His recommendations are essentially in line with yours.

I have completed my report for the Surgeon General today and am recommending the establishment of six centers for irradiation therapy for the Navy.

I certainly appreciate your help, Harry, on this work.

The Surgeon General plans on going to Westover tomorrow to visit the irradiation clinic of the army there. I shall advise you of the outcome of all this. Please call me when you are in town.

With all good wishes for a happy holiday season to you and Eleanore.

Sincerely,

R. E. Metcalfe
Lt. Comdr. (MC) USN

Washington D.C.

BUMED4X-ARP:II

22 December 1944

Dr Kelly assigned

To: Chief of Dentistry Division

Subj: BuMed Project X-434 - b: Prevention and treatment of Aero-Otitis Media in submarine personnel - assignment of Lieutenant Wm. J. Kelly (DC) USNR in charge of

Encl: 1. (HW) Ltr fr Captain Shilling of 18 Dec 1944 to Captain Brown relative subject item.

1. This office has been informed by Captain Shilling in charge of the Medical Research Department, Submarine Base, New London, Connecticut, that subject dental officer has special qualifications for the proposed research.

2. It is therefore requested that subject officer be nominated for duty at the Submarine Base, New London to be assigned to the Medical Research Department. It is understood that he is available for this duty.

H. W. SMITH
Rear Admiral (MC) USN

CC: Captain C. W. Shilling

Monday, 25 December 1944.

Christmas Day - no pressure or examinations.

Tuesday, 26 December 1944.

45 examined
no pressure.

Wednesday 27 December 1944.

45 examined
30 given pressure - 8 aero-otitis media
2 failures:
P.E.Hughes S2c, out 5 lbs.
#0 rt. #3 lt. small ads. both tubes closed - worse lt.
W. H. Mardis F2c, out 5 lbs.
#0 rt. #3 lt. mod. ads. lt tube shut - rt open.

Passed:
P.R. Lilly S2c, #4 rt. 0 lt. has slight cold. moderate ads. tubes covered open
R.B. Ebeling S2c. 0 rt. #2 lt. small ads. tubes narrowed.
R3127M.J. Ciarcia S1c. #4 rt 0 lt. small ads. lt. open - rt. covered.
J.M. Rector S2c, #2 rt #2 lt. slight cold small ads. tubes open
N.C. Jones F1c, #3 rt. #3 lt. small ads. tubes open - slight cold.
T. E. Murton F1c, #2 rt. #2 lt. small ads. tubes open - slight cold.

Thursday, 28 December 1944.

Officers and boat crews pressured - no record.

L. Shilling asc

28 December 1944

Lieut. William J. Kelly (DC) USNR
U.S.Naval Training Station
Gulfport, Mississippi.

Dear Doctor Kelly:

Having heard nothing from you or from the Bureau, I wrote again to Captain Brown, concerning your assignment. The enclosed copy of a letter from Admiral Smith to the Chief of the Dental Division will explain the results. I trust that now you will actually be on your way here.

We are now belatedly returning to you also a letter which was sent here for you.

Kindest personal regards.

Most sincerely,

C. W. Shilling
Captain, (MC), U.S.Navy

CWS:JMK
Enclosure

28 December 1944.

Lieut. William J. Kelly (DC) USNR
U.S.Naval Training Station
Gulfport, Mississippi

Dear Doctor Kelly:

We have not previously answered your letter and returned the preliminary draft of Part II of your paper dealing with Occlusion of the Eustachian Tubes, because we felt you would soon be arriving here. However, now that we find that your orders have not yet been issued, I am returning it to you with a summary of some of the comments made by interested members of the staff.

They feel that the three cases are too few. They feel that the cases have not been sufficiently worked up with proven details, so as to be acceptable, --at least to critical observers. They are interested in finding out how the patency of the Eustachian tube was determined and what the condition of the nasopharynx was. They would like very much to have some patients tried under extreme pressure conditions. In general, they didn't feel that it was a finished paper either so far as fundamental research or presentation was concerned.

As you can see, you are coming to work with a hard boiled outfit. We all read each others reports before they are submitted, and comment caustically. We feel that it is better for our friends to make adverse comments, than the general public or any adversaries, if we have such.

Hope to see you soon.

Sincerely,

C. W. Shilling
Captain, (MC), US.Navy

CWS:JMK
Enclosure

Washington 25, D.C.

BUMED-X-GN: II

NB7/P3-2

27 December 1944.

To: Medical Officer in Charge, Medical Research Department, New London.

Via: Commanding Officer.

Subje Authorization for Civilian Medical Treatment of Aero-Otitis Media Cases, Request for.

Ref: (a) MOinC, Med. Research Dept. New London, ltr dated 1 Dec 1944, with CO, US Sub. Base 1st end. NB7/P2(B) dated 2 Dec 1944.

1. In reply to reference (a) you are informed that the setting-up of a contract with a civilian medical facility for X-ray therapy for experimental purposes is not in accord with the policy of the Bureau and is therefore not approved.

2. Deep X-ray application is not a harmless procedure, either in the immediate or possible late effect, and might bring such a situation to general notice with the threat of unfavorable publicity.

3. It is suggested that arrangements be made for subject experimental therapy with the U. S. Naval Hospital, Newport, R. I.

/s/
ROSS T. McIntire
Vice Admiral (MC)
Surgeon General, U.S.N.

Friday, 29 December 1944.

35 examined
47 given pressure - 19 cases aero-otitis media.
8 failures:
J.T. Clum MM2c, out 7 lbs. #4 rt. 0 lt.
small ads. tubes closed
T.L.Tracy F1c. out 5 lbs. #3 rt 0 lt.
mod. amts. ads. tubes slit like.
E.E.Conner F2c, out 5 lbs. #2 rt. #2 lt.
enormous ads. tubes covered-not seen
* R.K.Harriott S2c - out at 5 lbs.
#3 rt. #3 lt. slt. cold.
* C.O.Williams S1c,-out at 5 lbs.
#3 rt. #3 lt. slt. cold.
* E.H.Yachnewich S1c - out at 5 lbs.
#3 rt. #3 lt. slt. cold.
* F.H.Elfrank F1c - out at 15 lbs.
0 rt. #4 lt. slt. cold
* P.J.Damon F1c - out at 15 lbs.
#1 rt. #4 lt. slt. cold.

Passed:
F. Mondano F1c - #4 rt. #4 lt.
enormous ads. tubes closed.
P. L. Proper SC3c - #4 rt. #4 lt.
very large ads. tubes closed.
E.S. Devere EM1c - #2 rt. #4 lt.
mod. amt. ads. lt. tube closed.
rt. tube open.
* P. B. Hughes S2c - 0 rt. #4 lt.
* J. M. McIntyre S1c - #4 rt. #4 lt.
* I. L. Ausherman F1c - #4 rt. #4 lt.
* W. H. Mardis F2c - 0 rt. #2 lt.
* J. M. Redington S1c,- #3 rt. #4 lt.
- J. T. Douglas MoMM3c - 0 rt. #4 lt.

Saturday, 30 December 1944.

25 given pressure. - 3 cases of aero-otitis media.
2 failures:
R' 2-14 A. D. Hendricks S1c out at 5 lbs.
0 rt. #2 lt. large ads. both tubes
covered - cold.
F. J. Sanzepacher MoMM3c - out 15 lbs
#4 rt. #4 lt.- very large ads. tubes
not seen.

Passed:
W. E. Bowker - MoMM2c - 0 rt. #4 lt.
Slt. cold - very large ads. tubes open-
narrowed.

Summary for December:

DECEMBER

594 candidates checked through the pressure chamber, Of these 172 developed aero-otitis media. Treated as last month. Of these 172 all but 2 had lymphoid tissue about Eustachian tubes that would require radium therapy. Of those passing and not developing Aero-otitis media there are approximately 100 more who if tested repeatedly would develop aero otitis media. Radium is due to arrive early in January.

Short resumé submitted for Semi-annual Report to B. Med

AERO-OTITIS MEDIA

A study of problem of aero-otitis media in those taking tests in submarine escape training tank has been begun. Work was originally started by Captain Shilling and Mr. Everley in 1940 and continued by Comdr. Teed. In September 1944 an otolaryngologist Dr. Haines was added to the department to continue this study.

All candidates for the submarine school varying from 70 to 30 daily are examined before and after chamber tests both otoscopically and nasopharyngoscopically. The cases of aero-otitis media are evaluated, and treated either with nose drops, suggestion, X-Ray or Radium. The evaluation of the various treatments and means of prevention are being studied. Effect of A.O.M. on hearing is checked. The study thus far has shown there is a definite correlation between condition of nasopharynx, amount of adenoids about Eustachian tubes and the incidense of aero otitis media and deafness.

The problem of radium in aero-otitis media was accepted by the Army Air Force in July and in the past month by the Navy Air Force. The submarine service started the work in July soon after the Army Air Service.

Our findings of about 25% a.o.m. of those taking pressure are similar to those in the Army Air Force.

Those for X-Ray theraphy are treated at Newport R.I. The radium treatments are given here at the Sub Base.

During period from July 1st to December 31st 1944 5240 passed lung training.

Examined by Medical Officer in Tank during November and December and given pressure - 1327.

Cases Aero-Otitis media - 338

Failed pressure - 121
Passed pressure
but had aero-otitis media - 217

% Aero-Otitis Media - 25.5%

Cl. 5, asc

Monday, Jan. 1, 1945

35 examined
39 given pressure - 7 cases aero-otitis media
5 failed pressure:
1-29 R, H.O. Hastings S1c - out 1? lbs. #4 rt. 0 lt.
has large red ads. - tubes covered.
1-30 R, G. J. Irowsky S2c - out 14 lbs. #4 rt 0 lt.
small ads. - rt. tube closed - lt. open
1-29 R, L. A. Harris S1c - out 8 lbs. #1 rt. #1 lt.
large ads. tubes free
1-29R, L. C. MacDonald S2c- out 5 lbs. 0 rt. #2 lt.
small ads. tubes open - slt. cold
~~1-29R~~ R, R. Kerr S1c - out 5 lbs. #4 rt. #4 lt.
small ads. tubes slt. like - closed
2 passed:
1-29R, K. R. Parsons S1c #1 rt. #4 lt.
very small ads. rt. tube open slt like
left tube.
1-29R, W. E. Ernest S1c - #2 rt 0 lt.
enormous ads. tubes covered not seen.

Tuesday, Jan. 2, 1945

29 given pressure - 8 cases aero-otitis media
4 failed pressure:
1-29R, G. G. Pedersen S1c- out 5 lbs. #0 rt. #2 lt.
large ads. lt. tube closed - rt. tube
open.
1-31-45 R, C. H. Schmidt S2c - out 2 lbs #1 rt. #2 lt.
small ads. tubes narrow slits.
1-29R, J. H. Bradley RM2c - out 17 lbs. #4 rt. 0 lt.
slt. cold - large ads. tubes closed
1-30R, J. O. Hickman MoMM2c - out 10 lbs. 0 rt. #2 lt
slt. cold.- small ads. lt. tube flat
4 Passed:
1-29R, H. J. Guleff S1c - #0 rt. #4 lt.
very large ads. lt. tube closed - rt.
narrow open.
1-29R, G. A. Miller S1c - #0 rt. #4 lt.
large ads. tubes flat.
1-29R, G. Sakash S1c - #4 rt #4 lt.
small ads. tubes open wit nodules on
lips - slt. cold.
1-29R, H. R. Hollwedel S1c - #2 rt. 0 lt.
large ads. both tubes narrow.

Wednesday, Jan. 3 1945

30 enlisted men given pressure
49 officers give pressure.

Of the 30 given pressure: - 10 cases aero-otitis media
4 failed pressure:
1-30R, L.P. Battermann, S2c - out 12 lbs.
#3 rt. #4 lt. enormous ads. tubes
not seen - slt. epistaxis lt.
1-30R, T.M. Jaggers S2c - out 9 lbs. #4 rt. #4 lt.
large ads. tubes small closed
1-25R, J.F. Brown S2c - out 4 lbs. #2 rt. #3 lt.
enormous ads. tubes covered -slt. cold.
- L.R. Baily, QM1c - out 11 lbs. 0 rt. #4 lt.
enormous ads cover tubes not seen
6 Passed:
2-1 R, R.W. Fenton S2c - #4 rt 0 lt.
small ads. but tubes slits
2-1 R, C.W. Houdeshell S1c - #4 rt. #4 lt.
enormous ads. both tubes closed
2-1 R, R.D. Hefner RM1c - #4 rt. #4 lt.
very large ads. tubes covered.
2-1 R, R.W. Whiteacre RT3c - #4 rt. #4 lt.
small ads. tubes narrow - slt. cold
1-31 R, W. F. Hudson S1c - #2 rt. #2 lt.
large ads. slit like tubes
1-31R, P.S. Hoffman S1c - 0 rt. #2 lt.
enormous ads. tubes covered

Of the 49 officers given pressure - 10 cases Aero-Otitis Media.

3 failures:

1-22 R1 2-19 R2 A. A. Magill, Ensign - out 10 lbs. #4 rt. #4 lt. large ads. tubes covered.

1-22 R1 2-19 R2 R. E. Nuckles, Ensign - out 20 lbs. #3 rt. #4 lt. mod. ads. tubes closed.

1-22 R1 2-19 R2 C. B. Cole Ensign - out 21 lbs. #4 rt. #3 lt. large ads. tubes flat.

7 passed:

1-22 R1 2-19 R2 W. A. Youngblood, Ensign - #3 rt. 0 lt. Large ads. tubes narrow open

1-22 R1 2-19 R2 R. G. Hawley Ensign - #2 rt. 0 lt. small ads. both tubes closed

1-22 R1 Dropped M. E. Ingwersen, Ensign - #2 rt. #2 lt. small ads. Rt. tube open, Lt. closed

1-22 R1 2-19 R2 J. W. Warnock, Ensign - 0 rt. #2 lt. small ads. tubes open - slight cold.

1-22 R1 2-19 R2 R. E. Davis, Ensign - #3 rt. 0 lt. large ads. tube closed on rt. lt. open

1-22 R1 2-19 R2 E. L. Foote, Ensign - #4 rt. #4 lt. small ads. tubes closed

Dropped L. J. Hollie - Ensign - 0 rt. #2 lt. small ads. tube narrow open

Thursday, 4 January 1945.

101 given pressure - 21 cases aero-otitis media.

6 failures:

1-22 R1 2-19 R2 C. W. Humphrys, Ens: out 8 lbs. #3 rt. #3 lt. very large ads. tubes not seen- slight cold.

2-1 R1 J. [illegible] Wood, RT3c out 3 lbs. #1 rt. #3 lt. small ads. both tubes flat closed

2-1 R1 J. L. Pacey, RT3c- out 6 lbs. #4 rt. #2 lt. enormous ads. tubes not seen

2-1 R1 H. S. Leroy, RT3c- out 15 lbs. #1 rt. scared. small ads. both tubes open- slit like.

2-1 R1 A.A.Herring RT3c - out 8 lbs. #4 rt. #4 lt. enormous ads. tubes covered - closed

2-1 R1 L. D. Bingiham RT3c- out 24 lbs. #0 rt. #4 lt. small ads. both tubes covered - narrow

15 passed:

2-1 R1 L.P. Cloud RT2c - #4 rt. #4 lt. large ads. both tubes covered

2-1 R1 J.M. Moore RT2c - #4 rt. #2 lt. small ads. tubes covered

2-1 R1 G. Singer RT3c - #0 rt. #3 lt. enor. ads. tubes not seen.

F.R. Damaly Cox - #3 rt. #3 lt. mod. amt. ads. tubes open - Fossae full

Officers:

1-22 R1 Dropped J.D. MacKinnon, Lt(jg) #0 rt. #2 lt. Small ads. tubes open - nodules on lips

out R.E. MaCleary, Ens; #4 rt. #4 lt. small ads. both tubes flat.

1-22 R1 2-19 R2 B.T. D'Arezzo, Ens; #4 rt. #3 lt. enormous ads. both tubes closed- slt.cold

1-22 R1 2-19 R2 H.L. Arnest, Lt.; 0 rt. #3 lt. small ads. tubes slit like - slt. cold

1-22 R1 2-19 R2 J.A. Purdy, Ens; 0 rt. #4 lt. mod. ads. tubes narrow - slits

1-22 R1 2-19 R2 E. Jefferson, Ens; #4 rt. 0 lt. mod. ads. Rt tube closed.

1-22 R1 2-19 R2 J.A. Grace, Lt.(jg) 0 rt. #4 lt. enormous ads. on lt. rt. tube free-narrowed

Repeaters:

1-22 R1 * E.L.Foote- Ens; #3 rt. #4 lt.

Dropped * T.J. Hallie Ens: #0 rt. #4 lt.

2-1 R1 * R.P. Mooney Ens; #3 rt. 0 lt.

1-22 R1 * R.E. Davis, Ens; #3 rt. 0 lt.

Friday, 5 January 1945.

139 officers pressured
5 failed pressure:

2-1 R1 R.W. Belt, Lt. out 12 lbs. #4 rt. #4 lt.
enormous ads. both tubes closed

2-1 R1 H.C. Doerschak. Ens: out at 19 lbs.
#2 rt. #4 lt. - small ads. tubes open
cold - mucous

2-1 R1 D.B. Miller. Lt(jg) out at 7 lbs. 0 rt.
#3 lt. - small ads. slit tubes.

Dropped *R.E. McCleary, Ens. out at 8 lbs. #4 rt. #4 lt.

Dropped C. K. Sutton, Lt(jg) out at 15 lbs. #2 rt.
#3 lt. small ads. tubes small open - cold.

Passed:

2-1 R1 J.C. Bland, Ens. #2 Rt. #2 lt.
large ads. tubes covered with mucous

1-22 R1 2-19 R2 *B.T. D'Arezzo, Ens. - #4 rt. #4 lt.

1-22 R1 2-19 R2 *J.A. Purdy. Ens. 0 rt. #4 lt.

1-22 R1 2-19 R2 *E. Jefferson. Ens. #4 rt. #2 lt.

1-22 R1 2-19 R2 *J.A. Grace. Lt(jg) 0 rt. #4 lt.

[redacted] R.L. Morris, Lt(jg). #2 rt. 0 lt.
enormous ads. tubes not seen

3-20 R1 R.E. Truscheit, Ens. #2 rt. #2 lt.
mod. sized ads. tubes covered open.

2-2 R1 T.F.R. Dungan, Ens. #0 rt. #4 lt.
large ads. tubes flat. rt. not seen.

Dropped from Shell 1-22 R1 *J.D. MacKinnon Lt.(jg) 0 rt. #2 lt.

2-2 R1 J. L. Patterson, Ens. #4 rt. #2 lt.
small ads. tubes open - slight cold

2-2 R1 F.R. Rehm, Ens. 0 rt. #4 lt.
large ads. tubes open - much mucous

2-2 R1 H.G. Topia, Ens. #3 rt. #0 lt.
large ads. tubes narrow

2-2 R1 E.B. Tomlin, Lt.(jg) #2 rt. #2 lt.
small ads. both tubes open - cold

2-2 R1 J.C. Wilcox, Ens. 0 rt. #4 lt.
small ads. nodules in orifaces of tubes

Saturday, 6 January 1945.

52 officers pressured
9 cases of aero-otitis media
1 failure:

* Ens. J. T. Patterson out at 7 lbs. #1 rt. #2 lt.

8 passed:

* Ens. S. G. Tapia - #3 rt. 0 lt.

2-2-45 R1 * Ens. G. O. Gibson - #2 rt. 0 lt.
small ads. tubes open - large cushions

* Lt. (jg) A. B. Tomlin - #3 rt. #2 lt.

* Ens. J. C. Wilcox - #4 rt. #4 lt.

* Ens. J. C. Bland - #4 rt. #4 lt.

* Ens. R. E. Truscheit - #2 rt. 0 lt.

* Lt (jg) R. L. Morris, #2 rt. #2 lt.

1-22 R1 * Ens. W. A. Youngblood. #4 rt. 0 lt.

TEAR SHEET

FROM

UNITED STATES NAVAL MEDICAL BULLETIN

1944

(53) - Sheet 1

white particles from the wound surface, and must often do a complete excision of the wound surface, as he has no way of knowing which of this material is coral sand and which is sulfonamide.

The widespread, enthusiastic, and usually inadequately supervised oral administration of sulfonamide drugs by hospital corpsmen in combat areas has many dangers. Untoward effects of the drugs cannot be watched for when great numbers of patients need attention. Temperature curves, furthermore, are profoundly modified by their use. This is a serious disadvantage, because on shipboard the medical officer caring for many casualties may have no time to check clinical features on the noncritical cases other than the temperature curves, nor can he adequately investigate the cause of every fever when the wound is not the responsible agent.

Sulfonamides have been applied locally at the time of debriding compound fractures in less than half the patients we have followed here. It is believed that occurrence or absence of infection in these cases has had no relation to the use of sulfonamides, but has depended on other factors, such as the extent of the devitalization of tissues at the time of the original injury, the length of time supervening between reception of the wound and the debridement or excision, the completeness of debridement permitted, and facilities available at the time of operation. Only one case was observed in which there was even a suggestion of the "spreading infection" (4) which is possibly benefited by sulfonamides.

Excepting laparotomies, when drop ether was necessary for relaxation, and in eye injuries, all operations on this ship have been carried out under sodium pentothal anesthesia. There have been no deaths or other serious complications due to its use, in spite of the fact that its administration has usually been in the hands of inexperienced men.

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3. ALTEMEIER, W. A.: Bacteriology of traumatic wounds. J.A.M.A. 124: 413-417, February 12, 1944.
4. NICHOLSON, J. T.; FERGUSON, L. K.; BROWN, R. B.; and GODFREY, E. W.: Treatment of compound fractures aboard hospital ship. U. S. Nav. M. Bull. 42: 607-622, March 1944.

(53)-Sheet 2

HEARING TESTS[1]

AN EVALUATION

CHARLES W. SHILLING
Captain (MC) U.S.N.
IRA A. EVERLEY
Lieutenant, junior grade (HC) U.S.N.
and
J. D. HARRIS
Ensign H(S) U.S.N.R.

The present study was undertaken in an effort to determine the true significance and value of the common clinical tests of hearing. These include the Spoken Voice, the Whispered Voice, the Coin Click, and the Watch Tick tests. Inasmuch as the custom is standard throughout the Navy of reporting hearing ability in terms of these particular tests, it is apparent that a thoroughgoing study of their measurement properties is needed.

As these clinical tests are designedly tests of auditory acuity, the technic was adopted of comparing the results on the clinical tests with results from the same population on the most reliable laboratory test of auditory acuity, the audiogram. The audiogram provides an accurate analysis of the range of the frequency spectrum to which an ear is sensitive, and the peak or peaks of maximum sensitivity, as well as a detection of any abnormalities such as diplacusis, lacunae, or tonal islands. This sort of information can be only crudely gathered with the use of clinical examination.

Specifically, it was hoped that by this method the following information on the clinician's tools could be secured:

1. Whether any one of the clinical tests serves as a good indicator of ability to hear specific frequencies (differential sensitivity).

[1] This is the fifth and final report on an audiometric study which was done during 1939-1942. The first part was reported in the U. S. NAVAL MEDICAL BULLETIN of January 1942, under the general title of "Auditory Acuity in Submarine Personnel," and concerned hearing loss due to Diesel engine noise. The second part appeared in the April 1942 issue and discussed "Hearing Loss due to Exposure to Radio under Service Conditions." Part Three appeared in July 1942, and was divided into two sections: One concerned "Aero-Otitis Media in Submarine Escape Training" and the other, "Hearing Loss due to Exposure to Increased Air Pressure." The fourth part appeared in October 1942, and discussed "Hearing Loss due to Exposure to Gunfire."

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2. Whether any combination of clinical tests can be colligated to produce a battery which might substitute satisfactorily for an audiogram.

In addition to the hearing tests administered, a number of other sorts of data were secured—chronologic age, Navy rate, and years of submarine service. On the basis of an otoscopic examination each ear was rated on a four-point scale from 0 (normal) through 3 (cases of acute infection, perforation of the drumskin, etc.). Finally, a check was made as to whether any disability was due to middle ear or to cochlear dysfunction (Weber and Rinne tests). While not related directly to the major problem, a number of significant facts have appeared from this data, and will be reported here.

TABLE 1.—*Distribution of subjects by age*

Age						
<20	21–25	26–30	31–35	36–40	41–45	>45
91	97	61	70	87	57	37 = 500

The clinical acuity tests used were, with the exception of the Spoken Voice test, administered in conformity with directions given by the Manual of the Medical Department, 1939. Our use of the Spoken Voice test corresponds closely in design to the Whispered Voice test, with the obvious differences in articulation and amplitude. The audiometric examination was conducted with the Western Electric 2A and 6B audiometers (results on the two instruments were demonstrated interchangeable). Tests were conducted under partially sound-deadened conditions. A standard psychophysical procedure was adopted, a modification of the Method of Limits, the Method of Serial Groups. Subjects were given one or more ascending series, in steps of five decibels; the threshold was taken as that lowest setting where the subject consistently reported the tone.

Of more than 2,000 men examined, a total of 500 cases was selected at random for study. Table 1 shows the distribution of this population with respect to age. The group included 231 engine room ratings, and 269 deck ratings. Table 2 summarizes the condition of the auditory systems as revealed by the Weber and Rinne tests. It would seem that there is sufficient heterogeneity on a variety of criteria to assure a wide range of scores on any tests of auditory function. Consequently, interpretation will not need to be restricted to a small band of the true range of ability.

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TABLE 2.—*Classification of auditory apparatus of subjects by tests of Weber and Rinne*

Weber	Rinne R	Rinne L	Interpretation	Number
1	1	1	Both ears normal	401
0	0	1	Middle ear dysfunction	0
2	1	0		4
1	0	0		5
0	1	1	Inner ear dysfunction	54
2	1	1		22
0	1	0	Not interpretable	7
1	1	0		3
0	0	0		2
2	0	0		1
2	0	1		1

Weber—0: Sound localized in R ear
1: Sound localized in median plane
2: Sound localized in L ear

Rinne—0: Middle ear dysfunction
1: Ear normal

The audiogram, regarded as the criterion, will be used as the point of departure for discussing other data.

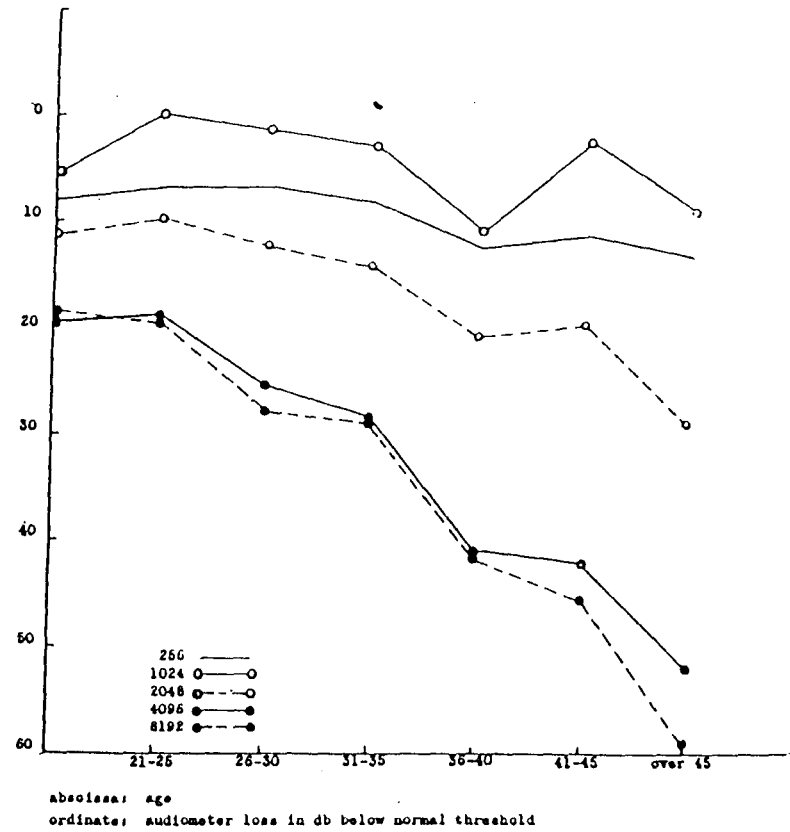
1. *The audiogram and the otoscopic examination.*—It will be seen on an inspection of table 3 that a direct relationship exists between the rating given an ear by the otologist, and the audiogram for that ear. The average loss of the whole range progresses regularly from 13.2 decibels at 0 (normal) rating to a loss of 41.2 decibels at rating 3. The usual result in studies of this kind is seen in table 3, where loss is not only progressive from rating 0 to 3, but is also progressively more severe in general as one passes from low to high frequencies.

It might be thought that these results may possibly be an artifact of a relationship between otologic condition and age, on the ground that with increased age the otoscopic rating is likely to be lower. It seems, however, that such is not altogether the case, since the correlation for all 1,000 ears between age and otoscopic

TABLE 3.—*Otoscopic rating*

Loss in decibels	Average loss in hearing			
Cycles per sec.	0	1	2	3
256	6.9	11.2	19.9	32.4
1,024	.7	4.7	15.9	28.0
2,048	11.2	14.8	23.3	35.5
4,096	23.3	34.6	36.5	55.2
8,192	24.2	38.4	55.9	55.2
Average	13.2	20.7	30.3	41.2
Number	528	420	43	9

(53) - Sheet 5



1. Relation of audiogram to age.

rating is only $r = +.30 \pm .02$. Such a relationship, while indicating that the connection between age and ear condition is by no means negligible, is probably not of such magnitude as to account for the results summarized in table 3.

2. *The audiogram and Navy rate.*—In view of the known fact that certain occupations are more instrumental than others in producing loss of acuity, it was thought necessary to analyze the 1,000 audiograms with respect to the variable of Navy rate. In this matter, however, it is important to control the factor of age. Analysis of the data revealed little difference in acuity between any two categories of rate. Between machinists and deck hands no statistically significant difference was present; moreover, the differences were by no means always in the expected direction.

3. *The audiogram and chronologic age.*—The relation between age and acuity is summarized in figure 1. As is universally re-

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ported, here too, increased age entails loss. Only two or three points need to be emphasized with these data. One is the rather remarkable fact that in the men over 40, many of whom had served a decade or more in submarine service, hearing throughout the speaking range (2,048 cycles per second and lower) is impaired relatively little. With these men, only the oldest group (over 45) was depressed as much as 20 decibels, and then only at 2,048 c.p.s. Evidently the average submariner, even the veteran, enjoys normal or only slightly depressed hearing for the spoken voice.

With the higher frequencies, the effect of age is somewhat more severe, such that men over 35 are appreciably affected. It is important to observe that the effect of age on hearing at 8,192 c.p.s. is statistically indistinguishable from that at 4,096 c.p.s.

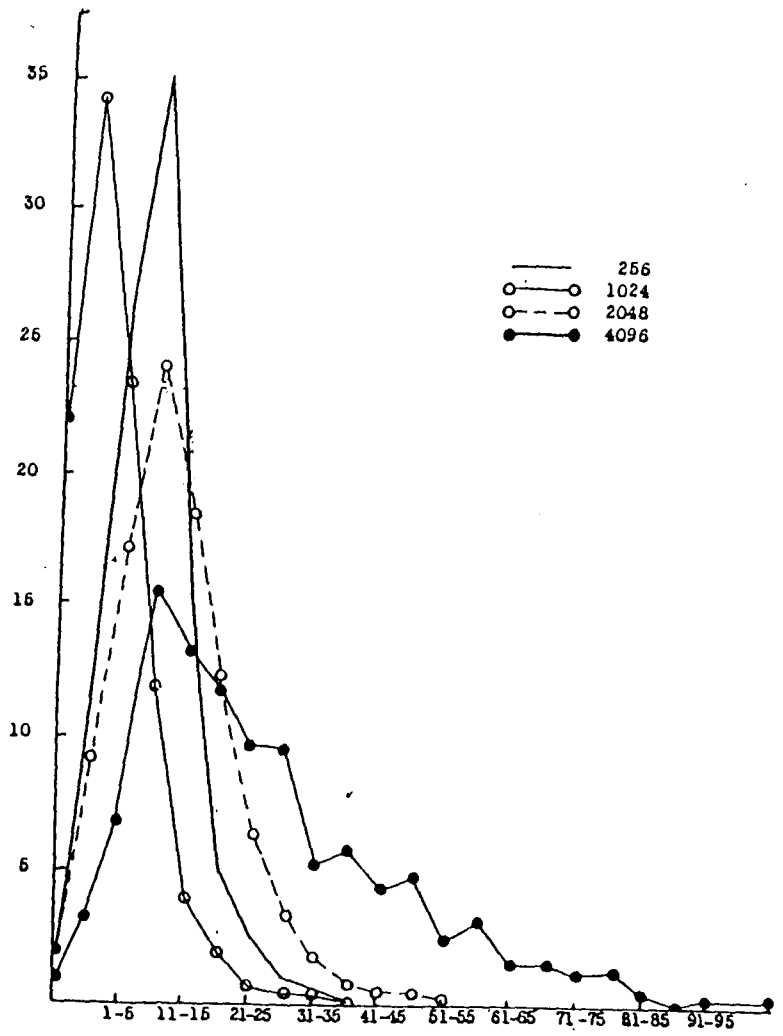
4. *The audiogram and the Spoken Voice test.*—On the basis of our results the Spoken Voice test may be summarily dismissed as of no diagnostic value. Of 1,000 ears, only 38 were reported as being anything but perfectly normal by this sign; whereas we know from other tests that many more ears were seriously defective. It is true that of the 38 ears most—not all—were defective by audiometer test; and that at the high frequencies these same ears *all* tested below 25 decibels. Yet it cannot be concluded that the spoken voice picks out those ears with high tone loss, since it classed as "normal" 87 ears which were, at 8,192 c.p.s., depressed some 90 decibels. Without burdening the reader with further data, we may be permitted on these grounds alone to view the test askance.

5. *The audiogram and the Whispered Voice test.*—The picture is more encouraging in the case of the Whispered Voice test. Here, 137 ears were characterized as in some degree below normal. Such a figure agrees somewhat more closely with the audiometer's findings.

The first point to be considered is the relation between the category "normal", and audiometry. Figure 2 shows the percentage of "normals" distributed against audiometric loss. (Data for frequencies 512 and 8,192 almost exactly coincide with those for 256 and 4,096 respectively, and are omitted so as not to burden the graph unduly.) For the four lower frequencies the relation is quite good—that is, the whispered voice did not indicate as "normal" any appreciable number who had serious low tone loss. For the two high frequencies the screening was hardly satisfactory. Of those whose high tone hearing had dropped even as far as 50 decibels below normal, a good percentage is reported "normal" by whispered voice. In cumulating the number of ears

which dropped below 25 decibels on the high tones, we find that more than a third of the cases are represented; yet these ears are passed as normal.

We conclude that if an ear is found normal by whispered voice, there is a very good chance indeed that at 2,048 c.p.s. and below, that ear will be functioning well; but that nothing can be said with confidence about possible loss at higher frequencies.



abscissa: audiometer loss in db below normal threshold

ordinate: percentage of ears reported "normal" on whispered voice test.

2. Whispered Voice test category "normal" as related to the audiogram.

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Without presenting graphs similar to figure 2 for every other category of Whispered Voice test, we can quickly get an idea from table 4 as to the relation in question. Let us take a provisional figure of 25 decibels loss, below which is said to be "failing". Then from table 4 it will be seen that if an ear is rated less than "normal"—even though falling into the adjacent (12–14/15) category, the chances become *practically certain* that a high tone deficiency occurs. We take this table to mean that if the Whispered Voice test score is 12–14/15, high tone hearing is almost certainly affected; but as the score deteriorates from 12–14 through 0–2/15, there is greater and greater likelihood that low tones are also lost.

TABLE 4.—*Rating on Whispered Voice test. (Percentage of those who "failed" (i.e., fell more than 25 decibels below normal) on audiogram at any frequency, as related to score on Whispered Voice test)*

Cycles per sec.	(Normal) 15/15	12–14/15	9–11/15	6–8/15	3–5/15	(Deaf) 0–2/15
256	2.3	7.1	33.3	45.4	50.0	48.0
512	3.5	14.2	50.0	45.4	42.8	51.0
1,024	1.6	21.3	33.3	27.2	21.3	44.0
2,048	8.6	50.0	83.3	81.8	85.7	100.0
4,096	46.5	100.0	100.0	100.0	100.0	100.0
8,192	37.4	92.8	100.0	90.9	100.0	100.0

A more precise demonstration of the relation between the whispered voice and audiometry is contained in figure 3. Here is plotted, for each frequency, the mean audiometer loss for each category of Whispered Voice test score. The plots describe a regular, fairly straight-line relationship. The sizes of the standard

TABLE 5.—*Interrelationships among clinical tests and audiometer test*

Cycles per sec.	256	512	1024	2048	4096	8192	C.C.	W.T.
W.V.	+.30	.32	.30	.60	.35	.37	.82	.60
	±.05	.05	.06	.04	.06	.05	.005	.01
C.C.	+.19	.29	.13	.39	.27	.21	.....	.56
	±.07	.06	.09	.07	.07	.07	.....	.01
W.T.	+.25	.25	.29	.41	.57	.46	.....	.....
	±.03	.03	.03	.02	.02	.02	.....	.....

Pearson product-moment correlation plus or minus 1 standard error.
W.V.: Whispered Voice test
C.C.: Coin Click test
W.T.: Watch Tick test
c.p.s.: Cycles per second

errors permit us to say that the general shape of these curves is statistically reliable. Figure 3 bears out our earlier statements as to the differential effect on high and low frequencies. Here, too, if we provisionally take any loss greater than 25 decibels as "fail" on the audiogram, figure 3 shows that as the Whispered

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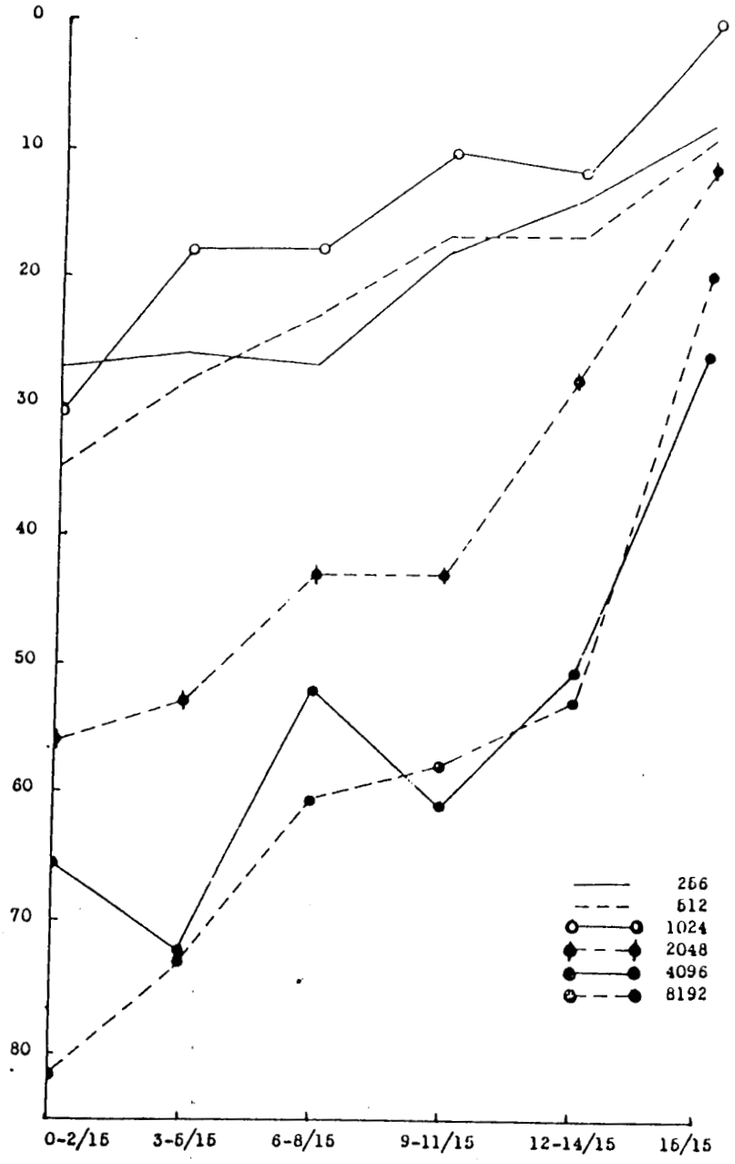

abscissa: Whispered voice test score.

ordinate: Audiometer loss in decibels below normal threshold.

3. Whispered Voice test score as related to the audiogram.

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Voice test score gets lower, the chances of "failing" the audiogram become progressively greater.

Furthermore it can be shown that the correlation between the audiogram and the Whispered Voice test is at all frequencies greater than chance (see table 5).

Evidently a definite relationship exists between each and every audiometer frequency and Whispered Voice test. Would it not then be justified to dispense with the audiometer test since the whispered voice is so much easier and cheaper to use? The negative answer is two-fold: (1) The Whispered Voice test is not a delicate enough instrument to pick out all deficient ears, and (2) when it does detect a deficient ear it provides no real cue as to the frequency-composition of the deficiency and only a rough approximation of its extent. The percentages with which one is forced to work in the interpretation of this test are much too gross to permit usable analysis of individual ears.

Nevertheless the results of this test are not obfuscated by unreliable or contradictory data; several important statements can be made about auditory acuity on the basis of whispered voice examination. The fact that as it stands it is not a good test of *differential* frequency loss, does not impair its other qualities nor prevent it from being elaborated or used in possible combination with other tests.

6. *The audiogram and the Coin Click test.*—The results of the Coin Click test can be presented in exactly the same manner as those of the preceding test. Figure 4 shows what discriminative value the "normal" category possesses; again it is seen that while the Coin Click rates as "normal" very few ears which show more than a mild loss for low tones, yet an appreciable number of ears seriously defective for high tones are not picked out.

The discriminative value of the other categories may be ascertained by a glance at tables 5 and 6, and at figure 5. The low positive correlations of table 5 indicate that a tendency does indeed exist for a low score on the Coin Click test to be paralleled by a depressed audiogram. Table 6 reveals (1) that any falling off of the coin click score from "normal" is a sure sign of high tone deficiency, and (2) that with lower and lower scores the presumption of low tone deficiency becomes more nearly a certainty. The results are graphically depicted in figure 5, where the mean audiometer loss at any coin click category is plotted. The differential discriminative value for different frequency bands is clear.

7. *The Whispered Voice and the Coin Click tests.*—Every line of evidence that we are able to muster from the original data points to the same conclusion, namely, that the Whispered Voice

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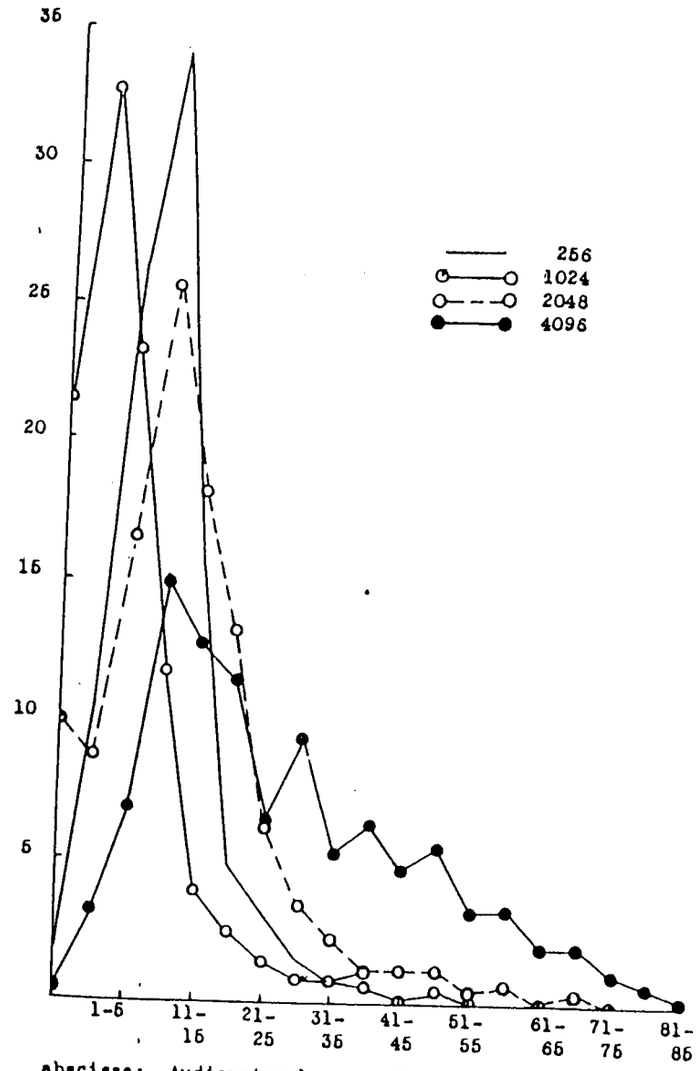

abscissa: Audiometer loss in db below normal threshold.
ordinate: Percentage of cases reported "normal" on coin click test.

4. Coin Click test category "normal" as related to the audiogram.

and the Coin Click tests are almost exactly alike in that they both test the same auditory functions, and produce almost identical results. When, for example, figures 2 and 4 (whose axes are com-

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parable in every way) are drawn on semi-transparent paper and superimposed one on the other, the lines are seen to coincide with startling fidelity. Quite evidently the audiometric interpretation of the "normal" category of both tests is identical. Again, similar inspection of figures 3 and 5 reveals this duplicative phenomenon. Furthermore the correlation between the tests ($r = +.82 \pm .005$, table 5) shows that both tests place individual ears in almost exactly the same category. This is so consistent that, as inspection of the original data reveals, there were only 25 of the 892 ears called "normal" by coin clicks which the whispered voice did not also call "normal".

Even though the predictive value of either of these tests on the other is so high as to make them almost interchangeable when administered as we did, there are nevertheless definite reasons for preferring the Whispered Voice over the Coin Click test: (1) The former screens out a few more defective ears (137 reported below "normal" as against only 108 by coin click); (2) the correlations with the audiometer data (table 5) are uniformly higher and more reliable; and (3) whereas the Whispered Voice test caught all but 25 of the ears which were screened out by coin clicks, the latter missed 50 ears screened out by whispered voice.

TABLE 6.—*Rating on Coin Click test. (Percentage of those who "failed" (i.e., fell more than 25 decibels below normal) on audiogram at any frequency, as related to score on Coin Click test)*

Cycles per sec.	(Normal) 20/20	16-19/20	12-15/20	8-11/16	4-7/15	(Deaf) 0-3/20
256	4.5	0.0	20.0	33.3	36.3	42.3
512	5.4	0.0	40.0	33.3	45.4	46.1
1,024	3.3	0.0	20.0	33.3	36.3	38.4
2,048	11.7	33.3	20.0	100.0	100.0	84.6
4,096	48.0	100.0	100.0	100.0	100.0	100.0
8,192	39.0	88.8	100.0	100.0	100.0	100.0

8. *The audiogram and the Watch Tick test.*—Inspection of figure 6 will reveal a slightly different relation with the audiogram than was true of the other tests; with progressively lower score it is not nearly so probable that low tones are affected. Even when the watch acoumeter has to be brought within 1 to 4 inches of the head, low tone impairment is not necessarily severe. While table 7 shows that the Watch Tick and the audiogram are not unrelated at low frequencies, the magnitude of this relationship is approximately doubled in the higher frequency bands. It seems justified to say that the Watch Tick test is one measuring primarily high tone deficiency.

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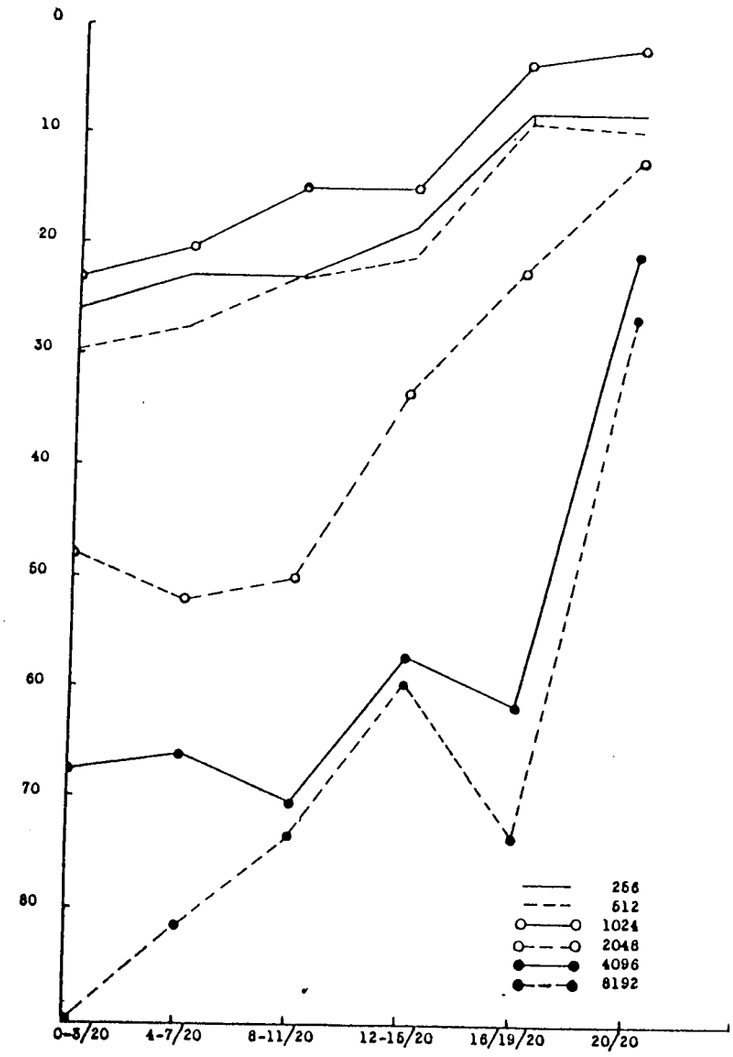

abscissa: Coin click test score.
ordinate: Audiometer loss in db below normal threshold.

5. Coin Click test score as related to the audiogram.

9. *The Watch Tick and other clinical tests.*—With regard to the practical question of how well a clinical test of hearing can screen out defective ears, figure 7 exhibits the value of the Watch Tick test. Not only does this test succeed in labeling correctly those

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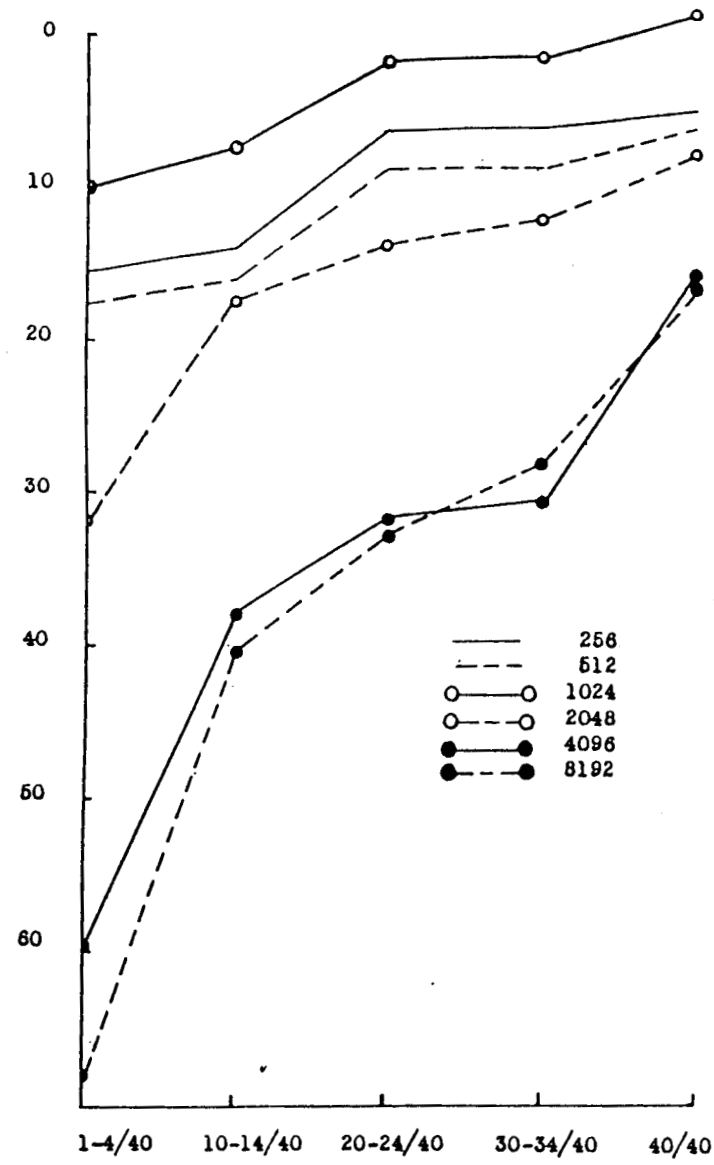

abscissa: Watch tick test score.
ordinate: Audiometer loss in db below normal threshold.

6. Watch Tick test score as related to the audiogram.

ears which are normally effective for low tones, but for high tones as well it is discriminative, in that only a few ears with important high tone loss are called "normal". (For categories below "normal" this argument is pursued in table 7.)

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TABLE 7.—*Rating on Watch Tick test. (Percentage of those who "failed" (i.e., fell more than 25 decibels below normal) on audiogram at any frequency, as related to score on Watch Tick test)*

Cycles per sec.	(Normal) 40/40	30-34/40	20-24/40	10-14/40	(Deaf) 1-4/40
256	0.4	0.0	1.9	16.8	14.8
512	0.6	1.7	5.8	18.3	20.9
1,024	0.2	1.7	1.9	9.8	13.5
2,048	3.2	8.4	15.6	18.3	55.5
4,096	14.5	61.0	56.8	94.5	100.0
8,192	15.4	44.0	56.8	79.8	98.7

Again with provisional designation of a loss greater than 25 decibels as "fail," table 7 shows that at the category "normal" the watch tick did *not* detect 14.5 and 15.4 percent of high tone defectives (at 4,096 and 8,192 c.p.s. respectively). These figures showing errors in screening are not satisfactory; nevertheless they are much better than the 37.4 to 48.0 percent of high tone defectives which the whispered voice and coin clicks passed as "normal" (see again tables 4 and 6). As one glances over table 7 from "normal" to "deaf," it becomes plain that the extent of low tone involvement is slight; but herein lies the practical value of the Watch Tick test—that a low score is that much more closely correlated with high tone loss. It will be remembered from tables 4 and 6 that any dropping off from "normal" with whispered voice or coin click meant that immediately a severe high tone loss could be predicted with some confidence; but the severity was unknown, while the extent of low tone involvement was uncertain. With the Watch Tick test, on the other hand, there is more ground for a statement about the severity of high tone loss, and this statement is not so much complicated by the possibility that low tone loss contributes to the Watch Tick test score.

The general fact underlying the preceding discussion on the dissimilarity of the Watch Tick and other tests is, that the watch tick tends to screen out a deficiency which the others do not. Whereas the whispered voice and the coin clicks tend to screen out those ears with severe high tone loss *accompanied by more or less severe low tone loss*, the watch tick detects these and, *in addition*, those ears which are *normal* for low tones but which have a more or less severe high tone loss. Two or three items connected with this statement should be emphasized. In the first place the watch tick picks out many more ears as defective (533 as against 137 for the whispered voice; it is of great importance to note that of these 137, the watch tick did not fail to detect a single one). In the second place, that the two types of test measure somewhat different abilities may be supposed from the only moderate cor-

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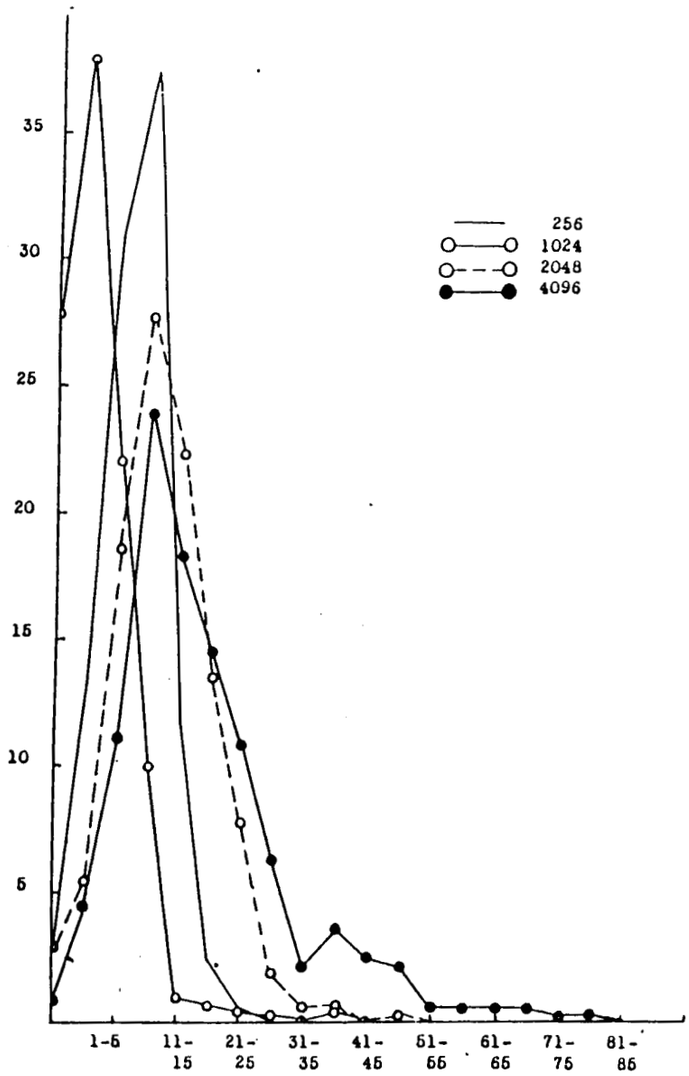

abscissa: Audiometer loss in db below normal threshold.

ordinate: Percentage of cases reported "Normal" on Watch Tick Test.

7. Watch Tick test category "normal" as related to the audiogram.

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relations between them (see table 5 on this relationship).

We may presume that the watch tick is a fair instrument for measuring high tone deficiency; the question arises whether it would be possible to use it in combination with other clinical tests to describe adequately a broad frequency range. To do so it would only be necessary to devise a clinical test which measures low tone loss independently.

In the clinical tests as we have been using them, no tendency to measure low tones independently is seen. The whispered voice appears, however, quite capable of being adapted for this purpose. It is highly possible that by the proper selection of words used, the working range of the whispered voice could be lowered by octaves. The proper use of gutterals, linguals, and nasals, for example, might materially change the picture.

Another possibility appears, namely, that one might devise an administration of the Coin Click test so that its undesirable features are obviated. In the present study there were obviously strong low tone components in the coin click itself. Yet it may be possible well-nigh to eliminate these by a suitable technic of suspending or balancing the coin instead of grasping it or placing it in the palm. Other variables include the denomination of the coin, the distance from the center at which it is struck, etc. It may be possible to standardize a coin click test which would, for example, more nearly approach the Watch Tick than the Whispered Voice test.

It is the hope of this laboratory to explore further a number of such leads with a view to establishing, if possible, a small battery of easily accessible tests which might serve as more than a crude substitute for the complete audiometric survey.

SUMMARY

1. Data has been presented from 1,000 ears relating the 6-octave audiogram to the Spoken Voice, Whispered Voice, Coin Click, and Watch Tick tests.

2. The Spoken Voice test was shown to be practically worthless as an index of acuity.

3. The Whispered Voice test was shown to be very effective in screening out that type of ear seriously defective for high tones and concomitantly more or less defective for low tones; the correlation between extent of low tone audiometric loss and whispered voice score was significant but not high ($r = +.30$).

4. The Coin Click test as used here produced results very similar to those of the Whispered Voice test, but for several reasons the latter is to be preferred.

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5. The Watch Tick test differs from the preceding tests in that low tones are involved only very slightly. The Watch Tick test is fairly satisfactory as a differential test of high tone hearing.

6. None of the clinical tests used showed any tendency to measure low tone hearing independently from high tone hearing.

7. In the conduct of this experiment it was found absolutely essential to standardize the technic of giving the various tests. Further study on the effect of variation in the administration of whispered voice and coin clicks is projected.

8. It is the intention of this laboratory to continue to explore the problem of clinical tests of hearing with a view to determining whether any clinical test can be devised which will screen ears with low tone, but not high tone, loss. If one should be successful in this, there could be made available a small battery of clinical tests which would provide information as to differential loss of acuity, and so serve as an effective substitute for an audiogram.

⚓ ⚓

PENICILLIN IN TREATMENT OF VINCENT'S ANGINA

The recent experimental work concerning the use of penicillin in various spirochete and spirillum diseases led to the view that this substance might be useful in the treatment of two patients suffering with Vincent's angina.

The two cases were extremely similar. There was "sore throat" of 24-hour duration, hyperemia and passive congestion of the pharyngeal mucous membranes and an oval shaped, yellow-gray pseudomembrane about 1.5 cm. by 2 cm. on the right tonsil of one patient and on the left of the other. This membrane, when removed, revealed a bleeding, raw ulcer. There was pain on pressure with a tongue blade and the breath was foul. The temperatures were 99.8° and 102.2° F. respectively. Smears from both lesions showed a great predominance of the spirilla and fusiform Vincent's bacilli.

The treatment consisted of intravenous injection of 100,000 units of penicillin, divided into five injections at 2-hour intervals. No untoward reactions were observed. No other measures of any type were employed. The usual sanitary precautions regarding individual utensils, etc., were observed.

Twenty-four hours after completion of treatment the patients had no complaints and temperatures had returned to and remained normal. At this time the pseudomembranes had disappeared; the ulcers were "clean" looking and did not bleed. After 48 hours there was a definite appearance of healthy granulation tissue and at the end of 96 hours both ulcers had healed completely. No further complaints or symptoms have been noted.—COLEMAN, R. M., Lieutenant (MC) U.S.N.R.

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Monday, 8 January 1945.

Radium arrived. 2 applicators of 49.5 mgm and 49.6 mgm radium salt each. The radium salt is in a monel metal tube of a density of 8.7 and a wall of 0.3 mm thick. The dosage of 1 gm 20 min. recommended for the lymphoid tissue in the nasopharynx by Dr. Burnam of Kelly Hospital, Baltimore, and by Dr. S. J. Crowe of the Johns Hopkins Hospital of Baltimore. Since their paper of 1942 they have recommended for better results and still well within the safety limits an increase of one minute in the time of the 50 mgm applications. Thus 7 min and 45 secs. is recommended in treatment - a dose of 1 gm 22.15 secs.

Applicators have been standardized by National Bureau of Standards: NBS - Dec. 5th 1944.

Applicator # 14495 and also #RWS2422 is 49.6 mgm
Applicator # 14496 and also #RWS2424 is 49.5 mgm.
Both applicators are being used either with a dose of 6 minutes 43 seconds or 7 minutes 43 seconds. Timed with a precision Alarm Clock.

In reply address not the signer of this letter, but Bureau of Naval Personnel, Navy Department, Washington 25, D. C.
Refer to No.
325199
Pers-31804-DAB-4b

NAVY DEPARTMENT
BUREAU OF NAVAL PERSONNEL
WASHINGTON 25, D. C.

5 January 1945

From: The Chief of Naval Personnel.
To: Lieutenant William J. K E L L Y, DC-V(S), USNR, Naval Training Center, Gulfport, Miss.

Via: Commander.

Subject: Change of duty.

1. You are hereby detached from duty at the Naval Training Center, Gulfport, Miss., and from such other duty as may have been assigned you; will proceed to New London, Conn., and report to the Commanding Officer, Submarine Base, for duty in the Medical Research Department.

2. You are hereby authorized to delay for a period of five days in reporting in compliance with these orders, such delay to count as leave.

3. Keep the Bureau of Naval Personnel and your new station advised of your address.

RANDALL JACOBS

CC:
ComEight. BuMed.
ComThree. ComSubsLant.
CO, SubBase, New London, Conn.

Qualifications Code:
[illegible]180292[illegible]065210.

Tuesday January 9, 1945. Morning

35 pressured
16 cases of aero-otitis media
12 failed pressure.

E. L. Barker S1c, out 2 lbs. #2 rt. #2 lt.
large ads. tube covered - flat.
A. F. Stanley, S1c, out 2 lbs. #2 rt. #2 lt.
sm. ads. tubes flat.
J. E. Minich F1c, out 3 lbs. #3 rt. #2 lt.
sm. ads. tubes slit like,
A. A. French S1c, out 2 lbs. #2 rt. #2 lt.
sm. ads. tubes slit like.
1-20 R' V. P. Maxson S1c, out 4 lbs. #4 rt. #0 lt.
large ads. tubes covered - rt. opens with swallowing.
2-7 R' N. G. Rames, MoMM3c, out 8 lbs. 0 rt. #4 lt.
large ads. both tubes completely covered.
R. McIntire Jr. S2c, out 10 lbs. 0 rt. #4 lt.
enor. ads. tubes not seen, covered
W. L. Ternan SM3c, out 10 lbs. 0 rt. #4 lt.
small ads. tubes flat.
W. O. Korasick F1c, out 11 lbs. #1 rt. #4 lt.
large ads. tubes open (cold)
R. J. Schulz, S1c, out 20 lbs. #0 rt. #2 lt.
large ads. tubes narrow open (cold)
F. L. Zak EM2c, out 24 lbs. #4 rt. #0 lt.
enormous ads. lt. open - rt. covered flat.
J. J. Lacy, RM2c, out 24 lbs. #2 rt. #3 lt.
large ads. both tubes covered.

4 passed pressure:

J. T. Scott, F1c, #2 rt. 0 lt.
sm. ads. tubes flat - open with movement throat.
W. E. Pope, S1c, #4 rt. #4 lt.
mod. ads. tubes flattened shut.
B. J. Langlois S1c, 0 rt. #3 lt.
large ads. rt. tube open - lt. slit like.
C. S. Gill, S1c, #4 rt. #0 lt.
large ads. rt. tube flat slit - lt open clear.

Afternoon

Rechedks: 18 pressured
17 cases Aero-otitis media.

J. D. Coleman EM1c #4 rt. #2 lt.
large ads. both tubes covered.
F. H. Elfrank, F1c - #4 rt. #2 lt.
A. A. Henring, RT3c, #4 rt. #3 lt.
L. A. Harris, S1c, #2 rt. 0 lt.

1-29 R' H. D. Hastings S1c, #4 rt. #4 lt.
L. R. Baily, QM1c, 0 rt. #2 lt.
P. J. Damon, F1c, 0 rt. #3 lt.
1-29 R' J. H. Bradley, RM2c, #4 rt. 0 lt.
1-31 R' C. H. Schmidt, MM2c, 0 rt. #2 lt.
1-30 R' T. M. Jaggers, S2c, 4 rt. #4 lt.
2-1 R' H. S. LeRoy, RT3c, #4 rt. 0 lt.
1-30 R' J. O. Hickman, S2c, #4 rt. #1 lt.
1-31 R' L. P. Battermann, S2c, #4 rt. #4 lt.
E. E. Conner, F2c, 0 rt. #1 lt.
T. L. Tracy, F1c, #4 rt. 0 lt.
1-29 R' E. G. Pedersen, S1c, #1 rt. #1 lt.
1-30 R' G. G. Igowsky, S2c, #3 rt. 0 lt.
1-29 R' Lc C. MacDonald, S2c - no aero-otitis

Wednesday, 10 January 1945.

60 pressured
15 aero-otitis media
11 failures.

L. H. L. Phelps, S1c, out 3 lbs. #0 rt. #3 lt.
large ads. both tubes open - clear.
1-25 R1 S. W. Bohn, S2c, out 5 lbs. #3 rt. #3 lt.
very large ads. tubes covered
1-25 R1 J. E. Conger, Jr. S2c, out 5 lbs. #3 rt. #4 lt.
large ads. tubes flat - closed. ✓
R'2-24 D.K D. W. Falconer, F2c, out 5 lbs. 0 rt. #3 lt.
very large ads. tubes covered - cold
H. C. Fullman, S1c, out 7 lbs. #4 rt. #4 lt.
Enors. ads. tubes covered - flat.
Dropped M. Flowers, Jr., S1c, out 7 lbs. #4 rt. #0 lt.
large mid-line ads. tubes open- free
D. D. Campbell S1c, out 7 lbs. #4 rt. #4 lt.
mod. ads. tubes flattened - small
R. R. Brown, S2c, out 9 lbs. #4 rt. 0 lt.
enormous ads. tubes covered - flat.
J. M. Hueter, S2c, out 10 lbs. #0 rt. #4 lt.
mod. ads. lt. tube closed - rt. open clear
1-30 R1 R. E. Thompson, S1c, out 12 ft. bell, #4 rt. #4 lt.
large ads. tubes covered - closed flat.
1-30 R1 W. Perrey, S1c, out 16 lbs. #4 rt. #4 lt. perforation
enormous ads. tubes covered.

4 passed pressure:

L. D. Secory, S2c, #3 rt. 0 lt.
large ads. mid line-tubes open - nodules on cushion
A. C. Atkison, S2c, #3 rt. 0 lt.
mod. sized ads. tubes narrow - small open.
B. M. Nowak, S2c, #3 rt. 0 lt.
large mid-line ads. tubes flattened.
S. R. Harding, S1c, #4 rt. #4 lt.
enormous ads. tubes flattened.

Thursday, 11 January 1945.

Westover Field Conference.

Friday, 12 January 1945.

16 pressured
3 cases aero-otitis media
1 failure.

R. K. MacNeill, RT2c, #1 rt. #3 lt.
enormous ads. tubes closed.

2 passed pressure.

E. J. Balsters, S1c, #0 rt. #4 lt.
enormous ads. tubes covered. lt. closed
M. C. Porter, F2c, #4 rt. #0 lt.
large ads. tubes covered. rt. closed.

Saturday, 13 January 1945.

20 pressured
7 cases of Aero-Otitis Media
2 failures.

J. H. Willingham, S2c, out 5 lbs. #0 rt. #2 lt.
mod. ads. tubes free - small - has cold.
K. H. Pettengill, RT2c, out 8 lbs. 0 rt. #2 lt.
large ads. both tubes closed.

5 passed pressure.

C. W. Haring, S2c, #2 rt. #2 lt.
large ads. both tubes open
H. A. Kazana, F2c, 0 rt. #4 lt.
enor. ads. - rt. tube clear - lt. closed.
J. H. Carlson, RT3c, #3 rt. 0 lt.
small ads. nodules in tubes.
J. L. Guillot - S2c, #2 rt. #2 lt.
small ads. - nodules in tubes.
F. E. Strauhal, S1c, #2 rt. #4 lt.
enormous ads. both tubes covered - flat.

Weather too thick Dr. Crowe and Maj. Reynuller unable to visit us this weekend from Mitchel Field, L. I.

6 January 1945.

MEMORANDUM TO THE EXECUTIVE OFFICER:

SUBJECT: Temporary additional duty orders.

1. It is requested that temporary additional duty orders be prepared for Lt.(jg) Henry L. Haines, (MC), USNR, to proceed to the U.S.Army Air Field, Westover, Mass., in time to attend a conference on aero-otitis media with Vice-Admiral MacIntyre and a group of BuMed representatives, on Thursday, 11 January 1945, at 1030.

2. Doctor Haines was commissioned and called to active duty in order to work on an BuMed aero-otitis media project at this base and it is considered highly desirable that he attend this conference.

3. It is further requested that Doctor Haines be authorized to perform this travel by means of his own privately owned automobile, a Dodge Sedan, blue, 1942 model, Connecticut Registration No. SU-807.

C. W. SHILLING
Capt. (MC) USN
MO-in-C, Medical Research Dept.

Aero

UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

11 January 1945.

CONFERENCE ON CONTROLLED SCHOLTZ TRANSMITTERS AT [illegible] FIELD
[illegible]

Navy representatives met [illegible] with Army representatives at the U.S. Army Air Base, [illegible] Field, [illegible], on Thursday, 11 January 1945, for [illegible] of the problem of [illegible] radio and radar [illegible].

The personnel attending are listed below:

Army

Col. U. S. [illegible], [illegible] Chief, [illegible] Field
Col. [illegible] Gillespie, [illegible] "
Col. [illegible], [illegible] Field "
Col. [illegible] Gillespie, [illegible] "
[illegible] "
[illegible] "
[illegible] Chief, [illegible] Div., [illegible] Wright Field
[illegible] Lathrop, [illegible] Div., [illegible] Wright Field
Maj. [illegible] Hamilton, [illegible] Div., [illegible] Wright Field

Navy

Lieut. Donald [illegible], [illegible], Bureau Ships, Bu.Ord.and Bureau.
Lieut. [illegible] Adams, (MC) USN, " "
Lieut. Richard [illegible], (MC) USN, " "
Lieut. [illegible] Gallagher, (MC) USN, U.S. Naval Medical Research Lab., Dahlgren, New London, Ct.
Lieut. [illegible], (MC) USN, [illegible], Henry St., R.I.
Lieut. [illegible] Gordon, (MC) USN, Bureau Medicine, Bureau
Lieut. [illegible], (MC) USN, " "
Lieut. (MC) [illegible], (MC) USN, Med. Research Lab., [illegible], Md.

R.C.A.F.

Wing Commdr. McHugh, (MC) RCAF, Canada

Civilian

Dr. Samuel J. Crow, Johns Hopkins Medical School, Baltimore, Md.

The conference was held in order that the Army might demonstrate to the Navy representatives the technique of the treatment of [illegible]

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ply
To

UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

ence on Conference concerning Aero-Otitis;

dia. The Army representatives presented at the meeting a large variety cases of aero-otitis media and demonstrated the associated pathology the naso-larynx and the technique of examination and treatment.

In addition to the actual subjects, a great deal of interesting erial was presented in the form of pictures, color slides, graphs, and itional data on the handling of the entire program for the Army, as well for the handling of the individual unit at Westover Field. Colonel Bol- ck acted as chairman and spoke on general of the problems encountered in e administration of the Army program and then turned the meeting over to local group, who did the actual presentation of the cases. Major ueller spoke of the administration of the organization in the First ir Force.

It seems evident from the present Army plans that within the next few months a tremendous volume of valuable data on prophylactic measures, as well as treatment with radium, will be available, particularly since the activity is being carried on in the theater of operations both in England and in Italy.

The undersigned is particularly interested in the entire program inasmuch as he has been working toward Navy recognition of this problem since 1940, and officially corresponded with representatives of the Bureau in 1943. At the present time an extensive project is set up for the trial

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ply
To:

UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

nd in Conference concerning Aero-Otitis

radium as well as other methods of treating aero-otitis media under the
gnizance of the Bureau of Medicine and Surgery (Project X-434, Sub No.80).
is hoped that this project will furnish for the Navy a number of answers
problems raised in connection with aero-otitis media. In this connection,
study will be equally beneficial to other branches of the Navy, such as
sea diving and submarines.

It might be of interest to note that so far in the conducting of the
riment at the Submarine Base, we have examined during the last four
ths 5,200 men, with a percentage of aero-otitis media for the months of
ember and December of 25.8 of all personnel processed through the Escape
training tank. It is thus evident that in this activity there will be an
ample number of material for the trial of various methods of treatment, and
in particular, for the use of radium.

Submarine candidates are particularly well suited for such an investigation, since they are given 50 pounds of pressure without there being any deficiency in oxygen, or affective noise such as is encountered in flying.

During this experiment at the Submarine Base, there will be a great of additional data available on all of the men. In particular, all will be getting immediate pre- and post-pressure audiograms and immediate post-pressure physical examinations. Additional information of value on all men will be: the results of an intelligence test;

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eply
r To:

UNITED STATES SUBMARINE BASE
NEW LONDON, CONNECTICUT

ne on Conference concerning Aero-Otitis

rsonal inventory tests; general physical examination; psychiatric interviews; ear and radar examination and night vision test, results of which may have interesting relationships with the problem involved.

The staff working on this project consists of LT. (jg) H. L. Malone, (MC) USN, and Ensign J. D. Harris, (S) USNR. Doctor Malone works from the standpoint of physical examination of ears, nose, and throat, and the treatment of aero-otitis media. He is an otologist with specialized training in the use of radium and was acting as an instructor of Army personnel, (holding Navy commission, but on inactive duty). In August of 1944 he was called to active duty with the Navy and transferred to the Medical Research Laboratory, Submarine Base, New London, Connecticut, to work on this project. Doctor Harris is a psychologist in charge of sound research and administering sound selection screening. He conducts all the audiometric examinations, which are an integral part of this project. A dental officer, Lt. Wm. J. Kelly (MC) USNR, is also being added to the project, in order to investigate the possibility of malocclusion causing non-patency of the Eustachian tube.

Of historical interest is the fact that a great deal of previous investigation has been conducted by the Medical Research Department of the Submarine Base, and some eight reports and published articles have been presented.

C. W. SHILLING
Capt. (MC) U.S.Navy.

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4.

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON

18 December 1944

SUBJECT: Aero-otitis Control Program

TO:

1. The Air Surgeon has instituted an Aero-otitis Control Program utilizing irradiation therapy of the nasopharynx, reduplicating the technique as recommended by Dr. S. J. Crowe of Johns Hopkins University.

2. The following pertinent data is submitted as a matter of information:

Practically all spontaneous radio-active substances belong either to the uranium or thorium groups of elements. Radium is a member of the uranium family which starts with uranium I and ends with lead. The uranium series consists of:

a. Uranium I, atomic weight 238, which by spontaneous transformation decreases to one-half in 4,670,000,000 years.

b. Uranium II, atomic weight 234, whose half value is 2,000,000 years.

c. Ionium, atomic weight 230, whose half value is 69,000 years.

d. Radium, atomic weight 226, half value 1,600 years.

e. Radon, atomic weight 222, half value 3.85 days.

f. Radium A, atomic weight 218, half value 3 minutes.

g. Radium B and Radium C, atomic weight 214, half value 26.8 minutes and 19.7 minutes, respectively.

h. Radium D and Radium E, whose half value is 25 years and 5 days respectively, are isotopes of Polonium.

i. Radium F, Polonium, atomic weight 210, half value 136.3 days, and finally lead, atomic weight 206.

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Omitting from consideration the predecessors of Radium and the descendants of Radium B and C, there remains only Radium, Radon and Radium B and C of importance in the nasal applicator. The effectual Beta and Gamma rays from a radium containing tube are from Radium B and C. Beta and Gamma rays invariably are given off together.

The active part of the applicator is a monel metal tubular chamber 15 mm. in length, with an inside diameter of 1.7 mm., a wall thickness of 0.3 mm. and an outside diameter of 2.3 mm. The chamber contains 50 mg. of Radium sulfate. The absorption capacity of a filter is proportional to its density. To absorb all beta rays only 0.5 mm. of platinum, gold or tungsten is required, one mm. of lead or silver, two mm of brass or monel metal, and ten mm. of aluminum. Even when all primary Beta radiation is absorbed, there is secondary Beta and Gamma radiation from the filter which is most penetrating from metals of high density. This secondary radiation is not large from monel metal and for the treatment of the nasopharynx with this applicator, a secondary screen of lighter material is not necessary.

Practically all the Beta rays emitted by this applicator are absorbed by the tissues of the nasopharynx. About 75% of the Beta rays are absorbed in the first 3 mm. of tissue, but 6 to 7% of the hard Beta rays are still detectable after passing through 20 mm. of tissue. In contrast, less than 10% of the Gamma rays are absorbed. The effects aimed at and obtained by radiation therapy are entirely dependent on ray absorption and are roughly proportional to the amount of absorption. Rays that pass through the body and are not absorbed have no therapeutic effect.

The therapeutic effect of a single dose may be modified greatly by the reparative powers of the tissues. A unit dose given at one sitting produces more effect than the same total dose given in daily fractions in a period of a week. The recovery period of the nasopharyngeal lymphoid tissues after a moderate irradiation varies from three to four weeks. It is because of this that the intervals between treatments has been fixed at 25 days. Edema is a constant change following radiation. Therefore it is advisable to omit treatment when the patient has an acute nasopharyngitis, and in subacute nasopharyngeal infection to give half the usual dose at the first sitting and the other half five days later. Twenty-five days later the second treatment (6 minutes and 40 seconds on each side of the nasopharynx) is given and if nasopharyngoscopic examination indicates further treatments are necessary, they must be spaced at intervals of twenty-five days. As a rule, three treatments are adequate but in refractory cases, four or five may be necessary. If adenoids are very large, a combination of surgical removal and one immediate radiation of each side of the nasopharynx for 6 minutes and 40 seconds is more effective than three or four radiation treatments alone.

The sensitivity of cells varies - next to sex cells, lymphoid tissue is the most sensitive in the body. Therefore, it is possible to treat adenoid tissue with a dosage far below the level that would injure mucous membrane, bone, cartilage, ductless glands or the central nervous

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system, including the eye. Hyperplastic tissues are more easily injured than quiescent tissues. Pathogenic bacteria, which cannot be destroyed in cultures, often disappear following irradiation of tissues in which the are located.

The size of the nasopharynx and the state of the lymphoid tissue vary, and the effects of treatment are not the same in each case. You are not treating deafness or aero-otitis but conditions in the nasopharynx tha favor the development of these maladies. The aim of the treatment is to remove mechanical obstructions in the eustachian tubes and chronic infecti in adjacent lymphoid tissue which causes hyperplasia, excessive secretion of mucus and edema of the mucous membrane.

The dosage that has been found most effective with this applicat is one gram twenty seconds on each side of the nasopharynx. Since this applicator contains only 50 mg. or 1/20 of a gram, the dosage is twenty times as long - 400 seconds or 6 minutes 40 seconds on each side.

Should the applicator contain an appreciably smaller or greater amount of radium (one or two milligrams either way will make no difference) the time it is left in the nasopharynx will have to be increased or decrea to approximately the desired dosage of 1 gram 20 seconds. For example, if the applicator contains only 40 milligrams of radium, the strength will be only 1/25 of a gram and the time should be increased to 500 seconds or 8 minutes and 20 seconds.

The nasal applicator must be treated as a delicate instrument. The Beta and Gamma rays given off are constant, so long as the chamber containing the radium salt is hermetically sealed. A microscopical fracture, not jeopardizing the radium, may cause loss of Radon and reduction in Gamma and Beta ray output. The applicator should be tested for a Radon leak once a week with an inexpensive Alpha ray electroscope. Place the applicator in the ionization chamber of the electroscope, leave for a few minutes and then remove. When no Radon is escaping, the electroscope can be charged as usual. When Radon is escaping, the electroscope becomes "contaminated" and will not function for hours. A leaking applicator should be returned to the Radium Company for repairs.

3. It is directed that the following technique of treatment with the nasal radium applicator be rigidly adhered to:

a. The applicator will be left in the lead cylinder until you are ready to insert it into the patient's nasopharynx. A lining tube of glass may be fitted into the hole in the lead cylinder and kept filled with 95% alcohol which is a convenient means of sterilizing the applicator. Heat must never be used.

b. Wear rubber gloves. Three mm. of rubber absorbs approximately 75% of the Beta rays and thus helps to protect the hands.

c. The patient should lie comfortably on a couch during the

treatment.

d. The Interval-Timer clock will be used to control the duration of the treatment.

e. Remove the applicator from the lead cylinder, wash off the alcohol with water, dip into a lubricant (one that is water soluble and may be quickly washed off at the conclusion of the treatment) and insert into the nasopharynx.

f. Exact placing of the applicator is most important. The nasopharynx varies in size. The middle (not the end) of the radium containing chamber should be in direct contact with the tissue in the fossa of Rosenmueller or the orifice of the Eustachian tube. The exact location and depth from the external naras to the area to be treated can be determined only by a preliminary examination with the nasopharyngoscope in one side of the nose and a calibrated rod or dummy applicator in the opposite side. Never hard the applicator in order to put it in the Eustachian tube, since this may lead to leakage of radon. When in place, fix it with a suitable clamp or adhesive.

g. The most important protection for personnel using the treatment is distance. The intensity of the radiation varies inversely with the square of the distance. At a distance of one foot, the radiation is 1 x 1 which is called unity. At ten feet, 10 x 10 = 100 and the intensity if 1/100 of what it is at one foot. At twenty feet, 20 x 20 = 400 and the intensity is reduced to 1/400 of what it is at one foot. During the treatment, all personnel who are constantly handling the applicator should be at a distance of 25 or 30 feet.

h. At the conclusion of the treatment, the mucus adhering to the applicator should be removed with a brush fixed to the table or sink and quickly replaced in the lead cylinder. The radium carrying chamber at the end of the applicator must never be touched. If the applicator is repeatedly cleaned by wiping it with gauze held in the hand, radiation changes will soon become evident in the skin and nails.

If the precautions outlined are followed, there is no danger to the hands or fingers. The applicator should always be held at the end of the handle and away from the body. The placing of the applicator should be done rapidly and when treatment is completed, the applicator should go back into the cylinder immediately.

Over-radiation of the entire body daily for months will produce a drop in the white blood count. This is mainly in the lymphoid cells. One-tenth of an r of Gamma radiation per diem is without accumulative effect. Actually, in treating fifty patients a day and every day, if the precautions indicated are followed, the body would not be exposed to anything like this safe dose - probably not more than 1/20 r per diem. There may be variation in tolerance and it should be a routine practice to make a complete cell count of the blood in every doctor and nurse employed in these treatments

[illegible] every two months. Individuals w[illegible] onset, [illegible] be excl[illegible] from the work.

[illegible] General Medical

[illegible] GREENLEE
[illegible]el, Medical Corps
[illegible]ctor of Professional Services
Office of the Air Surgeon

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[illegible] January 1945.

[illegible]
c/o Major [illegible]
Mitchell Field,
Long Island, New York.

Dear Dr. Crowe:

I was delighted to have the opportunity to meet you and talk over our problems of mutual interest. I have been hearing favorably about you for a long time but had never had the privilege of meeting you face to face.

We were greatly disappointed when the weather conditions were such that you were unable to see our activity on Saturday, the 13th. We want to cordially invite you to visit this activity because we believe we have enough material here to be of interest to you.

Dr. Haines joins me in sending you kindest personal regards both to yourself and to Major Weymuller.

Most sincerely,

C. W. SHILLING
Captain, (MC) U.S.N.

UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

Serial

23 January 1945.

Admiral H. W. Smith (MC) USN, (Ret.)
Medical Research Division
Bureau of Medicine and Surgery
Navy Department
Washington 25, D. C.

Dear Admiral Smith:

I trust that I am not stepping out of line but you know of our interest in the problem of Aero-Otitis Media. We have found that Dr. S. J. Crowe will soon have completed the active phase of his work with the Army and will be available to the Navy if needed. His ability cannot be doubted and if the Navy undertakes a modified form of the Army program for the treatment of Baro-trauma by the use of Radium, I am sure that Dr. Crowe's assistance would not only be willingly given but would prove very helpful.

Kindest personal regards.

Most sincerely,

C. W. SHILLING,
Capt. (MC), USN.

Monday, 15 January 1945.

31 pressured
8 cases Aero-otitis media
6 failed pressure:

C. J. Chodzke Y3c, out 4 lbs. #2 rt. 0 lt.
mod. ads. tubes narrow open
R. J. Groom S2c, out 4 lbs. #0 rt. #1 lt.
small ads. tubes open slt. cold
H. G. Holle S2c, out 9 lbs. #4 rt. #1 lt.
enormous ads. tubes covered
J. H. Doyle S1c, out 4 lbs. #2 rt. #4 lt.
enormous ads. tubes covered
J. A. Wallace S2c, out 4 lbs. #2 rt. #4 lt.
enormous ads. tubes flattened
J. E. Sutorius S2c, out 15 lbs. 0 rt. 0 lt.
enormous ads. tubes free - clear

3 passed pressure:

C. E. Shaver S1c #3 rt. #4 lt.
mod. ads. tubes crowded - closed
W. H. Condon S2c, 0 rt. #3 lt.
enormous ads. tubes covered not seen
R. H. Gearder S1c, 0 rt #4 lt.
small ads. lt. crowded flat - rt. small open

Tuesday, 16 January 1945.

29 pressured
7 Aero-otitis media
1 failure.

P. A. Crowder, F1c, out 15 lbs. #2 rt. 0 lt.
small ads. slit tubes - rt. closed - lt. small.

6 passed pressure

J. J. Corrigan, RT2c, 0 rt. #2 lt.
small ads. tubes slit - lt. closed - rt. clear.
V. M. Indrysek, F1c. #0 rt. #3 lt.
small ads. tubes flattened - lt. closed- rt. clear
1-30 R1 V. J. Mitchell, S1c, #4 rt. #4 lt.
enormous ads. tubes closed -covered-epistaxis
A. Roman, F2c, #4 rt. #4 lt.
small ads. tubes slits closed.
C. E. Stark, F1c, #3 rt. #2 lt.
mod. ads. tubes narrowed - closed.
W. M. Straton, S2c, #4 rt. #4 lt.
large ads. tubes slits only - closed.

Tuesday, 16 January 1945.

Treatment of Aero-Otitis Media by X-Ray therapy has been approved by Ad. McIntire - Dec. 27, 1944 to be arranged with U. S. Naval Hospital, Newport.

Dr. H. Haines visited U. S. Naval Hospital at Newport, R.I., Tuesday, January 16th and conferred with officer in charge of X-Ray, Dr. J. Gushon Cohen, (MC) USNR.

The only machine available at Newport is a portable Picker Unit, 140 KV which would require about 1/2 hour treatment per patient. This is unsatisfactory in that too small a number of cases can be handled to draw any conclusions.

Capt. Shilling suggests a visit to the U. S. Naval Hospital, Brooklyn, N.Y.

Wednesday, 17 January 1945 Morning

31 given pressure
10 cases Aero-Otitis media
5 failures:

1-30 R' J. Holubowicz, RM2c, out 6 lbs. 0 rt. #4 lt.
enormous ads. tubes covered - fill fassae
Radium 1-25 R' J. V. Cusick, S1c, out 6 lbs. #2 rt. #3 lt.
enormous ads. tubes covered - fill fassae.
Radium 1-25 R' H. G. Fowler, S2c, out 3 lbs. 0 rt. #2 lt.
mid line ads. nodules over lt. tube -crowded
Radium 1-25 R' R. G. Chambers, S2c, out 7 lbs. #4 rt. #4 lt.
Perf. rt. drum - small ads. tubes closed-
fassae filled.
2-10 R1 J. Christofferson, S1c, out 7 lbs. #4 rt. #4 lt.
mod. ads. tubes crowded flat.

5 passed:

on O 7 Ens. L. H. Lippincott - #0 rt. #3 lt. freq. stuffed
ears. mod. ads. lt. tube closed - rt clear.
on O 7 Ens. J. B. Jolly, #0 rt. #3 lt.
mod. ads. Lt. tube closed - rt. clear
H. L. Cotton, S2c, #3 rt. #0 lt.
small ads. both tubes flat
J. L. Langen, S1c, #3 rt. #0 lt.
small ads. small tubes open - crowded
C. T. Long, F1c, 0 rt. #2 lt.
small ads. tubes flattened.

Afternoon - rechecks

34 pressured
26 Aero-otitis media
5 failed pressure:

R1 1-25-15 J. F. Brown - S2c - out 5 lbs. #4 rt. #4 lt. ✓
R1 2-1 J. L. Pacey - RT3c - out 7 lbs. 0 rt. #4 lt.
E. I. Kohl - RT3c - out 4 lbs. #2 rt. #2 lt.
R1 2-24 D.K. D. T. Falconer - S2c - out 10 lbs. 0 rt. #4 lt.
J. T. Clum - MM2c - out 23 lbs. #4 rt. 0 lt.

21 passed:

E. L. Barker, S1c, #2 rt. #2 lt.
A. A. French, S1c, #4 rt. 0 lt.
J. M. Mueter S2c, 0 rt. #4 lt.
J. E. Minich, F1c, #4 rt. #2 lt.
F. E. Strauhal, S1c, #4 rt. #4 lt.
F. L. Zak, EM2c, #3 rt. 0 lt.
R. R. Brown, S2c, #4 rt. #0 lt.

E. B. Reinke, MoMM1c, #4 rt. #4 lt.
R1 2-1 L. D. Bingham, RT2c, 0 rt. #2 lt.
R. K. Harriott, S2c, #4 rt. #4 lt.
H. C. Fullman, S1c, #3 rt. #2 lt.
K. H. Pettengill, RT3c, #0 rt. #2 lt.
J. T. Wallace, S2c, #4 rt. #4 lt.
C. J. Chodzke, Y3c, #2 rt. 0 lt.
W. L. Ternan, SM3c, #0 rt. #2 lt.
G. D. Williams, S1c, #4 rt. #4 lt.
R. McIntire, S2c 0 rt. #4 lt.
E. T. Stamm, S1c, 0 rt. #3 lt.
D. D. Campbell, S1c, #4 rt. #2 lt.
E. H. Vuehnewich, S1c, 0 rt. #2 lt.
A. F. Stanley, S1c #4 rt. #4 lt.

Thursday & Friday Jan 18th & 19th on board salvage ship Penguin on qualification dives - No aero-otitis noted - unable to check those at Training Tank.

Saturday: No pressure

Monday, 22 January 1945.

58 pressured
19 cases aero-otitis media
6 failures:

R' 2-26 J. F. Bowshier, PhM1c, out #4 rt. #4 lt.
mod. ads. tubes closed.
R. E. Harrison, PhM2c, out #4 rt. #2 lt.
very large ads. tubes crowded - closed
J. A. Bridges, PhM1c, out #4 rt. #2 lt.
small ads. tubes narrow - open
(has trouble with ears on aeroplane)
R. E. Rathbun, S1c, out 8 lbs. #4 rt. #4 lt.
very large ads. tubes covered - flat.
2-7 R1 J. H. Mullen, S2c, out 26 lbs. #2 rt. 0 lt.
small ads. tubes clear - slt. cold
K. F. Ashbaugh, F2c, out 6 lbs. #4 rt. #0 lt.
enormous ads. tubes flat - crowded.

13 passed pressure:

B. N. DeZinno, PhM2c, #2 rt. 0 lt.
mod. ads. tubes open - slt. cold
S. V. Peterson, PhM 2c, #2 rt. - lt.
small ads. tubes covered with nodules.
R' 2-26 E. S. Hubbard, PhM 2c, #4 rt. #2 lt.
large ads. tubes closed.
J. H. Salvas, SM1c, #4 rt. #4 lt.
small ads. both tubes slits - closed
D. D. Sheldon, S1c, #4 rt. #2 lt.
small ads. rt. tube closed - lt. crowded flat
L. F. Moore, S2c, #4 rt. #4 lt.
Enormous ads. tubes covered closed
D. J. Spowart, S2c, #4 rt. #2 lt.
small ads. - tubes closed.
D. J. LaValley, S2c, #4 rt. #2 lt.
enormous ads. tubes closed - covered
E. V. Mitchell, S2c, #0 rt. #4 lt.
enormous ads. tubes covered - open on rt.
with swallowing.
M. J. Cook, S2c, #0 rt. #4 lt.
enormous ads. covered - rt. opens with
swallowing.
T. A. DeGroot, S2c, #0 rt. #2 lt.
enormous ads. covered - rt. opens with
swallowing.
H. D. Hall, S2c, 0 rt. #4 lt.
mod. ads. - tubes both flattened - crowded
R. J. Kinsella, RT1c, #4 rt. #4 lt.
very large ads. tubes flattened - closed.

Tuesday, 23 January 1945.

29 pressured
6 cases aero-otitis media
1 failed pressure.

Alphous Egan, F1c, out 17 lbs. #1 rt. #4 lt.
large ads. lt. tube flat - rt. is clear.

5 passed:

D.K. A. L. Cress, Y2c, 0 rt. #4 lt.
small ads. lt. tube flat. rt. is clear.
D.K - M. E. Daly, F2c, #3 rt. #3 lt.
small ads. tubes are flat.
E. Marems, S1c, #3 rt. #0 lt.
large ads. tubes covered - cold.
D.K - P. J. Messina, F2c, #4 rt. 0 lt.
mod. ads. tubes flat.
K. A. Reed, S2c, #4 rt. #4 lt.
enormous ads. tubes covered.

Wednesday, 24 January 1945. Morning

30 pressured
10 cases of aero-otitis media.
5 failed pressure;

G. L. Hartvigsen, S2c, out 11 lbs. #4 rt. #4 lt.—
small ads. rt. open - lt. covered - slt. cold
2-7 R1 D. DiLorenzo, S2c, out 6 lbs. #4 rt. 0 lt.
small ads. - rt. open - lt. covered.
B. Husman, S1c, out 6 lbs. #4 rt. 0 lt.
large ads. both tubes covered.
2-14 R1 R. L. Mishler, S1c, out 5 lbs. #3 rt #3 lt.
mod. amt. ads. tubes covered.
2-7 R1 R. P. Slager, RT2c, out 5 lbs. 0 rt. #4 lt.—
mod. ads. nodules over lt. tube - rt. clear.

5 passed pressure:

R. A. Clansen, PT2c, #3 rt. 0 lt.
enormous ads. tubes covered.
A. C. Champagne, S1c, #2 rt. #1 rt.
large ads. tubes free.
J. K. Kimzey, F1c, #2 rt. #4 lt.—
very large ads. tubes covered.
H. Velthuysen, S2c, #4 rt. #4 lt.
small ads. tubes narrow - slit like.
R. A. Steward, S1c, 0 rt. #4 lt.
small ads. rt. tube open - left flat covered.

Wed. Jan 23rd – Afternoon

20 pressured – all Rechecks
17 cases of aero-otitis media.
9 failures:

2-7 R1 Q.R. D. R. Smith, S1c, out 5 lbs. 0 rt. #2 lt.
large ads. rt. tube free – lt. closed.
Dig. R. R. Ryder, S2c, out 5 lbs. 0 rt. #3 lt.
enormous ads. tubes covered – flat.
Dig. F. J. Samzenbacher, MoMM3c, out 5 lbs. #4 rt. #4 lt.
R'1-25 J. H. Good, RT3c, out 5 lbs. #3 rt. #2 lt.
R'1-25 J. E. Conger, S2c, out 5 lbs. #4 rt. #3 lt.
Dig. H. C. Holle, S2c, out 5 lbs. #0 rt. #3 lt.
J. F. Pacey, RT2c, out 5 lbs. #2 rt. 0 lt.
R'1-25 S. J. Bohn, S2c, out 9 lbs. #3 rt. #3 lt.
R'1-25 J. W. Cusick, S1c, out 12 lbs. #4 rt. #2 lt.

8 passed pressure with aero-otitis media.

R'1-30 J. Perrey, S1c, #4 rt. 0 lt.
J. T. Clum, MM2c, #2 rt. 0 lt.
Dig. M. Flowers, S1c, #3 rt. 0 lt.
John Billingham, S2c, 0 rt. 3 lt.
W. O. Korasick, F1c, #3 rt. #2 lt.
R'1-30 J. J. Holubowicz, RM2c, #1 rt. #4 lt.
R. K. MacNeill, RT2c 0 rt. #4 lt.
H. E. Auberg, S2c, 0 rt. #3 lt.

Thursday, 25 January 1945.

29 pressured
16 cases Aero-Otitis Media.
4 failures?

J. H. Majilton, MoMM2c, out 5 lbs. #0 rt. #2 lt.
small ads. tubes crowded flat.
2-16 R1 V. E. Hashagen, F1c, out 9 lbs. #4 rt. 0 lt.—
small ads. tubes flattened.
2-1 R1 B. G. Combs, FC2c, out 5 lbs. #2 rt. #2 lt.—
small ads. tubes flattened – slt. cold.
W. M. Elliott, S1c, – out 18 lbs. #3 rt. 0 lt.
large ads. tubes covered.

12 passed pressure:

R'1-30 R. Spelce, S2c, #3 rt. 0 lt.
large ads. tubes covered.
R'1-30 M. Schrager, MoMM1c, #0 rt. #4 lt.—
large ads. tubes crowded flat.
R'1-30 H. L. White, F2c, #4 rt. 0 lt.—
mod. ads. tubes covered – open lt.
R'1-30 D. G. Webb, S2c, #4 rt. 0 lt.
large ads. mid line – tubes slit.
E. L. L. Rangitsch, RT2c, 0 rt. #4 lt.—
small ads. tubes slit like.
Wm. Rand, RT2c, 0 rt. #3 lt.—
small ads. tubes covered.
R'1-30* V. J. Mitchell, S1c, #2 rt. #3 lt.
R'1-30* V. P. Maxson, S1c. #3 rt. #0 lt.
R'1-30* J. J. Holubowicz, RM2c, 0 rt. #2 lt.
Dropped* M. Flowers, S1c, #2 rt. 0 lt.
R'1-30* W. Perrey, S1c #4 rt. #4 lt.
R'1-30* R. E. Thompson, S1c, 0 rt. #4 lt.

Friday, 26 January 1945.

30 pressured
7 aero-otitis media
5 failures:

J. A. Ayles, F1c, out 4 lbs - 0 rt. #2 lt.
enormous ads. tubes closed.
A. J. Hall, F1c, out 4 lbs. - 1 rt. #4 lt. -
large ads. cold - tubes crowded and closed
2-7 R1 J. H. Cross, S2c, out at 9 lbs. #2 rt. 0 lt.
enormous ads. tubes flat
2-7 R1 R. C. Peterik, S2c - out at 22 lbs. #0 rt. #4 lt.
mod. ads. tubes narrow
V. D. Kemp, F1c, out at 22 lbs. 0 rt. #4 lt.
large ads. tubes flat.

2 passed:

R1-30 R. E. Corbin, F2c, #4 rt. #0 lt.
large ads. tubes crowded - closed
R1-30 E. F. Rose, S2c, #2 lt. #2 rt.
enormous ads. tubes covered.

— CCB5. ASC

MEMORANDUM FOR AERO-OTITIS MEDIA LOG:

Doctor Shilling visited the U.S.Naval Hospital, Brooklyn, New York, on 26 January 1945, and conferred with the Commanding Officer, Captain Gardner E. Robinson, (MC) USN; the Executive Officer, Captain Walter M. Anderson, (MC) USN; and with the officers in charge of the X-ray Department: Comdr. G. W. Cramp, (MC) USNR, and Lt. Benjamin DuBilsier, (MC) USNR.

Tentative arrangements were made for conducting treatments in connection with our aero-otitis media project and it was promised that representatives from this department would contact the above-mentioned doctors in order to make final detailed arrangements.

Saturday, 27 January 1945.

10 Pressured - from S13
2 cases Aero-otitis media - No failures.

1-27 R' R. M. Shaw, MMlc - #4 rt. 0 lt.
small ads. tubes crowded flattened
1-27 R' J. B. Davey, F1c - #4 rt. 0 lt.
small ads. - tubes crowded, flat.

Monday, 29 January 1945.

29 pressured
7 Aero-otitis media
2 failures:

2-7 R1 J. H. Robinson, EM1c - out 6 lbs. #4 lt. #0 rt.
large ads. tubes narrow - crowded - left flat.
3-2 R1 J. J. Parks EM2c - out 6 lbs. #3 rt. #1 lt.
large ads. left tube clear - right covered.

Passed:

D. E. Hewat, RT3c, 0 rt. #3 lt.
small ads. tubes open
2-9 R1 L. J. Hope, S1c, 0 rt. #3 lt.
enormous ads. tubes covered
2-9 R1 J. A. Miller, S1c, #3 rt. #4 lt.
mod. sized ads. tubes covered. crowded
2-9 R1 J. E. Shrom, F1c, #3 rt. #3 lt.
mod. sized ads. tubes covered. crowded
2-9 R1 F. Zillner, F1c, 0 rt. #4 lt.
enormous ads. tubes covered.

Tuesday, 30 January 1945

41 pressured
10 aero-otitis media
1 failure:

2-16 R1 J. P. Walsh, S1c - out 3 lbs. 0 rt. #2 lt.
small ads. tubes flat.

Passed:

R' 2-9 R. E. Andrew, F2c - #2 rt. 0 lt.
mod. ads. tubes covered open
Signed J. T. Dame, S2c - #4 rt. #4 lt.
enormous ads. tubes covered closed
R1-2-9 J. P. Ferris, S2c, #3 rt. #3 lt.
large ads. tubes closed
R' 2-6 L. W. Gibbs, SM2c - #2 rt. #2 lt.
small ads. tubes narrow
1-24 R1- A. B. Johnson, EM3c, #3 rt. 0 lt.
large ads. tubes covered.
29 R1 J. E. Stier, S2c 0 rt. #4 lt.
large ads. tubes covered flat.
R' 2-6 D. L. Walker, S2c - #3 rt. 0 lt.
small ads. tubes open
R' From 1-30-45 S13 G. D. Farmer, MoMM3c, #4 rt. 0 lt.
mod. ads. tubes closed
R' " " 1-30-45 G. W. Palmer, F1c - #4 rt. 0 lt.
small ads. rt. tube open - lt. closed

Wednesday, 31 January 1945. Morning

29 pressured
10 aero-otitis
4 failures:

R'2-6 R. V. Darin, RT3c - #4 rt. 0 lt. out 5 lbs.
small ads. midline tubes - crowded
H. W. C. Repon, Flc - out 5 lbs. - #0 rt. #5 lt.
mod. ads. tubes covered crowded.
R'2-6 R. M. Gingrich, Slc, out 5 lbs. - #1 rt. 0 lt.
very large ads. tubes open
R'2-6 A. J. Fanthorp, Slc - out 5 lbs. - #3 rt. 0 lt.
large ads. tubes crowded and flat.

Passed:

R'2-6 F. M. Feldmann, Slc - #3 rt #4 lt.
mod. sized ads. tubes closed
R'2-6 S. R. Baldwin, RT3c - #3 rt. 0 lt.
small ads. tubes flat
R'2-9 J. C. Kuhns, Flc - #3rt #3 lt.
enormous ads. tubes crowded and flat.

R'2-8 A. H. Schwacke, Slc - #4 rt. 0 lt.
mod. ads. tubes crowded and flat.
C. A. Tummonds, RT2c - #4 rt. #4 lt.
mod. ads. tubes flat.
R' 2-9 W. R. White, Slc - 0 rt. #3 lt.
mod. ads. tubes flat

Afternoon

24 Pressured (23 rechecks - 1 diver)
21 Aero-otitis media
1 failure:
H. G. Fowler S2c - out 13 lbs. #0rt. #4 lt.

Passed:

O. R. Hill, Diver #3 rt.
J. H. Majilton, Mo?12c - #2 lt.
2-7 R' J. H. Mullin, S2c - 0 rt. 0 lt.
J. A. Ayles Flc - 0 rt. 0 lt.
A. Egan, Flc - #0 rt. #3 lt.
2-7 R' R. C. Peterik, S2c - #0 rt. #2 lt.
2-7 R' J. H. Cross, S2c - 0 rt. #2 lt.
2-7 R' N. G. Ramos - Mo?13c - #3 rt. #4 lt.
R'-2-7 D. DiLorenzo, S2c - #2 rt. 0 lt.
R'1-25 S. W. Bohn, S2c - 0 rt. #3 lt.
R'1-25 J. E. Conger, Jr. S2c - #4 rt. #4 lt.
R' 3-2 J. J. Parks - Em2c - #1 rt. 0 lt.
A. W. Hall, Flc - #4 rt. #4 lt.
V. D. Kemp, Flc - 0 rt. #2 lt.
2-7 R' J. H. Robinson, Jr., EM1c - 0 rt. #2 lt.
2-7 R' B. G. Combs, FC3c - 0 rt. #2 lt.
2-10 R' W. J. Christofferson, Slc - #4 rt. 0 lt.
W. H. Elliott, Slc - 0 rt. 0 lt.
B. H. Husman, Slc - #4 rt. 0 lt.
2-7 R' D. R. Smith Slc - 0 rt. #3 lt.
R. E. Rathbun, Slc - #4 rt. #4 lt.
J. H. Doyle, Slc - #3 rt. 0 lt.
2-7 R' R. P. Slager, RT2c - 0 rt. #2 lt.

25 January 1945.

Captain F. W. Lepeska, Material Division
U.S.Naval Supply Depot
Brooklyn, N.Y.

Dear Captain Lepeska:

[illegible] Condition having assigned to [illegible] experiment, and several other technicians in addition to Doctor Kelly, who is doing the dental approach to the problem, that is from the point of view of the relpositions of the jaws affecting Eustachian tube occlusion.

We would greatly appreciate, if you would allow us the courtesy of checking through your surveyed dental equipment and making a list of what he would need on this experiment.

If he finds material which would be satisfactory, official arrangements can be made for its transfer at a later date.

Most sincerely,

C. W. [illegible]
Captain (MC), U. S. Navy.

CWH:[illegible]

Summary -

Arrival of Radium
Cases Treated c̄ Radium
1st treatment 88. -
Dr. Kelly's arrival - beginning work on cases
Brooklyn Hosp. ok'd for Treatment
c̄ X Ray. — Discontinued 3-13-45
School & Officers & Spitz cooperating.
~~2~~ 590 Aero otits
319 Cases Aero otits
1042 Treated & Examined post prom

Victoria Field Conference &
Set up of New London as Radium
treatment base.
10 gal. chewing gum
7 0 chicks weather against failures
in tanks.

Plan for Collaboration
Dr. Haines
Dr. Kelly

The collaboration on the areo-otitis media project will function as follows:

The areo-otitis cases will be divided into three main groups for treatment purposes:

Group 1 - To be treated with radium only

Group 2 - To be treated dentally

Group 3 - To be treated with radium and dentally

The cases in each group will be further subdivided into four classes:

Class A - No ADS

Class B - Small ADS

Class C - Moderate ADS

Class D - Large ADS

The patients for each group will be taken at random... an effort will be made, however to have an adequate number of classes in each group.

FUNCTIONAL DISHARMONY

An explanation of the above term as used in this log.

We believe that the common term "mal-occlusion" is unsuited for this project. It is used by orthodontists and others as a classification of mouth irregularities, but is based upon and implies a static relationship, namely that the various classes of mal-occlusion are determined with the teeth in contact and the lower jaw in its most retruded position. A static relationship.

Any of the accepted methods of equalizing pressure involves movement of muscles and the lower jaw. Provided there is no mechanical stoppage, it is the tonicity of the tubal muscles that determine whether or not the ostium of the tube can be made patent against external pressure.

It is believed that the tonicity of the tubal muscles is interdependant upon the tonicity of the muscles of mastication, whose tonicity is controlled by the ability of the mandible to make unhampered movements in all positions, that interferrence of occlusion in the various excursions puts all muscles in strained and unnatural positions.

Therefore any study of occlusion that is not made in motion is valueless for this research. As our only interest is occlusal interference in motion the term functional disharmony will be used.

✓ Over

Thursday, 1 February 1945.

18 radium Rx all new
no records

29 Pressures
8 Aero-otitis media
4 failures:

2-14 R' Smith, G. A. Slc - out at 5 lbs. #2 rt. 0 lt.
large ads. tubes-closed-flat.
2-14 R' Wilson, M. H., RT3c - out at 6½ lbs. - 0 rt. #3 lt.
mod. ads. nodgel on left tube - right clear
2-16 R' Clark, J. C. SM2c - out at 16 lbs. - 0 rt. #3 lt.
small ads. right tube open - left closed
Haider, R. K., MoMM2c - out at 5 lbs. - #4 rt. #2 lt.
mod. ads. nodgels tubes - flat.

Passed:

Bendixsen, RT3c - 0 rt. #3 lt.
small ads. tubes open - slightly crowded.
Hosbach, A. H. Flc - #4 rt. #4 lt.
enormas ads. tubes covered - crowded-flat
Hoskins, C. R. Flc - #3 rt. 0 lt.
large ads. tubes covered
A'-3-9 Levis, E. Jr., Slc - #4 rt. 0 lt.
mod. sized ads. tubes crowded and flat.

Friday, 2 February 1945

8 radium Rx - new

20 pressured
3 cases of aero-otitis media
2 failed pressure:

Coulter, T. M., Flc - out 6 lbs. #1 rt. #4 lt.
Enormous ads. tubes crowded, flat.
Daly, J. G. RT2c - out 6 lbs. #3 rt. #4 lt.
very large ads. tubes covered

new
#1

1 passed pressure:

Phillips, E.F., Flc - #3 rt. #3 lt.
large ads. tubes flat - crowded.

Saturday 3rd Feb 1945
no pressure
8 radium treatments new
25 rechecks
Conference with Dr Hanes on deafness + aero-otitis media - need record #1 is & #2 ears for check pre + post pressures.

Monday, 5 February 1945.

5 radium Rx

39 pressured
10 cases aero-otitis media
5 failures:

Walker, R. L., S2c - out 5 lbs - #4 rt. #4 lt.
large ads. mid line - tubes crowded flat.
2-5 RI-2.5 Thomas, I., SM1c(02) out 4 lbs. 0 rt. #3 lt.
mod. ads. tubes flat.
2-5 RI 2.5 Auer, D. G., Ens. (02) out 17 lbs. #3 rt. 0 lt.
large mass ads. - tubes closed rt. lt. clear
old mastoid scar rt.
Halzer, D.W., S2c - out 7 lbs. #3 rt. 0 lt.
large ads. - tubes flat crowded
Clevenger, R.R., F1c - out 9 lbs. - #4 rt. #4 lt.
large ads. tubes covered - not seen.

5 passed Pressure:

2-16 RI Day, R.E.L., S2c - #4 rt. 0 lt.
large ads. tubes closed - flat.
Salerno, F.A., S2c - #4 rt. #4 lt.
large ads. - tubes closed - flat.
Arcara, P.L., S2c - #0 rt. #3 lt.
large ads. - tubes flat closed
Bishop, B.B., S.c, - #2 rt. 0 lt.
small ads. tubes flat.
Breidenbach, C.F., MoMM3c - #4 rt. #4 lt.
large ads. - tubes closed - crowded.

Tuesday, 6th February 1945

9 Radium Rx.

33 Pressured
12 cases Aero-otitis media
7 failed pressure:

Wood, W.H., S2c - out 5 lbs. #3 rt. #3 lt.
small ads. - tubes crowded - flat.
Miller, Marius, S1c - out 6 lbs. #3rt #0 lt.
small ads. nodules in both tubes.
Goodland, J. C., S2c - out 3 lbs. - 0 rt. #3 lt.
large ads. - nodules in lt. tube
Charhonneau, A.A., F3c - out at 3 lbs. #2 rt. 0 lt.
enormous ads. - tubes flat - crowded
Gracohive, D. J., F1c - out 4 lbs. #3 rt. #2 lt.
enormous ads. - tubes covered.
Adamson, T.O. F2c, out 4 lbs. - #3 rt. #1 lt.
large ads. tubes flat - nodules in rt tube
Greenhut, J., S2c - out 4 lbs. #1 rt. #3 lt.
enormous ads. - tubes covered

5 passed pressure

Barker, D.L., S2c - #2 rt. 0 lt.
enormous ads. tubes crowded flat.
Cook, E.B., S2c - #2 rt. 0 lt.
large ads. - tubes flattened.
Corcoran, J.M., F1c - #0 rt. #4 lt.
mod. ads. - tubes crowded - flat.
Ting, A. W., S2c - #2 rt. #2 lt.
small ads. - tubes crowded flat
(diver) 2-9 Mauney, J. U., MM3c - #4 rt. 0 lt.
enormous ads - tubes crowded - nodules

✓ (2-45)

UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

5 February 1945.

MEMORANDUM TO THE EXECUTIVE OFFICER:

SUBJECT: Temporary Additional Duty Orders.

1. It is requested that temporary additional duty orders be prepared for Commander Allan S. Chrisman, (MC) USN, and Lieut.(jg) Henry L. Haines, (MC), USNR, to proceed to the U.S.Naval Hospital, Brooklyn, New York, in time to arrive on the morning of Thursday, 8 February, 1945, for a conference with the X-ray Department of that hospital, Comdr. G. W. Cramp, (MC) USNR, and Lt. Benjamin Dubillier, (MC) USNR, as tentatively arranged for by the undersigned and Captain Gardner E. Robertson, (MC) USN, Commanding Officer of the Brooklyn Naval Hospital.

2. This conference concerns certain phases of a research project on aero-otitis media now under way at the Medical Research Department of this base.

C. W. SHILLING
Captain, (MC) USNavy.

Wednesday, 7 February 1945 Morning

13 Radium Rx

35 pressured
3 failures
7 cases Aero-otitis media.

Failures:

R1-2-16 Johnson, N.C., F1c - out 5 lbs. #1 rt. #2 lt.
small ads. tubes flat open
Curfman, O.P., EM2c - out 5 lbs. #2 rt. #3 lt.
mod. ads. lt. tube closed - Rt. open crowded
R1-2-16 Saltus, M., F2c - out 10 lbs. #4 rt. 0 lt.
large ads. tubes crowded flat.

Passed:

R1 2-16 Burrier, E. L. F1c - #2 rt. #2 lt.
small ads. nodules in tubes
R1 2-16 Canfield, J.E. F1c - 0 rt. #4 lt.
mod. ads. tubes crowded - narrow open
R1 2-16 Cornelison, G. S., F1c - #4 rt. #4 lt.
enormous ads. tubes covered
R1 2-16 Hammett, J. B., F2c - 0 rt. #3 lt.
small ads. tubes narrow open

Afternoon

15 Rechecks Pressured
14 cases Aero-otitis media
5 failures:

2-14 R1 Wilson, M.H., RT3c - out 5 lbs. 0 rt. #4 lt.
2-14 R1 Mishler, R.L., S1c - out 5 lbs. #3 rt. #3 lt.
2-16 R1 Walsh, J.P., S1c - out 8 lbs. #3 rt. #4 lt.
1-25 R1 Duncan, J.F., S2c - out 20 lbs. #3 rt. #2 lt.
2-14 R1 Smith, G.A., S1c - out 20 lbs. #4 rt. #2 lt.

Passed:

Walker, R. L., S2c - #3 rt. #3 lt.
Darin, R.N., RT3c - #4 rt. 0 lt.
Cryson, H.W., F1c - 0 rt. #2 lt.
Daly, J. G., RT2c - 0 rt. #4 lt.
Coulter, T. M., F1c - 0 rt. #4 lt.
Hartzigren, G.L., S2c - #4 rt. #4 lt.
Ashbaugh, K.F., F2c - #4 rt. #4 lt.
R1 2-6 Fanthorp, A. J., S1c - #4 rt. 0 lt.
R1 2-6 Gingrich, R. M., S1c - 0 rt. 0 lt.
Maider, R.K., MoMM2c - #3 rt. 0 lt.

Thursday, 8 February 1945.

32 pressured
2 failed:

Not checked for otitis media due to my trip to Brooklyn Naval Hospital

MEDICAL RESEARCH LABORATORY
U. S. SUBMARINE BASE
NEW LONDON, CONNECTICUT

8 February 1945

Memorandum on Conference at Naval Hospital, Brooklyn, N.Y., re: X-ray treatment of Aero-Otitis Media.

Comdr. A. S. Chrisman (MC) USN and Lieut. (jg) M. L. Haines, (MC) USNR, conferred with Comdr. C. W. Cramp, (MC) USNR, and Lieut. B. Dubilier (MC) USNR, at the U.S.Naval Hospital, Brooklyn, N.Y., on 8 February 1945, relative to X-ray treatments for aero-otitis media cases in connection with research project X-434 (Sub. No. 90), now underway in the Medical Research Dept., Submarine Base, New London, Conn. The following program was agreed upon:

(a) The Naval Hospital in Brooklyn will be able to handle five new cases each week as out-patients. The patients are to report to the hospital before noon, if possible.

(b) Each case will require a series of three treatments, at weekly intervals. Thus beginning with the third week, fifteen men will be treated each week.

(c) The Naval Hospital prefers these cases in groups of five a day for three days a week.

(d) A short record will accompany each patient sent to the Brooklyn Hospital, (consisting of an audiogram, and summary of nasopharyngoscopic exam.), and follow-up audiograms will be made at suitable intervals.

(e) The following factors are to be employed in treatment:

250 KV
15 MA
50 cm. distance
½ mm. copper, plus 1 mm. of aluminum filtration.

Two ports to be treated at each weekly treatment period. Each port will include the Eustachian tube on that side.

209 "r" units will be delivered to each Eustachian tube orifice at each treatment. The total "r" units delivered to each Eustachian tube orifice will be 1002 "r" during the three weeks treatment course. This total includes the "overlap" from the opposite side.

(f) The time required to complete this experimental project will be approximately 6 months.

Friday, 9 February 1945.

11 Radium Rx

34 pressured
14 cases Aero-Otitis Media
7 failures:

2-14 R' Augustyniak, E. J., RT3c - out 6 lbs. #1 rt. #4 lt.
large ads. - lt. tube closed - rt. crowded
Fossae of R full.
2-16 R' Abbott, R. C., S2c - out 6 lbs. #4 rt. #4 lt.
enormous ads. tubes flat crowded.
2-16 R' Haynes, R. W., S2c - out 6 lbs. #4 rt. #4 lt.
enormous ads. - tubes not seen - fossae full.
2-21 R' Zimmerman, S. L., RT2c - out at 3 lbs. #3 rt. #0 lt.
small ads. tubes flat -fossae full.
Redman, P.C., S2c - out 3 lbs. #3 rt. 0 lt.
small ads. tubes flat fossae full.
Mullen, J.L., S2c - out 14 lbs. 0 rt. #4 lt.
small ads. tubes both flattened.
Dr. Kelly 2-14 R' Stahler, O. E., RT3c - out 23 lbs. - #3 rt. #4 lt.
mod.ads. tubes flat - rt. open.

Passed:

2-15 R1 Burgess, O.L., F2c - #2 rt. #2 lt.
small ads. tubes open -plugs in canals- cold
Melville, J.E., S2c - 0 rt. #4 lt.
mod. ads. tubes crowded flat.
Martin, O.R., S1c - #2 rt. #3 lt.
small ads. tubes clear - cold
Paige, R.W., RT2c - #3 rt. 0 lt.
small ads. tubes open - covered
Peoples, W.H., S2c - #3 rt. #2 lt.
small ads. tubes open
Pope, J., F1c - 0 rt. #4 lt.
large ads. tubes covered - crowded
Rea, R. G., F1c - #4 rt. #4 lt.
mod. ads. tubes covered and closed.

Saturday, 10 February 1945.

5 new Radium
1 2nd Rx.

10 pressured from 06
4 cases Aero-otitis media
1 recheck of Dr. Kelly's pressured -M.H.Daly

R' 2-10 Blair, M. S. Ens. #2 rt. #1 lt.
enormous ads. tubes covered
R' 2-10 Clement, R. J., TM3c - #1 rt. #1 lt.
large ads. tubes flat.
R' 2-13 Pishlo, M. E. SC1c - #2 rt. #1 lt
R' 3-8 Barker, W. A., CMoMM #0 rt #1 lt.

Daly, M. H., treated by Dr. Kelly -
absolutely no effort in tank -
took pressure like an instructor
inspite of slt. cold #1 ears ear
side.

U. S. NAVAL HOSPITAL
NEW YORK, N.Y.
263 Flushing Ave., Brooklyn,1, N.Y.

NavHosp
NYK-BD/rd

9 February
1 9 4 5

Commander A. S. Chrisman
U. S. Naval Hospital, Submarine Base
New London, Connecticut.

Dear Commander Chrisman:

I am enclosing a graph which represents depth dose measurements performed on a presswood phantom.

As you can glean from the graph, at 6 cm. distance, the approximate depth of the eustachian tube orifice, only 50% of the air dose is calculated - and at 9 cm., only 30%.

I have had a conversation with Lt. Comdr. Farrow who treated ten patients for the same condition about two years ago and I believe they came from your station. These patients were given 300 r. every second day, or a total of 900 r. to the affected side.

The results were not significant. Therefore, after careful consideration and as you will see in the lower part of the graph, the suggested therapy, in my opinion, should be 400 r. in air to each side for three doses once a week. The dose to each eustachian tube orifice will total 209 r. plus 125 r. from the other side, the total after three treatments to equal 1002 r. into the eustachian tube orifice area.

I shall be extremely interested in your opinion in this change of therapy.

Respectfully yours,

/s/
Benjamin DuBilier
Lieutenant (MC) USNR.

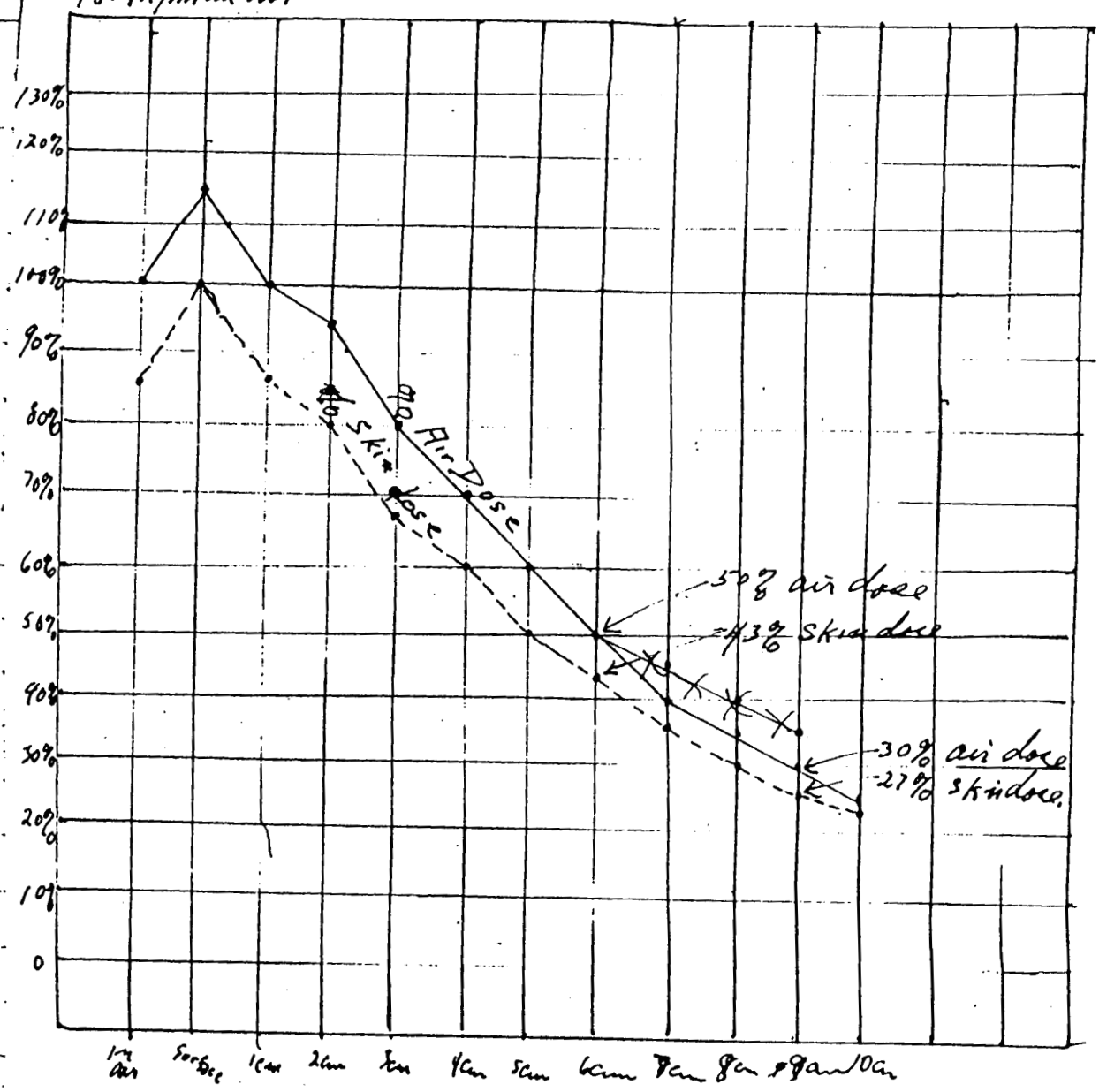
Reply
Refer To:

UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

Initial:

200 K.V.
15 ma
½ Cu 1 Al filter
7 cm field
18.7 r/min in air

8 Feb 1945 USN Hosp. Bklyn.
B. D. Billies, Lt MC-USNR.



Depth dose measurements using Pruewood Phantom
The Eust. tube Orifice is approx. 6 cm or 9 cm from skin.
measures. Suggested therapy: 400 r in air to each side for 3 doses once a wk. Dose to each Eust. tube 209 r + 125 r = 334
3 × 334 = 1002 r total.

MEDICAL RESEARCH LABORATORY
U. S. SUBMARINE BASE
NEW LONDON, CONNECTICUT

10 February 1945.

Lieut. Benjamin DuBilier, (MC) USNR
U.S.Naval Hospital
263 Flushing Avenue
Brooklyn, 1, New York.

Dear Doctor DuBilier:

Thank you very much for your letter of 9 February 1945. Both Doctor Haines and myself are in agreement on the calculations and the dosage that you suggest. We feel that this dosage more closely approximates the dosage these cases are now receiving from the radium applicator than did the dosage originally suggested.

I am enclosing a copy of the memorandum prepared after our conference last week, amended to include the suggestions contained in your letter of yesterday. Pending receipt of official approval, which we are sure will be forthcoming, we will send our first five patients to you on Wednesday, 14 February, as agreed.

I wish to again thank you for your interest and help in this problem and I feel certain that a lot of information will be derived from this project.

Sincerely,

A. S. Chrisman
Commander, (MC), U.S.Navy.

ASC:JWK

P.S. I received despatch orders detaching me from duty here and will report to the Naval Hospital, Bainbrdige, Md. From now on Doctor Haines will contact you whenever it is necessary.

A. S. C.

MEDICAL RESEARCH LABORATORY
U. S. SUBMARINE BASE
NEW LONDON, CONNECTICUT

10 February 1945.

Captain Gardner H. Robertson, (MC) USN
U.S.Naval Hospital
Brooklyn, N.Y.

Dear Captain Robertson:

Enclosed herewith is a copy of the memorandum prepared after the conference between Commander Chrisman and Doctor Haines from this department and Comdr. Cramp and Doctor Dubilier of your Hospital, on 8 February, and revised upon receipt of a note from Doctor Dubilier.

Also enclosed is a copy of our official request to the Bureau of Medicine and Surgery, asking permission to transport these aero-otitis media cases to Brooklyn and return. The research project now being carried out with this aero-otitis media has been approved by the Bureau of Medicine and Surgery, and it was the Surgeon General's suggestion that these cases be treated in a Naval Hospital, so we do not anticipate any trouble as far as approval of the transportation is concerned.

Again let us thank you for your cooperation and also for the helpful suggestions made by the members of your X-ray Department.

Most sincerely,

C. W. Shilling
Captain, (MC), U.S.Navy.

CWS:JWK

Enclosures.

NB7/P3-1(MR)

10 February 1945.

From: Medical Officer-in-Charge, Medical Research Dept.
To: Chief of the Bureau of Medicine and Surgery.
Via: Commanding Officer, Submarine Base.

Subject: Treatment of Aero-Otitis Media cases with X-Ray at the U.S.Naval Hospital, Brooklyn, N.Y., Request for Permission for.

Reference: (a) Approved BuMed Project X-434 (Sub. No. 90) of 9 August 1944.

(b) Our letter to Chf. BuMed, NB7/P2-5, Serial 4796, of 1 December 1944 requesting permission to arrange for X-Ray therapy at local civilian hospital.

(c) Chf. BuMed ltr. BUMED-X-GN:II, NB7/P3-2 of 27 December 1944 disapproving request in ref. (b) and directing that such treatment be obtained at Naval Hospital, Newport.

1. By reference (b) this department requested permission to arrange for the X-Ray therapy required to accomplish the approved research project, X-434 (Sub. No. 90), reference (a), at a local civilian hospital.

2. By reference (c) this permission was refused and it was suggested that arrangements be made to have these treatments given at the Naval Hospital, Newport. However, investigation proved that the Newport hospital does not have proper equipment for the necessary type of treatment.

3. The nearest Naval Hospital having the desired equipment is the one at Brooklyn, N.Y. Preliminary arrangements with the Commanding Officer and the X-Ray Department of that hospital have been made and are entirely satisfactory to both parties. If approved, these patients will be treated as out-patients and not admitted to the Sick List.

4. It is therefore requested that this department be authorized to make arrangements for the required X-Ray therapy at the Naval Hospital, Brooklyn, N.Y., and for the transportation of aero-otitis media cases to that hospital.

C. W. SHILLING.

BUMED-X-BLW:II

12 February 1945

DEPARTMENT OF THE NAVY
BUREAU OF MEDICINE AND SURGERY
WASHINGTON 25, D. C.

Captain C. W. Shilling
U. S. Submarine Base
New London, Connecticut

Dear Captain Shilling:

Captain Brown has been on the sick list for a few days and should return to duty the 14th or 15th day of February. He asked me to convey to you that there will be no change in the aero-otitis media project and to proceed as previously.

JACK BASMAN
Lieutenant Commander (MC) USNR

Monday, 12 February 1945. clear - cool

6 new Radium Rx
3 2nd Treatments

29 pressured
12 Aero-otitis media
5 failures:

Hollingsworth, J. T., S1c - out 6 lbs. #4 rt. #3 lt. enormous ads. tubes covered.
R' 2-21 Floyd, R. W., S1c - out 14 lbs. #1 rt. #4 lt. mod. ads. tubes flat.
R' 2-21 Muhler, C. P., S1c - #1 rt. #3 lt. out 3 lbs. large ads. tubes covered - closed
R' 2-21 Puchner, A.J., S2c - out 3 lbs. #3 rt. #3 lt. large ads. tubes flat - closed
1-24 R' Schrader, L. W., RM2c - out 9 lbs. #3 lt. 0 rt. mod. ads. tubes covered - has had 1st. rad. treatment.

Passed:

R' 3-15 Carlucci, P.R., F1c - #3 rt. 0 lt. small ads. tubes flat - closed
1-24-45 R' Mancil, E., S1c - #4 rt. #3 lt. has had 1st Radium treatment
2-16 R' Hunter, J. L, S2c - #2 rt. 0 lt. small ads. both tubes covered
Ralston, D., S2c - #1 rt. #2 lt. mod. ads. tubes open narrow
2-16 R' Slack, W., F2c - #1 lt. #3 rt. mod. ads. flat tubes - open
2-16 R' Summitt, J. S1c - #0 rt. #2 lt. small ads. tubes flat - fossae R #
2-16 R' Zimmer, B. R., F2c - #1 rt. #4 lt. mod. ads. tubes flat - Fossae R#

Tuesday, 13 February 1945.

8 new Radium

50 Pressured
15 Aero-otitis media
4 Failures:

2-13 R' Ajello, E., F1c - out at 5 lbs. - #4 rt. #4 lt. - moderate ads. - tubes flat.
2-13 R' Christie, I. J., F1c - out at 5 lbs. - #0 rt. #2 lt. - small ads. - left tube flat - (scared).
2-13 R' Stewart, S. J., F2c - out at 7 lbs. - #4 rt. #4 lt. - enormous ads. - tubes flat.
2-13 R' Jernigan, C. B., MM2c - out at 26 lbs. - #4 rt. #0 lt. - enormous ads. - tubes flat.

Passed:

Cameron, D. E., S2c - #2 rt. #2 lt. - small ads. - tubes flat, narrow.
Falciani, A. N., MT2c - #1 rt. #2 lt. - small ads. - tubes open, crowded.
Geary, R. B., S2c - #3 lt. - small ads. - tubes flat -
2-7 R' Phillips, O. E., F2c - Diver - #2 rt. #3 lt.
Knauss, S. F. Jr., S1c - #2 rt. #4 lt. - moderate ads. - tubes flat.
Moore, E. T., F1c - #2 rt. #4 lt. - small ads. - tubes flat - left tube closed.
Olson, I. D., S1c - #4 lt. - moderate ads. - left tube flat - right tube covered.
2-13 R' Tiemann, I. J. - #2 rt. (right perforated) #4 lt. - large ads. - tubes flat, closed.
XRay Carter, J. D., S2c - #4 rt. #3 lt. - moderate ads. - tubes flat.
2-17 R' Tenanon, T. R., Y2c - #4 rt. #4 lt. - small ads. - both tubes flat.
2-13 R' Clinging Smith, F., CT - #3 rt. #2 lt. - small ads. - tubes flat.

Wednesday, 14 February 1945. Morning.

Gnew Radmy

46 Pressured
11 Aero-otitis media
5 Failures:

Fairbank, I. J. Jr., S1c - out at 16 lbs. - #4 rt. #3 lt. - large ads. - tubes flat, crowded.
R' 2-14 Hennan, J. V., BM2c (Diver) - out at 26 lbs. - #2 rt #4 lt. - enormous ads. - tubes closed, flat.
R' 2-14 Shore, Q. C., S2c - out at 11 lbs. - #4 rt. #4 lt. - large ads. - tubes flat - Fossae xxx.
Pierce, C. O. Jr., SK2c - out at 4 lbs. - #3 rt #3 lt. - moderate ads. - mid line - tubes crowded, flat.
R' 2-14 Halloran, R. J., CT - out at 6 lbs. - #4 rt. #4 lt. - large ads. - tubes crowded, flattened, open.

Passed:

Demorest, E. L., RT1c - #3 rt. #3 lt. - moderate ads. - tubes flat, crowded.
Craig, J. J., F1c - #2 rt. #2 lt. - large ads. - tubes flat - Fossae xx.
Grimm, G. W., F1c - #4 rt. #4 lt. - large ads. - tubes narrow, opened - Fossae xx.
Douad, Proctor, S1c - #4 rt. #4 lt. - large ads. - tubes flat (cold).
Atkins, E. R., CM1 - #1 rt. #3 lt. - small ads. - left tubes covered.
R' 2-15 Grover, G. E., MM2c - #4 rt. - enormous ads. - tubes covered.

Wednesday, 14 February 1945. Afternoon Rechecks

16 Pressured
13 Aero-otitis media
1 Failure:

2-16 R' Saltus, W., F2c - out at 3 lbs. - #3 rt. #3 lt.

Passed:

Wood, T. H., S2c, #2 rt. #2 lt.
Adamson, J. T., F2c - #1 rt. #1 lt.
Furfman - #0 rt. #0 lt.
Helzer, D. W., S2c - #0 rt. #1 lt.
Charbonneau, A. A., F2c - #0 rt. #0 lt.
R' 2-24 Falconer, D. W., F2c - #0 rt. #1 lt.
Goodling, J. C., S2c - #0 rt. #0 lt.
Clevenger, R. R. - F1c - #0 rt. #2 lt.
Miller, M. B., S1c - #1 rt. #0 lt.
Redmon, I. C., S2c - #2 rt. #0 lt.

R' 1-25 Cusick, J. W., S1c - #1 rt. #1 lt.
Hallett, R. J., S1c - #4 rt. #4 lt.
Greenhut, J., S2c - #0 rt. #1 lt.
Duskin, A. I., RT2c - #3 rt. #3 lt.
R' 2-24 Zimmerman, S. L., RT2c - #1 rt. #0 lt.

Thursday, 15 February 1945.

6 new Radium B

41 Processed
8 Aero-otitis media.
2 Failures:

Levitt, J. R., S1c - out at 10 lbs. - #0 rt. #4 lt. large ads. - both tubes flat.
R'2-19 Fenrite, M. D., MoM2c - out at 5 lbs. - #0 rt. #4 lt. Large red ads - tubes flat - no nausea

Passed:

Burkardt, F. M., F1c - #3 rt. #2 lt. - med. ads. - tubes crowded and closed.
XRay Freund, C. G., F1c - #0 rt. #4 lt. - enormous ads. - tubes covered.
XRay Grene, R. J., S1c - #4 rt. #4 lt. - moderate ads. - both tubes flat.
Luinman, M. C., F1c - #4 rt. #3 lt. - enormous ads - tubes covered.
Eufence, C. E. - #4 rt. - small ads. - tubes narrowed.- enormous ads. - tubes covered.
Falconer, - #4 lt. - in 50 ft. okay - 1st in 1t - then in each of 50-50 and vertigo. Bends -

Friday, 16 February 1945.

20 new Radium B
1 2nd " "

38 Processed
11 Aero-otitis media
6 Failures:

Grayson, S. B., S1c - out at 10 lbs. - #4 rt. #0 lt. small ads. - tubes flat and cold.
Dawson, C. I., F1c - out at 10 lbs. - #3 rt. #0 lt. - large ads. - tubes covered.
R'2-21 Cowan, J. I., M3c - out at 13 lbs. - #4 rt. #0 lt. - tubes not seen - moderate ads.
Selvey, C. B. Jr., S1c - out at 9 lbs. - #4 lt. #1 rt. - moderate ads. - tubes flat.
R'2-22 Thorpe, W. C., F1c - out at 9 lbs. - #4 rt. #3 lt. - moderate ads. - L.N. tubes flat.
2-15 R' Barwick, G. N., CMoM - out at 5 lbs. - #4 rt. #4 lt. - large ads. - tubes flat. on "08"

Passed:

Black, F. J., S1c - #0 rt. #3 lt. - moderate ads. - tubes flat.
2-15 R' Schoff, A. J., S2c - (Pref. ?) #4 rt. #4 lt. - large ads. - tubes flat and covered.
Meredith, J. M., F2c - #0 rt. #4 lt. - moderate sized ads. - tubes flat.
XRay Zehr, E. E., S1c - #5 rt. #0 lt. - small ads. - tubes flat. Blue drum rt.
2-15 R' Taylor, J. C. - MoM1c - #4 rt. #0 lt. - moderate ads. - tubes crowded and open. on "08"

CWS

17 February 1945, Saturday. 6 new cases Rodman Pf

21 Pressured
4 Aero-Otitis Media
2 Failures:

R/ 2-17 LeFaige, F. T., PhM1c - out at 12 lbs. - #4 rt #4 lt - moderate ads. - tubes flat, closed.
R/ 2-17 Flath, D. A., PhM1c - out at 20 lbs. - #1 rt #4 lt - small ads - tubes closed, flat.

Passed:

R/ 2-17 Scherff, J. H., PhM1c - #4 rt 0 lt - small ads., tubes, nodules - growth right in the tube.
R/ 2-17 Turner, D. H., PhM1c - 0 rt #3 lt - small ads - tubes flat - left worst.

Commander A. S. Chrisman has been transferred to Bainbridge, Md., to be Executive Officer of the hospital there.

19 February 1945, Monday.

6 new Radium Cards
15 2nd Radium Cards

39 Pressured
9 Aero-Otitis Media
2 Failures:

Bengard, V. S., MoM3c - out at 22 lbs. - #4 rt #r lt - very large ads. - tubes flat - had same trouble while trying to enter Diving School.

R' 2-23 McCormack, J. H., F1c - out at 4 lbs. - 0 rt #3 lt - moderate amount ads - tubes flat - Fossae XX

Passed:

R' 2-19 Jarvis, R., F1c - #4 rt #4 lt - pref. left ear - moderate amount ads. - tubes flat.

Craft, J. C., QM1c - #4 rt #2 lt - small amount ads. - tubes narrow and open.

DiLeo, J. J., MoM1c - 0 rt #3 lt - small amount ads. - tubes flat.

X-Ray O'Han, James S., MoM1c - #4 rt #4 lt - moderate size ads. - tubes flat - post wall Fossae xx.

Rich, J. F., F1c - 0 rt #3 lt - moderate size ads. - tubes flat - post wall Fossae xx.

Larson, L. P., TM1c - 0 rt #4 lt - moderate ads. - tubes flat (TORPOISE)

R' 2-20 Bannerman, G. L., RM1c - #4 rt #4 lt - large ads. - tubes closed (TORPOISE)

---

20 February 1945, Tuesday.

8 new cards Radium
1 2nd Radium

15 Pressured
14 Aero-Otitis Media
6 Failures:

Carr, C. J., SM3c (Diver) - out at 10 lbs. - #4 rt 0 lt - cold - small ads. - tubes narrow, open. (Dr. Kelly)

R' 2-21 Friday, J. E., S2c - out at 10 lbs. - #4 rt #4 lt - enormous ads. - tubes covered.

Twiss, L. K., S1c - out at 10 lbs. - #4 rt 0 lt - very large ads - tubes flat.

Tanner, F. L., S2c (Diver) - out at 24 lbs. - 0 rt #4 lt - enormous ads. - tubes flat. (Dr. Kelly)

R' 2-28 Altig, J. R., S2c - out at 8 lbs. - #3 rt #3 lt - small ads. - tubes flat.

R' 2-20 Ormond, Ray L., MM1c (TORPOISE) - out at 6 lbs - #3 rt #3 lt - small ads. - both tubes open.

Passed:

Leason, H. G., F1c - #3 rt #1 lt - moderate ads. - midline project tubes open.

Voeltz, L., S1c - 0 rt #4 lt - very large ads. and tubes flat - left closed - Fossae xx.

Armstrong, W. G., F1c - left perforation - moderate ads. - projecting - tubes closed and flat.

Coghlan, H. C., RT3c - #3 rt 0 lt - small ads. - both tubes open.

Krammer, W. I., F2c - 0 rt #3 lt - moderate ads. - tubes flattened.

R' 2-20 Valentine, E. E., CMoM (TORPOISE) - 0 rt #3 lt - small ads. - tubes closed, flat.

R' 2-20 Volliere, H. T., Y1c(CACHALOT) - 0 rt #3 lt - small ads - nodules over left tube.

R' 2-20 Fosberg, O. A., CMoM (CACHALOT) - #3 rt 0 lt - small ads. - tubes narrow, flat.

19 February 1945.

MEMORANDUM TO OFFICER-IN-CHARGE, MEDICAL RESEARCH DEPARTMENT.

SUBJECT: X-Ray Therapy Treatment of Aero-Otitis Media.

1. The following named men are to report to Dr. Dubilier, U. S. Naval Hospital, Brooklyn, New York, on 20 February 1945 at 1000 for X-ray therapy treatment of aero-otitis media:

ONAN, James B., MoMMlc - #4 rt #4 lt - moderate amount adenoids - both tubes flattened - large amount in each Fossae of Rosenmuller - bleeding from both eustachian tubes.

GRENE, R. J., Slc - #4 rt #4 lt - moderate amount adenoids - tubes flat - fossae partially filled - bleeding from both tubes.

FREUND, C. G., Flc - 0 rt #4 lt - enormous adenoids - tubes covered and not seen - Fossae of Rosenmuller filled - bleeding from left eustachian tube.

CARTER, J. D., S2c - #4 rt #3 lt - moderate adenoids midline and post-wall - extending into fossae - bleeding from right eustachian tube.

ZEHR, E. E., Slc - #5 rt 0 lt - small adenoids over post-wall - tubes flattened - bleeding from right eustachian tube.

H. L. HAINES
Lieut. (jg), (MC) U

HLH:pf

24 February 1945, Saturday

Five cases were sent to the Naval Hospital, Brooklyn. All returned Tuesday evening and were admitted to sick bay with a post radiation parotitis and sub maxillary swelling. Unable to open mouth, mouth dry, swelling objectively over parotitis and submaxillary glands.

These patients were alarmed and after discussing their troubles among themselves were in a pretty state of mind. All have recovered. They had some earache after radiation and none could inflate ears and felt as if ears were stuffed up and they had a cold.

They are willing to return for the second treatment next week.

Dosage checked with Dr. McDonald - (Radiologist at Disp. & this dosage appears to be okay - Letter written to Dr. Dubilier

21 February 1945, Wednesday - Morning

5 more Rechecks by 4 Dec

53 Pressured
12 Aero-Otitis Media
3 Failures:

R'2-28 Farr, H. N., S1c - out at 5 lbs. - #1 rt #3 lt - enormous ads. - tubes covered.
R'2-28 Ellis, J. B., S1c - out at 8 lbs. - #4 rt #4 lt - enormous ads. - tubes covered.
Cunningham, J. V., E2c (S13) - out at 4 lbs. - #4 rt #4 lt - moderate ads. - tubes flat - bleeding - Fossae xx.

Passed:

Donnely, J. W., S2c - 0 rt #2 lt - large ads. - tubes flat - cold.
Haer, H. C., S1c - #4 rt #1 lt - enormous ads. - tubes covered.
MacIntyre, N., S1c - #4 rt #1 lt - enormous ads. - tubes covered.
Marshall, L. B., S2c - 0 rt #3 lt - moderate ads. - tubes flat, closed.
Orr, R. F., S1c - #4 rt 0 lt - moderate ads. - mid line - left flat, covered - right plugged.
Smith, Ray F., RT2c - #2 rt perforated left - left covered - moderate ads. - right flat with nodule in canal - cold.
Sparks, T. N., S1c - #3 rt #4 lt - very large ads. - tubes covered.
Mesler, R. J., SM2c (S13) - #2 rt 0 lt - moderate ads. - tubes open - nodules on margins and laterally - cold
Fuhrman, H. A., F1c (S13) - 0 rt #2 lt - small ads. - tubes narrow, open.- slight cold.

21 February 1945, Wednesday - Afternoon

Rechecks

13 Pressured
11 Aero-Otitis Media
1 Failure:

R' 2-16 Giacobine, D. W., F1c - out at 8 lbs. - #4 rt #4 lt.

Passed:

R' 2-16 Abbott, R. C., S2c - #3 rt #4 lt
Levitt, I. R., S1c - 0 rt #4 lt
Dawson, G. S., F1c - #3 rt 0 lt
R1 2-13 Christia, L. J., F1c - 0 rt #1 lt
R1 2-13 Ajello, E., F1c - #4 rt #4 lt
Hollingsworth, J. T., S1c - 0 rt #1 lt
R1 2-14 Augustyniack, E. J., RT3c - #4 rt #4 lt
R1 2-14 Wilson, E. H., RT3c - 0 rt 0 lt
R1 2-22 Thorpe, W. C., F1c - #4 rt #3 lt
R1 2-16 Haynes, R. W., S2c - #4 rt #4 lt
Grayson, S. B., S1c - 0 rt 0 lt
Selvey, C. B., S1c - 0 rt #2 lt

22 February 1945, Thursday

1 New Radio Q
2 and Radio-R

42 Pressured
12 Aero-Otitis Media
4 Failures:

R 2-28 Lochow, M. E., S1c - out at 4 lbs. - 0 rt #4 lt - enormous ads. - tubes covered and closed.

2-27 R' Perry, G. H., RT3c - out at 4 lbs. - #1 rt #2 lt - very large ads. - tubes flat.

Roy, H. F., S1c - out at 4 lbs. - #4 rt 0 lt - moderate ads. - tubes flat.

R 2-26 Tober, L. E., F1c - out at 4 lbs. - #3 rt #4 lt - enormous ads. - tubes covered.

Passed:

Baumgardner, W. J., F1c - #4 rt 0 lt - moderate ads. - tubes flat.

Chattas, V. J., F1c - #3 rt #1 lt - small ads. - tubes flat - Fossae xxx.

Josephs, B., RT3c - #2 lt 0 rt - very small ads. - tubes open.

Harvey, R. E., RT3c - #2 rt 0 lt - small ads. - tubes flat, open.

McKean, A. H., RT2c - 0 rt #3 lt - moderate ads. - tubes flat - Fossae xxx.

McCarthy, C. T., S1c - perforation in rt - #4 lt - large ads. - scarred drums - tubes flat, covered.

Stemp, T., T1c (0-10) #3 rt 0 lt - scarred and ret. drums - moderate ads. - tubes flattened - slight cold.

R' 2-24 Prizel, W. R., T1c (0-10) #4 rt #3 lt - large ads. - tubes covered - flat, ret. drums.

22 February 1945, Thursday Rechecks

6 Pressured
5 Aero-Otitis Media
0 Failures

Passed:

R' 1-22 Cole, C. B., Ensign - 0 rt. #2 lt.

R' 1-22 Nuckles, R. E., Ensign - 0 rt #3 lt.

R' 1-22 Magill, A. A., Lt.(jg) - #4 rt. #4 lt.

R' 2-1 Belt, R. W. Jr., Lt. - #4 rt. #1 lt. - subjectively no trouble.

R' 2-1 Miller, D. B., Lt. (jg) - #4 rt. 0 lt.

3 new Radium Rx
3 2d Radium Rx

23 February 1945, Friday

39 Pressured
13 Aero-Otitis Media
5 Failures:

R'2-28 Fox, J. R., RT3c - out at 5 lbs. - #3 rt. #3 lt. enormous ads. - tubes flat, covered.
R'2-28 Swoers, W. J., F1c (Spritz) - out at 4 lbs. - #3 rt. #2 lt. - moderate ads. - project - tubes covered, open - Fossae xx
R'2-28 Stanbury, R. J., RT2c (Spritz) - out at 4 lbs. - #2 rt. #2 lt. - large ads. - piled up - tubes crowded - nodules in left.
R'2-28 Tompkins, E., S2c - out at 4 lbs. - #3 rt. 0 lt. - enormous ads. - tubes covered -slight cold.
R'2-23 Fain, I. S., RT1c (S-13) - out at 4 lbs. - #4 rt. #3 lt. - large ads. - tubes flat - closed.

Passed:

Ledger, D. E., S1c - #4 rt. 0 lt. - very large ads. - tubes flat.
Harrison, D. I., S1c - #4 rt. #3 lt. - large ads. - tubes flat.
Duncan, C. S., S2c - #2 rt. 0 lt. - moderate ads. - tubes flat.
Hasell, R. F., RT3c - #2 rt. #2 lt. - large ads. - tubes open, narrow.
Hintle, T. H., S2c - #3 rt. 0 lt. - large ads. - tubes flat, crowded.
Kelleher, J. R., CM1 - #3 rt. 0 lt. (HIKE) - large ads. - tubes flat.
Baxter, I. F., STM2c - #4 rt. #3 lt. (HIKE) - enormous ads. - tubes flat.
White, J. A., FC2c - #2 rt. #3 lt. - (HORNOSE) - enormous ads.

Radium treatments to date: 177 in Feb
88 in Jan
265 to date:

✓ CWS

Saturday - 24th February -
Zero pressure today.
5 new radium cases
2 2nd radium Rx.

26 February 1945, Monday

7 Drum Cases
2 2nd Red Pk

46 Pressured
10 Aero-Otitis Media
3 Failures:

2-26 R. CHRISTIAN, R. F., [illegible]2c - out at 28 lbs. - 4 rt. 2 lt. - moderate ads. - tubes narrow and crowded.

2-26 R. NARASMAE, I. G., S2c - out at 15 lbs. - 2 rt. 0 lt. - enormous ads. - tubes covered.

2-26 R. VARGAS, Jasper, SC3c - out at 14 lbs. - 4 rt. 4 lt. - enormous ads. - tubes covered and flat.

Passed:

COLMAN, M. D., S[illegible]2c - (0-7) 3 rt. 2 lt. - ads. not seen.
FARRAR, S. M., S[illegible]2c (0-10) 4 rt. 0 lt. - enormous ads. - tubes flat and bleeding.
[illegible], [illegible], F1c (0-7) - 0 rt. 3 lt. - moderate ads. - tubes flat and crowded.
LICK, E. F., C[illegible] (0-7) - 3 rt. 1 lt. - small ads. - tubes narrow and crowded.
[illegible], [illegible], F1c (0-2) - small ads. - tubes flat, open.
MAGOO, T. J., [illegible]2c (0-7) - 0 rt. 4 lt. - large ads. - tubes narrow.
ROTH, Howard Jr., S[illegible]3c - 3 rt. 1 lt. - large ads. - tubes flat and closed.

U. S. NAVAL HOSPITAL
NEW YORK, N. Y.
263 FLUSHING AVENUE, BROOKLYN 1, N. Y.

AND REFER TO NO

2-27-45

Dr. H. Haines
U. S. Submarine Base
New London, Conn.

Dear Dr. Haines,

Apparently the severe reactions were due to irradiating the parotid glands. I have reduced the size of the field to 3½ cm. and placed it posterior to the parotid. I expect that there will not be any acute reactions from this time on. The dosage has not been reduced.

I examined the boys with a nasopharyngoscope and did not find any erythematous reactions about the eustachian orifice.

I would appreciate a report of comparative audiograms in about 6 weeks as it should take that long before full affect can be noticed.

Sincerely,

B. DuBilier
Lt. MC USNR

27 February 1945, Tuesday

6 new radium cases
8 2nd radium Rx

65 Pressured
22 Aero-Otitis Media
6 Failures:

2-27 R' [illegible], R. F., MoM2c (O-4) - Out at 7 lbs. - 4 rt. 1 lt. - moderate ads. - tubes flat - nodule - right.
[illegible], F. R., MoM1c (DOINING) - Out at [illegible] lbs. - 4 rt. 4 lt. - moderate ads. - tubes flat, closed.
2-27 R' [illegible], F. J., S01c (DOINING) - Out at 20 lbs. - 3 rt. 3 lt. - moderate ads. - tubes covered, flattened, open.
2-27 R' [illegible], A. C., S2c (DOINING) - Out at 5 lbs. - 3 rt. 2 lt. - small ads. - tubes narrow - flattened, open.
2-27 R' [illegible], J. F., MoM2c (DOINING) - Out at 5 lbs. 3 rt. 1 lt. - small ads. - tubes flat.
2-27 R' [illegible], C. [illegible], C[illegible] (DOINING) - Out at 6 lbs. - 4 rt. 2 lt.

Passed:

[illegible], G. R., F1c - 4 rt. 4 lt. - enormous ads. - tubes covered, flat.
[illegible], I. T., T1c (DOINING) - 3 rt. 0 lt - large ads. - tubes flat.
[illegible], C. R., RT2c - 3 rt. 0 lt. - very large ads. - tubes covered, flat.
[illegible], [illegible] C., MoM1c - 0 rt. 3 lt. - small ads. - tubes flat.
[illegible], J. [illegible], MoM1c - 4 rt. 1 lt. - enormous ads. - tubes covered, flat.
[illegible], A. R., F1c - (DOINING) 4 rt. 4 lt. - large ads. - tubes flat.
[illegible], J. [illegible], S2c (DOINING) 0 rt. 4 lt. - small ads. - tubes narrow, open.
[illegible], [illegible], S1c (DOINING) - 3 rt. 4 lt. small ads. - tubes narrow, flat.
[illegible], J. F., CM (DOINING) 3 rt. 3 lt. - moderate ads. - tubes narrow and open.
[illegible], R. C., S2c - 4 rt. 4 lt. - enormous ads. - tubes covered, flat.
[illegible], C. J., MoM1c (DOINING) - 0 rt. 3 lt. - small ads. - tubes flat and open.
[illegible], C. F., S1c - 0 rt. 4 lt. - enormous ads., tubes flat, covered.
[illegible], G. R., MoM3c - DOINING - 0 rt. 4 lt. - enormous ads. - tubes flat.
2-28 R' [illegible], F. F., Lieut. - (DOINING) - 0 rt. 4 lt. - small ads. - tubes flat.
[illegible], L. C., RT2c (School) - 4 rt. 4 lt. - moderate ads. - tubes flat.
[illegible], G. I., S2c (School) - 0 rt. 3 lt. - enormous ads. - tubes covered - nodules left.

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27 February 1945, Tuesday Afternoon

10 Pressured - Divers
3 Aero-Otitis Media
0 Failures

Passed: - To be treated by Dr. Kelly

R'3-5 GALLI, John, SF3c - 4 rt. 4 lt. - moderate ads. - tubes flat, closed.
Dr. Kelly [illegible], [illegible], F1c - 0 rt. 4 lt. - moderate ads. - tubes flat - cold.
R'3-5 [illegible], [illegible], S1c - 4 rt. 4 lt. - enormous ads. - tubes covered, flat.

28 February 1945, Wednesday

12 new cases Rx Rep.
1 sec. radium Rx

29 Pressured
8 Aero-Otitis Media
3 Failures:

Spencer, R. W., EM1c - out at 5 lbs. - moderate ads. - tubes flat - pro.
R'3-15 Tripodi, J. F., S1c - out at 5 lbs. - moderate ads. - tubes covered.
Miller, B. E., S1c - out at 5 lbs. - 3/3 rt. 3/3 lt. - moderate ads. - tubes covered.

Passed:

R' 2-26 Bowshier, J. F., IM1c - 4/4 rt. 4/4 lt. - perviously checked
Ferguson, J. E., F1c - 3/3 rt. 3/3 lt. - moderate ads. - tubes flat, closed.
Heintzman, J. S., RT2c - 4/4 rt. 4/4 lt. - moderate ads. - tubes flat, closed.
R' 2-17 Lehaige, F. T., IM1c - 4/4 rt. 4/4 lt. - perviously checked
Pontzious, W. D., S1c - 3/3 rt. 0 lt. - enormous ads. - tubes covered.
R' 3-16

28 February 1945, Wednesday

Rechecks

21 Pressured
17 Aero-Otitis Media
7 Failures:

R' 2-21 Cowan, J. I., RM3c - out at 5 lbs. - 3/3 rt. 3/3 lt.
R' 2-28 Ellis, J. B., S1c - out at 5 lbs. - 4/1 rt. 4/4 lt.
R' 2-14 Shore, Q. C., S2c - out at 5 lbs. - 4/4 rt. 4/4 lt.
R' 2-28 Stanbury, R. J., RT2c - out at 5 lbs. - 3/3 rt. 3/3 lt.
R' 2-13 Stewart, S. J., F2c - out at 5 lbs. - 4/4 rt. 4/1 lt.
R' 2-14 Swivers, A. J., F1c - out at 5 lbs. - 3/3 rt. 4/4 lt.
R' 2-14 Taber, L. S. Sr., F1c - out at 5 lbs. - 3/3 rt. 0 lt.

Passed:

R' 2-28 Altig, J. R., S2c - 0 rt. 0 lt.
R' 2-16 Clark, J. C., SM2c - 0 rt. 0 lt.
Fairbank, I. C., S1c - 4/4 rt. 4/1 lt.
R' 2-28 Farr, H. E., S1c - 3/3 rt. 4/1 lt.
R' 2-21 Floyd, R. W., S1c - 4/2 rt. 0 lt.
R' 2-16 Giadobine, D. A., F1c - 4/4 rt. 4/2 lt.
R' 2-16 Hashagen, V. E., F1c - 4/4 rt. 3/3 lt.
R' 2-16 Johnson, H. C., F1c - 0 rt. 4/1 lt.
R' 2-14 Mishler, R. L., S1c - 4/4 rt. 4/1 lt.
R' 2-28 Friday, J. E., S2c - 0 rt. 4/2 lt.
R' 2-14 Smith, G. A., S1c - 0 rt. 0 lt.
R' 2-14 Stahler, O. E., RT3c - 0 rt. 0 lt.
R' 2-28 Tompkins, E., S2c - 4/2 rt. 0 lt.
Twiss, L. K., S1c - 3/3 rt. 0 lt.

907 Pressured
283 cases Aero-Otitis media
241 Treated

February Summary

① 198 new radium treatments in Feb.
43 received 2nd radium treatments in
241 treated in Feb
88 treated in Jan.
329 treated to date.

② Chewing gum ordered for check of its effect in changing tissue.

③ 5 cases sent to Naval Hospital Brooklyn N.Y. for X Ray treatment of adenoids — in both treatments a wide apart — all patients had to be admitted to sick bay due to swelling & discomfort from radiation of tonsils. Less trouble after second treatment due to using smaller filter however there appears to be some erythema of skin thru which radiated. This form of treatment has been discontinued temporarily until okay for transportation from human, adults. The intra oral approach will be attempted on next cases. The above five will not report for their third treatment ~~and~~ however they are not unwilling to go. They will be checked as to adenoids in 3 wks from now & again in 6 wks.

④ In Kelly's cases — 5 have turned out "surprisingly" to me well — all have noticeably "more comfortable" & pass pressure like 2 mitts.

(9b) 5 Each cases "lends" in Falconer accepted

1 March 1945, Thursday

1 new Radium Rx
2 2nd Radium Rx

17 Pressured
2 Aero-Otitis Media
0 Failures

Passed:

Conser, R. E., RT3c - 0 rt. 4 lt. - enormous ads left - right flat - left covered.
Snyder, A. C. Jr., S1c - 3 rt. 0 lt. - small ads. - tubes open, crowded.

2 March Friday -
No pressure group - tank overhaul -
3 new radium Rx
11 2nd radium Rx

3 March Saturday:
No pressure group - tank overhaul
Maj. Dearmin MC AA Inc, Maj. McDonald VC - unfit from wish to return.
C.U.S.

UNITED STATES SUBMARINE BASE
NEW LONDON, CONNECTICUT

February 24th, 1945

Copy - Rough!

Dear Dr. Dubilier:

The five patients sent for Xray Treatment of their nasopharynx returned here with rather marked swelling of region of the parotids and sub-maxillary glands. All were somewhat terrified because they could only open their mouths abou a cm. They had some pains in the jaw and reddness of their drums. They were admitted on sick-bay by one of the dispensary and were discharged yesterday. They are returning as per schedule Tuesd

You may wish to change the dosage or the schedule of treatment; what ever you wish to do will be all right here.

Thursday the second group will report for treatment(1

Cancelled

Dr. H. Haines

5 March 1945, Monday

27 Pressured
7 Aeor-Otitis Media
1 Failure:

Barry, J. F., MoMlc - out at 5 lbs. - #4 rt. #4 lt. - large ads. - tubes flat.

Passed:

Earle, M. E., S2c - #4 rt. 0 lt. - large ads. - tubes covered.
Hann, J. G., S2c - #2 rt. #2 lt. - small ads. - tubes narrow and open.
Hickman, R. J., Mlc - #4 rt. #4 lt. - enormous ads. - tubes flat.
LeValley, V. R., S2c - #2 rt. 0 lt. - small ads. - tubes open - cold.
Ramsey, E. B., Slc - #4 rt. #4 lt. - enormous ads. - tubes covered and flat.
Whitford, B. M., Slc - #3 rt. 0 lt. - small ads. - tubes narrow and flat.

6 March 1945, Tuesday Rain - Warm

30 Pressured
12 Aero-Otitis Media
4 Failures:

R'3-15 Chakourides, J., S2c - out at 6 lbs. - #4 rt. #4 lt. small ads. - tubes crowded, flattened, open.
R'3-16 Jewell, S. E., SM2c - out at 3 lbs. - #3 rt. #3 lt. - very large ads. - tubes covered and flat - cold.
Lewis, G. W., Flc - out at 12 lbs. - 0 rt. #4 lt. - large ads. tubes flat.
Miller, C. I., F2c - out at 3 lbs. - #1 rt. 0 lt. - small ads. - tubes open.

Passed:

Atchison, W. B., Slc - #3 rt. #4 lt. - large ads. - proj. tubes covered and flat.
Bates, R. S., F2c - #4 rt. #4 lt. - moderate ads. - tubes covered.
Campbell, F. H., F2c - #3 rt. #3 lt. - enormous ads. - tubes not seen.
Ginnane, D. E., S2c - #4 rt. #4 lt. - small ads. - tubes closed and flat.
Rhodem, B. T., EM2c - #3 rt. 0 lt. - large ads. - tubes flat - cold.
Schuman, S., Slc - #2 rt. #2 lt. - scared - moderate ads. - tubes covered.
Smith, F. B. Jr., Flc - #3 rt. #1 lt. - small ads. - tubes flat and cold.
Widtman, W. M., S2c - #2 rt. #2 lt. - scared - small ads. - tubes open.

Tuesday - March 6th -

5 March 1945.

MEMORANDUM TO OFFICER-IN-CHARGE, MEDICAL RESEARCH DEPARTMENT.

Subject: X-Ray Therapy Treatment of Aero-Otitis Media.

1. The following named men are to report to Dr. Dubilier, U. S. Naval Hospital, Brooklyn, New York, on 6 March 1945 at 1000 for X-ray therapy treatment of aero-otitis media:

ONAN, James B., MoMMlc - #4 rt #4 lt - moderate amount adenoids - both tubes flattened - large amount in each Fossae of Rosenmuller - bleeding from both eustachian tubes.

GRENE, R. J., Slc - #4 rt #4 lt - moderate amount adenoids - tubes flat - fossae partially filled - bleeding from both tubes.

FREUND, C. G., Flc - 0 rt #4 lt - enormous adenoids - tubes covered and not seen - Fossae of Rosenmuller filled - bleeding from left eustachian tube.

CARTER, J. D., S2c - #4 rt #3 lt - moderate adenoids midline and post-wall - extending into fossae - bleeding from right eustachian tube.

ZEHI, E. E., Slc - #4 rt 0 lt - small adenoids over post-wall - tubes flattened - bleeding from right eustachian tube.

H. L. HAINES
Lieut. (jg), (MC) USNR

This is our 3rd X Ray treatment. Have had these weekly & with rather marked post radiation reactions of "deafness" - stuffiness of ears & pain in & about ears & parotids. Dosage to be reduced & another partial course to be done this. Dr H.

TELEPHONE:
EVERGREEN 8-2600

U. S. NAVAL HOSPITAL
NEW YORK, N. Y.
263 FLUSHING AVENUE, BROOKLYN 1, N. Y.

ADDRESS YOUR REPLY TO
THE COMMANDING OFFICER
AND REFER TO NO._____

Dear Dr Haines.

I treated the men according to your findings. I gave Otrivin & Prene Rx to both tubes. Freund - to left, Carter to rt & Zeli to Rt..

If you think we should concentrate on the affected tubes only it may be easier on the soft palate. It will mean sending the clinical findings along with each new group.

Sincerely
Ben DeBelis

On return from Brooklyn, Naval Hospital these pts. complained of pain in ears, deafness & difficulty in urination. All were admitted to sick bay for several days. Staff has pursued now for 5 days - all sent roentgenograms with some diagnosis across scale. Nasopharynx is red & edematous. Drums are opaque.

7 March 1945, Wednesday

20 Pressured
11 Aero-Otitis Media
4 Failures:

R'3-7 Baird, H. D., S2c - out at 7 lbs. - 1/1 rt. 1/4 lt. - enormous ads. - pro. tubes flat.
R'3-7 Callery, J. J., S1c - out at 4 lbs. - 1/3 rt. 1/3 lt. - moderate ads. - tubes covered, flat.
R'3-7 Carr, S. J., RT3c - out at 7 lbs. - 1/4 rt. 0 lt. - small ads. - tubes open.
R'3-7 Henderson, R. E., S2c - out at 7 lbs. - 1/2 rt. 1/4 lt. - moderate ads. - tubes narrow, closed.

Passed:

Dirker, W. H., S2c - 1/2 rt. 1/1 lt. - small ads. - tubes narrow, open.
R'3-7 Lamoureux, R. M., CMoM (Training Tank) - large perf. rt. - 1/3 lt. - moderate ads. - tubes flat - left open.
R'3-7 Ourand, R. C., S1c - 1/4 rt. 1/4 lt.
Racine, G. A., RT3c - 1/4 rt. 1/4 lt. - enormous ads. -tubes covered, flat.
Rowe, H. R., S1c - 1/2 rt. 1/2 lt. - large ads. - pro. tubes flat.
Shannon, A. I., SC1c - 0 rt. 1/4 lt. - small ads. - tubes flat.
Suter, J. E., S1c - 1/2 rt. 1/4 lt. - enormous ads. - tubes covered and flat.

7 March 1945, Wednesday

Rechecks

15 Pressured
14 Aero-Otitis Media
7 Failures:

R'2-28 Cowan, J. T., RT3c - out at 14 lbs. - 1/4 rt. 1/4 lt.
R'2-28 Ellis, J. B., S1c - out at 4 lbs. - 1/2 rt. 1/3 lt.
R'2-23 McCormack, J. H., F1c - out at 14 lbs. - 0 rt. 1/4 lt.
R'2-24 Schrader, L. W., RT2c - out at 4 lbs. - 1/3 rt. 1/3 lt.
Spencer, R. W., E1c - out at 14 lbs. - 0 rt. 1/4 lt.
7P34 - Dropped R? Stewart, S. J., F2c - out at 32 lbs. - 1/4 rt. 0 lt. -7
Willer, D. E., S1c - out at 11 lbs. - 1/2 rt. 1/3 lt.

Passed:

Bengard, V. S., LoH3c - 1/3 rt. 0 lt.
R'2-26 Barasman, T. G., S2c - 0 rt. 0 lt.
R'2-28 Lochow, E. E., S1c - 0 rt. 1/4 lt.
R'2-21 Puchner, A. J., S2c - 1/4 rt. 1/4 lt.
Roy, H. F., S1c - 1/4 rt. 0 lt.
R'2-28 Stanbury, R. J., RT2c - 0 rt. 1/3 lt.
R'2-26 Taber, L. M., F1c - 1/1 rt. 1/1 lt.
R'2-26 Vargas, J., SC3c - 1/1 rt. 1/1 lt.

8 March 1945, Thursday

32 Pressured
5 Aero-Otitis Media
3 Failures:

Caldwell, J. J., SK2c - out at 12 lbs. - #4 rt. #2 lt. - small ads. - tubes narrow.
R'3-8 Judwiczak, T. A., RT2c - out at 9 lbs. - #3 rt. #3 lt. enormous ads. - tubes covered.
R'3-8 McDonnell, E. F., RT3c - out at 4 lbs. - #4 rt. #3 lt. - moderate ads. - tubes covered.

Passed:

Tillson, W., RT2c - #4 rt. #4 lt. - large ads. - tubes flat.
Waite, J. B., F2c - #1 rt. #4 lt. - small ads. - tubes flat.

9 March 1945, Friday

24 Pressured
[illegible] Aero-Otitis Media
3 Failures:

R'3-10 Johnson, S. F., S1c - out at 4 lbs. - 0 rt. #4 lt. - small ads. - tubes crowded - bleeding on left.
R'3-10 Jones, P. D., F1c - out at 16 lbs. - #1 rt. #3 lt. - moderate ads. - tubes covered - cold.
R'3-10 Seufert, A. E., F1c - out at 7 lbs. - 0 rt. #4 lt. - moderate ads. - tubes narrow, open.

Passed:

R'3-9 Finn, J. S., Lt.Comdr. - (O-4) #3 rt. #1 lt.
R'3-10 Barnes, J. S., F1c - #3 rt. #4 lt. - moderate ads. - tubes flat.
R'3-10 Elias, J., SC2c - #3 rt. 0 lt. - large ads. - tubes flat.
R'3-12 Lake, R. H., S1c - #4 rt. #4 lt. - small ads. - tubes covered, flat.
R'3-12 Ryykenen, C. S., S1c - #3 rt. 0 lt. - small ads. - tubes open - nodules.

Copied weather conditions for month of February & will try to correlate with failures — during that month. — Data taken from "Penguin's" log — Weather bureau only keeps its predictions & not what weather actually is. — C.W.S.

March 12, 1945, Monday

38 Pressured
8 Aero-Otitis Media
6 Failures:

R'3-12 Chapman, R. G., MoM3c (O-4) - out at 5 lbs. - 0 rt. #3 lt. - small ads. - right tube open, clear, - left closed, flat.
R'3-12 Gigliotti, B. J., F1c - out at 6 lbs. - #3 rt. #4 lt. - small ads. - right tube open - left shut.
R'3-12 Maslin, G. W., F2c - out at 12 lbs. - #4 rt. #4 lt. - moderate ads. - proj. tubes narrow, crowded.
R'3-12 Munk, G. A., F1c - out at 9 lbs. - 0 rt. #4 lt. - mod. ads. - proj. tubes narrow, open. R tube covered.
R'3-12 Reed, H. M., F1c - out at 6 lbs. - #4 rt. #4 lt. -
R'3-12 Nachob, G. D., F2c - out at 6 lbs. - #1 rt. #4 lt. - enormous ads. - tubes covered, proj.

Passed:

R'4-13 Favors, J. W., EM2c (Sturgeon) - #4 rt. #4 lt. - enor. ads. - covered - proj.
Lopp, J. D., TM3c (Sturgeon) - #3 rt. #2 lt. - small ads. - nodules over both tubes.

Tuesday March 13th:
Capt. Shilling returned from Wash DC. - The XRay treatment of aero-otitis media has been discontinued.
Those treated (the 5 previously written up in past 2 wks) have all had to be hospitalized following treatment because of ear aches - deafness - acute post radiation parotitis. This is slow in clearing at present but no infectious procks present. They are being followed & will be checked again about 2nd wk in April for effect on adenoids.
No more cases to be treated by XRay.
To date there has been no ill effects from the radium.

Due to increased # of treatments a 7 inch lead shield was placed on treatment t

13 March 1945, Tuesday

36 Pressured
11 Aero-Otitis Media
6 Failures:

R'3-14 Fleming, W. J., RT2c - out at 7 lbs. - #3 rt. #4 lt. - moderate ads. - nodules in tubes. - D. Kelly

R'3-13 Hume, B. W., EM2c (STURGEON) - out at 4 lbs. - 0 rt. #3 lt. - very large ads. - tubes flat - slight cold - has had trouble before.

R'3-15 Larson, W. C., RT1c - out at 4 lbs. - 0 rt. #3 lt. - small ads. - tubes flat.

Peebles, J. D., RT2c - out at 4 lbs. - #3 rt. #1 lt. - moderate ads. - tubes covered. - D. Kelly

R'3-15 Schatzsnider, C. G., S1c - out at 4 lbs. - #2 rt. #4 lt. - moderate ads. - tubes covered.

R'3-14 Yoder, R. E., F1c - out at 10 lbs. - #4 rt. #4 lt. - enormous ads. - tubes covered, bleeding.

Passed:

R'3-14 Clark, H. C., S1c - 0 rt. #4 lt. - small ads. - tubes open, crowded.

R'3-14 Dodson, F. E., S2c - #3 rt. #2 lt. - small ads. - tubes open, flat.

R'3-14 Ellis, C. M., F1c - #4 rt. #4 lt. - enormous ads. - tubes covered.

R'3-14 Harper, W. E., RT2c - #1 rt. #2 lt. - moderate ads. - tubes flat, covered.

R'3-13 Stine, M. L., TM1c (STURGEON) - #3 rt. #3 lt. - tubes covered - enormous ads. - frequent similar trouble before.

14 March 1945, Wednesday

35 Pressured
10 Aero-Otitis Media
5 Failures:

R'3-15 Atchison, G. B., QM1c - out at 4 lbs. - #2 rt. #3 lt. - enormous ads. - tubes covered.

R'3-15 Hedquist, E. T., S1c - out at 14 lbs. - #4 rt. 0 lt. - moderate ads. - right tube closed - left tube open.

R'3-15 Morton, W. I., S1c - out at 9 lbs. - 0 rt. #3 lt. - enormous ads. - tubes covered.

Steinman, W. S., S2c - #3 rt. #3 lt. - enormous ads. - tubes covered - proj. - out at 4 lbs.

R'3-15 Williams, J. D., S1c - out at 4 lbs. - #3 rt. 0 lt. - moderate ads. - tubes flat - cold.

Passed:

R'3-14 Bunch, E., RT3c - #4 rt. #2 lt. - large ads. - tubes covered.

R'3-14 Clark, F. R., F1c (STURGEON) - 0 rt. #3 lt. - enormous ads. - tubes covered.

R'3-15 Funk, F. H., RM1c - (STURGEON) - #4 rt. #4 lt. - moderate ads. - tubes flat - cold.

R'3-14 Harvath, J. J., EM1c - #3 rt. #2 lt. - large ads. - tubes flat.

R'3-15 Parker, J. S., QM2c - #4 rt. #4 lt. - moderate ads. - tubes narrow.

14 March 1945, Wednesday afternoon

Rechecks

27 Pressured
25 Aero-Otitis Media
4 Failures:

Disq R'[illegible] Duncan, J., S2c - out at 6 lbs. - #4 rt. #4 lt. -
R' 3-15 Jewell, S. E., SM2c - out at 7 lbs. - #4 rt. 0 lt.
R' 2-21 Muhler, C. P., S1c - out at 7 lbs. - 0 rt. #4 lt.
Disq R'[illegible] Saltus, M., F2c - out at 20 lbs. - #4 rt. #4 lt.

Passed:

Barry, J. F., MoMM1c - #3 rt. #4 lt.
R' 3-27 Baird, H. D., S2c - #4 rt. #4 lt.
R' 3-17 Callery, J. J., S1c - #2 rt. #2 lt.
R' 3-2 Carr, S. W., RT3c - #4 rt. #2 lt.
R' 3-15 Chakoudes, J., S2c - #4 rt. #3 lt.
R' 2-26 Christian, R. M., MM2c - #3 rt. 0 lt.
R' 2-21 Cowan, J. P., RM2c - #4 rt. #4 lt.
R' 2-28 Ellis, J. B., S1c - #4 rt. #4 lt.
R' 1-25 Fowler, H. G., S2c - #3 rt. #3 lt.
R' 2-18 Fox, J. R. Jr., RT3c - 0 rt. 0 lt.
R' 3-7 Henderson, [illegible] S2c - #4 rt. #4 lt.
R' 3-16 Johnson, S. P., S1c - #2 rt. #2 lt.
[illegible] Lewis, G. W., F1c - 0 rt. #2 lt.
R' 3-8 McDonnell, E. P., RT3c - #4 rt. #3 lt.
R' 2-16 Mullen, J. F., S2c - #3 rt. #3 lt.
R' 2-27 Perry, G. H., RT3c - #2 rt. #2 lt.
R' 1-24 Schrader, L. W., RM2c - 0 rt. 0 lt.
R' 2-14 Shore, Q. C., S2c - #4 rt. 0 lt.
Spencer, R. W., EM1c - 0 rt. #2 lt.
R' 2-28 Sweers, W. J., F1c - #3 rt. #2 lt.
R' 3-4 Tripodi, J. P., S1c - #4 rt. #4 lt.
Willer, D. E., S1c - #3 rt. #3 lt.

R' 3-14 Reppe, C. B., MoMM2c (STURGEON)

15 March 1945, Thursday

24 Pressured
5 Aero-Otitis Media
4 Failures:

R' 3-15 BURKHART, P. J., S1c - out at 5 lbs. - #4 rt. #2 lt. - enormous ads. - tubes covered, closed - proj.
R' 3-15 LEROUX, J. W., S1c - out at 5 lbs. - #3 rt. #4 lt. - large ads. - tubes flat.
R' 3-15 LLOLD, H. F. D., S2c - out at 4 lbs. - #2 rt. #2 lt. - large ads. - tubes covered - cold.
R' 3-15 PEPLOE, G. M., RT2c - out at 4 lbs. - 0 rt. #3 lt. - small ads. - tubes crowded.

Passed: (Recheck)

KELLAM, W. G., MoMM2c (Diver) - #1 rt. #1 lt. - Dr Kelly.

Wednesday

16 March 1945, Friday

25 Pressured
6 Aero-Otitis Media
4 Failures:

R'3-19 Larson, H. I., S2c - out at 7 lbs. - #3 rt. #3 lt. - moderate ads. - tubes covered, flat.
R'3-19 Mocock, R. E., S2c - out at 7 lbs. - #2 rt. #2 lt. - cold - moderate ads. - tubes crowded.
R'3-19 Miswender, D. E., F1c - out at 7 lbs. - #4 rt. #4 lt. - cold - moderate ads. - tubes crowded.
R'3-19 Scott, L. L., RM2c - out at 6 lbs. - #4 rt. #3 lt. - enormous ads. - tubes covered.

Passed:

R'3-16 Burrett, L. R., S1c - #4 rt. #4 lt. - small ads. - tubes crowded - no cold.
R'3-16 Smith, P. M., S1c - 0 rt. #4 lt. - large ads. - tubes crowded. - can only pass accep on lt.

5 07 cl Radium treatments to date.

17 March 1945, Saturday

18 Pressured
5 Aero-Otitis Media
6 Failures:

R'3-17 Caponi, N. J., PhM2c - out at 32 lbs. - #4 rt. #3 lt. - small ads. midline - tubes open - large cush.
R'3-17 Clancy, W. M., CPhM - out at 10 lbs. - #4 rt. #4 lt. - small ads. - tubes closed.
R'3-17 Crusan, E. M., PhM1c - out at 5 lbs. - #1 rt. #2 lt. - enormous ads. - tubes not seen.
Lindsey, A. A., PhM1c - out at 5 lbs. - 0 rt. 0 lt. - small ads. - tubes open.
R'3-17 Schaum, M. A. - PhM2c - out at 10 lbs. - #4 rt. 0 lt. - moderate ads. - proj. - tubes flat.
R'3-17 Smith, R. W., PhM1c - out at 5 lbs. - #3 rt. 0 lt. - enormous ads. - tubes covered, narrow.

376 Pressured to date
130 cases Aero-otitis media
186 Radium treatments so far this month.

✓ CHS

19 March 1945, Monday

5 new Radm
9 old Radm

22 Pressured
6 Aero-Otitis Media
2 Failures:

R'3-20 Sullivan, R. F., S1c - out at 26 lbs. - #3 rt. #2 lt. moderate ads. - tubes flat - no cold - Fossae xx

R'3-28 Vondra, F., S2c - out at 7 lbs. - #4 rt. #4 lt. - ~~no cold~~ - enormous ads. - tubes covered - no cold.

Passed:

R'3-20 Barlow, V. D., S2c - #4 rt. #4 lt. - large ads. - tubes flat - cold

R'3-20 Finley, D. B., PhM1c - #4 rt. #4 lt. - trouble in tank

R'3-20 Keown, R. M., S2c - #4 rt. #4 lt. - very large ads. - tubes flat.

R'3-20 Richards, W. T., S2c - #1 rt. #4 lt. - enormous ads. - tubes covered

20 March 1945, Tuesday

Cloudy - Damp

5 old Radm
8 new "

29 Pressured
10 Aero-Otitis Media
7 Failures:

R'3-22 Adolph, F. P., S1c - out at 13 lbs. - #4 rt. 0 lt. - enormous ads. - tubes covered.

R'3-21 Blessee, W. R., S2c - out at 3 lbs. - #3 rt. #3 lt. - enormous ads. - tubes covered.

R'3-21 Jones, R. P., S2c - out at 8 lbs. - #4 rt. 0 lt. - small ads. - tubes covered, open.

R'3-21 Jordon, J. F., RT3c - out at 3 lbs. - 0 rt. #3 lt. - enormous ads. - tubes covered.

R'3-22 Lasette, F. B., S2c - out at 6 lbs. - #4 rt. #2 lt. - small ads. - tubes covered, open.

R'3-22 Mitchell, W. J., F1c - out at 13 lbs. - #4 rt. #3 lt. - very large ads. - tubes covered.

R'3-22 Streland, F. C., F1c - out at 8 lbs. - #4 rt. #4 lt. - moderate ads. - tubes covered.

Passed:

R'3-22 Dean, W. G., S1c - 0 rt. #3 lt. - small ads. - tubes open, crowded - Fossae xxx

R'3-21 Rickwa, L., S1c - #3 rt. #4 lt. - enormous ads. - tubes covered, flat, closed.

R'3-21 Stouff, O. L., S1c - #3 rt. #2 lt. - enormous ads. - tubes covered - not seen.

21 March 1945, Wednesday

8 new Radios
7 old Radios

31 Pressured
15 Aero-Otitis Media
6 Failures:

R'3-17 Cruzan, E. M., PhMlc - out at 3 lbs. - #3 rt. #3 lt. - has cold (Second Attempt)
R'3-21 Gilmore, W. H., Flc - out at 3 lbs. - #3 rt. #3 lt. - enormous ads. - tubes closed - project - no cold.
R'3-22 Lentz, J. C., Slc - out at 7 lbs. - #4 rt. #2 lt. - enormous ads. - tubes covered. - project - no cold!
R'3-22 Smith, H. O., Slc - out at 5 lbs. - hole in left - #2 lt. - 0 rt. - ads. not seen - Med Research
R'3-17 Smith, R. W., PhMlc - out at 22 lbs. - #4 rt. #1 lt. (recheck)
R'3-22 Wilcox, H. J., Slc - out at 5 lbs. - 0 rt. #2 lt. - small ads. - tubes flat.

Passed:

R'3-17 Caponi, N. J., PhM2c - #2 rt. #1 lt.
R'3-17 Clancy, V. M., CPhM - #4 rt. #3 lt.
R'3-22 Condron, L. E., S3c - #2 rt. #2 lt. - enormous ads. - tubes covered, flat.
R'3-17 Cruzan, E. M., PhMlc - #2 rt. 0 lt.
R'3-22 Dowling, W., S2c - #3 rt. #3 lt. - enormous ads. - cold.
R'3-22 Moore, J. B., TM3c - #4 rt. #3 lt. - enormous ads. - tubes flat.
R'3-22 Vossler, D. A., Slc - #4 rt. #1 lt. - large ads. - tubes flat, closed - open left - cold.
Whitelock, J. R., Slc - 0 rt. #3 lt. - enormous ads. - tubes covered - open.

R'3-22 Moore, R. C., Slc - #4 rt. #4 lt. - moderate ads. - tubes flat.

21 March 1945, Wednesday Afternoon

Rechecks

26 Pressured
24 Aero-Otitis Media
7 Failures:

Caldwell, W. J., S2c - out at 5 lbs. - #2 rt. 0 lt.
R'3-16 Lloyd, H. F. D., S2c - out at 8 lbs. - #4 rt. #4 lt.
R'2-25 McCormack, J. H., Flc - out at 10 lbs. - 0 rt. #4 lt.
R'3-19 Mocock, R. E., S2c - out at 13 lbs. - #4 rt. #2 lt.
R'3-15 Morton, W. I., Slc - out at 13 lbs. - 0 rt. #4 lt.
D-Kelly Peebles, J. D., RT2c - out at 13 lbs. - 0 rt. #3 lt.
R'3-7 Peploe, G. M., RT2c - out at 23 lbs. - #2 rt. #4 lt.

Passed:

R'3-16 Burkhart, P. J., Slc - 0 rt. #1 lt.
R'3-17 Fleming, W. J., RT2c - #1 rt. #1 lt.
R'3-12 Gigliotti, B. Jr., Flc - 0 rt. #4 lt.
R'3-15 Hedquist, E. T., Slc - #4 rt. 0 lt.
R'3-16 Jewell, S. E., SM2c - #4 rt. #2 lt.
R'3-19 Larson, H. I., S2c - #4 rt. #4 lt.
R'3-16 LeRoux, J. W., Slc - #2 rt. #4 lt.
R'3-8 Ludwiczak, T. A., RT2c - 0 rt. 0 lt.
R'3-12 Maslin, G. W., F2c - #4 rt. #4 lt.
R'3-12 Munk, G. A., Flc - 0 rt. #3 lt.
R'3-19 Niswender, D. E., Flc - #4 rt. #3 lt.
R'3-12 Reed, H. M., Flc - #1 rt. #2 lt.
R'3-19 Scott, L. L., RM2c - #3 rt. #4 lt.
R'3-12 Seufert, W. E., Flc - 0 rt. #4 lt.
Taylor, J. J., TM2c - 0 rt. 0 lt.
R'3-12 Wachob, G. D. Jr., F2c - 0 rt. #4 lt.
R'2-16 Walsh, J. P., Slc - #3 rt. 0 lt.
R'3-15 Williams, J. D., Jr., Slc - #1 rt. #1 lt.

22 March 1945, Thursday

17 new Radium
8 old Radium

26 Pressured
9 Aero-Otitis Media
1 Failure:

R 3.27 Ellis, C. N., Flc (Diver) - out at 9 lbs. - 0 rt. #4 lt.

Passed:

R 3.27 Baran, S. B., S2c - #4 rt. #4 lt. - small ads. - tubes flat - no cold.
R 3.27 Burger, F. R., QMlc (Dr. Kelly) - #4 rt. 0 lt. - moderate ads. - tubes flat - left covered - open.
R 3.27 Haight, R. P., Flc - #4 rt. #4 lt. - enormous ads. - tubes open - cold.
R 3.27 Matusovic, J. L., S2c - #4 rt. #4 lt. - moderate ads. - tubes flat.
R 3.27 McCormack, H. M., TM3c - #4 rt. 0 lt. - large ads. - tubes filled.
R 3.27 Nance, P. E., S2c - #3 rt. #4 lt. - moderate ads. - tubes narrow - crowded.
R 3.27 O'nody, F. J., Flc - #4 rt. 0 lt. - enormous ads. - tubes covered.
R 3.27 Williams, F. G., S2c - #4 rt. #4 lt. - large ads. - tubes flat - no cold.

6 cartons of Beech Nut chewing gum received today - Every other one entering pressure chamber will chew gum - chewing hard (but hard) & all will be checked for effect on AO Ms.

1 new Radium
4 old Radium

23 March 1945, Friday

26 Pressured
9 Aero-Otitis Media
5 Failures:

7 Given Gum
1 Aero-Otitis Media
1 Failure

R 3.28 Carter, C. H., Flc - out at 18 lbs. - #3 rt. #2 lt. small ads. - tubes open.
Fenton, W. E., S2c - out at 5 lbs. - #3 rt. 0 lt. - large ads. - tubes flat.
Fleace, J. C., S2c - GUM - out at 5 lbs. - #2 rt. #3 lt. - enormous ads. - tubes covered.
Rank, R. E., RT3c - out at 5 lbs. - 0 rt. #3 lt. - moderate ads. - tubes narrow
R 3.28 Wetmiller, B. S., Jr., Flc - out at 5 lbs. - #3 rt. 0 lt. - small ads. - nodules in both tubes - open.

Passed:

Butters, W. F., RT3c - #3 rt. #4 lt. - enormous ads. - tubes covered.
Coyne, R. J., SMlc - 0 rt. #4 lt. - enormous ads. - tubes covered.
Flink, F. D., S2c - #2 rt. #2 lt. - enormous ads. - tubes narrow.
R 3.30 Nixon, R. A., RT2c - #4 rt. #5 lt. - large ads. - tubes flat.

NB7/P3-2
BUMED-X-OA

BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
WASHINGTON 25, D. C.

19 March 1945

To: Medical Officer in Charge, Medical Research Dept.
Via: Commanding Officer, Submarine Base.

Subj: Treatment of Aero-Otitis Media cases with X-ray at the U. S. Naval Hospital, Brooklyn, N. Y.; request for permission for.

Ref: Your letter NB7/P3-2(B) Serial 751 dated 12 Feb 1945.

1. Owing to rapid developments in the technique of using radium in the nasopharynx, and the accomplished recognition of radium as the preferred agent in both prophylaxis and therapy, further research to establish the relative value of Roentgen therapy is considered unnecessary and inexpedient.

2. It is understood that the employment of radium applicators will be continued.

ROSS T. McINTIRE

- -

FIRST ENDORSEMENT
NB7/P3-2 (B) Ser. 1024

U. S. SUBMARINE BASE, NEW LONDON, CONN.
21 March 1945

From: The Commanding Officer, Submarine Base.
To: Officer in Charge, Medical Research Laboratory.

1. Forwarded.

H. H. McLEAN

CWS

Saturday March 24th 1945
Radium today: 5 old cases
1 new cases.

IN 6009

THE JOHNS HOPKINS HOSPITAL

WINFORD H. SMITH, M. D., DIRECTOR

FIELD T. LONGCOPE, M. D.
PHYSICIAN-IN-CHIEF
RED BLALOCK, M. D.
SURGEON-IN-CHIEF
N G. WHITEHORN, M. D.
PSYCHIATRIST-IN-CHIEF
ARDS A. PARK, M. D.
PEDIATRICIAN-IN-CHIEF

NICHOLSON J. EASTMAN, M. D.
OBSTETRICIAN-IN-CHIEF
ALAN C. WOODS, M. D.
OPHTHALMOLOGIST-IN-CHIEF
RICHARD W. TE LINDE, M. D.
CHIEF GYNECOLOGIST
ARNOLD R. RICH, M. D.
ACTING PATHOLOGIST

Baltimore-5, Maryland

March 24, 1945.

Dear Henry:

I was so pleased to get your long interesting letter. I would give anything to be able to get away for a day or two and see your work and results - that seems impossible, but I am coming if and when I can.

I don't know whether or not I wrote you saying the dosage with the 50 mg. Army-radium applicator can be safely increased from 6.6 min to 8.5 minutes on cool side of the nasopharynx. Take particular care to examine for and irradiate lymphoid tissue up near the posterior end of the middle turbinates or in the upper 1/4 of the fossa of R. To treat this area it is better to have the patients sit in a chair with head resting against wall rather than lie down. In the sitting posture gravity pulls the bottle down and the radium containing chamber up toward this area. If overlooked at examination or treated with the pt. lying on back and applicator dropped into nasopharynx, the results will often be disappointing.

Write me as often as you can -

As ever yours -

S J Crowe

FORM 8001

THE JOHNS HOPKINS HOSPITAL

March 13. 45

Dear Sherry:

Thank you for the long and interesting letter. This is not an answer but a note. I have been trying to find time to write you for several days. –

Dr. Burrows has made a series of studies with the Army (50 mg/applicator and finds the dosage may safely be increased to 8½ minutes on each side. This information has gone out to all the units giving radium treatment in the A.A.F.

Lt Broyles is a captain and in charge of a hospital at the Air Base (naval) in San Diego, Cal. Surely Bobb has been returned to this country and is in the Navy Gen Hospital, Galesburg, Ill. I am coming to see you if I can ever get a day off – life is very strenuous here – Write as often as you can.

As ever yours

S. J. Crowe

Gold Radium

26 March 1945, Monday.

24 Pressured
6 Aero-Otitis Media
3 Failures:

R' 3-27 Barrosse, E. J., S2c – out at 3 lbs. – #2 rt. #2 lt. – enormous ads. – tubes covered.

R' 3-27 Moran, J. P., S1c – out at 3 lbs. – #2 rt. #2 lt. – large ads. – tubes not seen.

R' 3-27 Robinson, J. E., S2c – out at 9 lbs. – #4 rt. #4 lt. – enormous ads. – tubes not seen.

Passed:

R' 3-27 Bauman, M. R., S1c – #4 rt. #4 lt. – moderate ads. – tubes flat – no cold.

R' 3-27 Kelley, D. W., F1c – #4 rt. #3 lt. – large ads. – tubes closed.

R' 3-27 Roginski, W., S1c – #4 rt. #4 lt. – enormous ads. – tubes covered.

14 new Radium
10 old cases

27 March 1945, Tuesday

1 Gum - 1
1 aom

25 Pressured
7 Aero-Otitis Media
3 Failures:

Fargason, R. E., S2c - out at 7 lbs. - #3 rt. #2 lt. - enormous ads. - tubes flat.
Kobran, V., RT3c - out at 5 lbs. - 0 rt. #3 lt. - enormous ads. - tubes covered.
R 2-23 White, V. L., S2c - out at 5 lbs. - #1 rt. #3 lt. - enormous ads. - tubes flat.

Passed:

Donovan, C. F., RMlc - #3 rt. #3 lt. - moderate ads. - tubes flat.
Hall, B., Slc - #3 rt. #3 lt. - projecting ads. - tubes flat.
Hornaman, F. E., S2c - #4 rt. #4 lt. - enormous ads. - tubes covered.
VanHauen, G. A., Flc (Gum) 0 rt. #2 lt.

28 March 1945, Wednesday

3 new radium
5 old radium

Gum to 29
10 aom
4 Failures

37 Pressured
13 Aero-Otitis Media
6 Failures:

Ensley, F. B. - PMlc - out at 1½ lbs. - #2 rt. #2 lt. - very large ads. - tubes covered - no cold. (Gum)
R 1-5 Henry, D. A., RT2c - out at 5 lbs. - #3 rt. 0 lt. - moderate ads. - tubes narrow (Gum)
R 2-22 Hopkins, R. R., RT3c - out at 1½ lbs. - #2 rt. #2 lt. - had two radium treatments (Gum)
Riley, D. C., Flc - out at 8 lbs. - 0 rt. #2 lt. - large ads. - tubes flat.
Thomas, W. H., RT2c - out at 5 lbs. - 0 rt. #3 lt. - enormous ads. - tubes covered.
Young, J. A., Flc - out at 8 lbs. - enormous ads. - tubes covered - #3 rt. 0 lt. (Gum)

Passed:

R 3-29 Brown, D. E., SC2c - (R-16) 0 rt. #4 lt. - large ads. - tubes flat.
Cruzan, E. M., PhMlc - 0 rt. 0 lt. - 1 radium 2 wks. (Gum)
Donahoe, A. H., RT2c - #4 rt. 0 lt. - small ads. - tubes flat - (Gum)
Goes, J. C., RT3c - #2 rt. #4 lt. - small ads. - tubes flat (Gum)
McClure, J. A., Flc - #2 rt. #2 lt. - small ads. - tubes open (Gum)
Smith, R. W., PhMlc - #2 rt. 0 lt. - 1 radium 2 wks. - (Gum)
Sommer, O. W., RT3c - #2 rt. #2 lt. - small ads. - tubes open. (Gum)

28 March 1945, Wednesday.

Rechecks

22 Pressured
20 Aero-Otitis Media
10 Failures:

R'3-15 Atchison, G. B., QMlc - out at 19 lbs. - #3 rt. #3 lt.
R'3-28 Carter, C. H., Flc - out at 12 lbs. - 0 rt. 0 lt.
R'3-21 Gilmore, W. H., Flc - out at 4 lbs. - #3 rt. #2 lt.
R'3-21 Jordan, J. F., RT3c - out at 4 lbs. - 0 rt. #3 lt.
R'3-22 Lasette, F. B., S2c - out at 4 lbs. - #3 rt. #3 lt.
R'3-16 Lloyd, H. F. D., S2c - out at 4 lbs. - #3 rt. #2 lt.
R'3-15 Morton, W. I., Slc - out at 12 lbs. - 0 rt. #4 lt.
Peebles, J. D., RT2c - out at 4 lbs. - #3 rt. #3 lt.
R'3-22 Wilcox, H. J., Slc - out at 7 lbs. - 0 rt. #3 lt.
R'3-28 Vondra, F., S2c - out at 12 lbs. - #4 rt. #4 lt.

Passed:

R'3-22 Adolph, F. P., Slc - #1 rt. #1 lt.
R'3-21 Blessee, W. R., S2c - 0 rt. #3 lt.
Caldwell, W. J., S2c - #1 rt. #1 lt.
Fenton, W. E., S2c - #4 rt. #3 lt.
Fleace, J. C., S2c - #4 rt. #2 lt.
R'3-22 Jones, R. P., S2c - #4 rt. 0 lt.
R'3-22 Lentz, J. C., Slc - #4 rt. 0 lt.
R'3-23 McCormack, J. H., Flc - 0 rt. 0 lt.
R'3-19 Mocock, R. E., S2c - #1 rt. #1 lt.
R'3-16 Peploe, G. M., RT2c - 0 rt. #3 lt.
Rank, R. E., RT3c - 0 rt. #2 lt.
R'3-16 Sullivan, R. F., Slc - #1 rt. 0 lt.

29 March 1945, Thursday

4 new Radium
2 0 old Radium

39 Pressured
8 Aero-Otitis Media
3 Failures:

1 Gum
1 a o m

R'3-30 Turner, C. W., Slc - out at 5 lbs. - #3 rt. 0 lt. - small ads. - tubes narrow, open.
R'3-29 Waters, O. D. (R-16), TM2c - out at 13 lbs. - #4 rt. 0 lt. - enormous ads. - tubes covered. - Operated
R'3-29 Wilson, R. F. (R-16), StMlc - out at 6 lbs. - #4 rt. #4 lt. - enormous ads. - tubes covered.

Passed:

Archer, L. O., Slc - #3 rt. 0 lt. - small ads. - tubes open.
Cooley, R. J., Slc - #2 rt. 0 lt. - large ads. - tubes narrow, open.
Campbell, L. S., Flc - #4 rt. 0 lt. - moderate ads. - tubes flat - cold.
Creamer, E. E., Slc - #2 rt. 0 lt. - small ads. - tubes narrow, open.
Stevens, G. O., Slc (Gum) #2 rt. 0 lt. - large ads. - tubes open - slight cold.

3 new Radium
16 old Radium

30 March 1945, Friday — Ten - Gums
2 - failures + a cm

37 Pressured
8 Aero-Otitis Media
3 Failures:

R's 30 Clinton, R. F., Flc - out at 2 lbs. - #4 rt. #4 lt. - From R1
very large ads. - tubes flat - Fossae xxx
McCormack, E. C., Slc - (Gum) - out at 6 lbs. -
#3 rt. 0 lt. - moderate ads. - tubes flat.
Shepardson, W. C., S2c - (Gum) - Out at 6 lbs. -
#3 lt. 0 rt. - large ads. - tubes closed, flat.

Passed: [redacted]

Cain, R. J., S2c - #2 rt. #4 lt. - enormous ads. -
tubes covered.
R's 4-3 Cramer, W. F., Lieut. (R-16) - [redacted] - #4 rt.
#0 lt. - [redacted]. - tubes flat - [redacted] Lt. Open
Guild, D. H., Slc - #4 rt. #4 lt. - enormous ads. -
tubes covered.
Horne, W. R., Slc - 0 rt. #3 lt. - moderate ads. -
tubes covered, flat.
Peter, E. A., MoMM2c - #3 rt. 0 lt. - small ads. - From R16.
tubes narrow.

31 March Saturday: Hold Radium

No pressure groups today
Chewing gum tried out 46 case
too few to draw any conclusion
Radium Treatments this wk -
All radium treatments to be
entered in health record.
Good cooperation from Sub sch.
JAS WMS

March Summary

① 351 radium treatments this
680 ~~cases~~ treatments to date
Cases to-date treated.

② This month the X Ray treatments were discontinued + Bureau action
③ 1/4 inch lead added to treatment tab
④ Chew gum experiment added, too few cases for any indications.
⑤ Dr Crowe recommend increasing time on dosage for 50 mgm radium from 6 1/2 to 8 1/2 min. – No ill effects on this new dosage to-date.

700 Cases presented
265 Cases aero-otitis media
113 Tubes –

⑥ too early to place any in chamber for rechecks tho many have been under pressure after only 2 radium treatments.

Dr H Harris

2 April 1945, Monday

8 old Radium

22 Pressured
4 Aero-Otitis Media
3 Failures:

Dorre, L., S2c - out at 6 lbs. - #3 rt. 0 lt. - cannot pass scope - ret. Med. Res.
R'3-18 Green, R. E., S2c - out at 6 lbs. - #3 rt. #4 lt. - very large ads. - tubes covered.
R'3-17 Wilson, B. D., F2c - out at 6 lbs. - #4 rt. #4 lt. - large ads. - tubes flat - left covered.

Passed:

Yarnoluk, T. M., Flc - Per. rt. #3 - lt. #3. - Perf. Hear
small ads. - tubes flat.

Divers:

Stauffer, W. N., CM1c - out at 7 lbs. - #3 rt. 0 lt. - large ads. - tubes flat.
Tucker, J. L., SF3c - out at 7 lbs. - #3 lt. 0 rt. - enormous ads. - tubes covered.
Viene, Ervin - GM3c - out at 16 lbs. - #4 rt. #1 lt. - enormous ads. - tubes flattened.

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3 April 1945, Tuesday

1 new Radium
5 old Radium

22 Pressured
5 Aero-Otitis Media
2 Failures:

R'4-18 Grossheider, R., S1c - out at 4 lbs. - #4 rt. #2 lt. - moderate ads. - right tube flat, closed - left open.
R'4-18 Schroeder, J. E., Flc - out at 7 lbs. - #4 rt. #3 lt. - moderate ads. - tubes covered - slight cold & mucous.

Passed:

Athey, R. L., S2c - #2 rt. #2 lt. - scarred, ret. drums - for radium.
R'4-18 Rosenthal, R. C., TM3c - 0 rt. #4 lt. - small ads. - tubes open.
R'4-5 Snyder, L. C., Flc - 0 rt. #4 lt. - small ads. - tubes open.

3 new Radm
8 old Radm

4 April 1945, Wednesday morning

29 Pressured
9 Aero-Otitis Media
1 Failure:

R' 4-4 Daly, W. E., S2c - out at 12 lbs. - #4 rt. 0 lt. - small ads. - tubes flat, open - left free.

Passed:

Cullen, W. F., S2c - #4 rt. #4 lt. - enormous ads. - tubes covered.
Dolezal, P. R., S2c - 0 rt. #3 lt. - enormous ads. - tubes covered.
R' 4-11 Haba, E. E., S2c - 0 rt. #4 lt. - moderate ads. - tubes flat, open.
McGrane, L. C., F1c - #3 rt. 0 lt. - small ads. - tubes flat.
R' 4-14 Sahle, P. E., S1c - #4 rt. 0 lt. - moderate ads. - tubes flat.
R' 4-14 Seberle, J. A., S1c - #4 rt. 0 lt. - enormous ads. - tubes flat.
Shrum, W. M., S2c - #4 rt. 0 lt. - small ads. - tubes open, narrow.
R' 4-17 Streeter, D. H., S2c - 0 rt. #4 lt. - very large ads. - tubes covered.

4 April 1945, Wednesday afternoon.

Rechecks

20 Pressured
19 Aero-Otitis Media
8 Failures:

R' 3-29 Barrosse, E. J., S2c - out at 3 lbs. - #2 rt. #2 lt.
Floyd, H. F. D., S2c - out at 9 lbs. - #4 rt. #4 lt.
R' 4-5 Henry, D. A., RT2c - out at 5 lbs. - 0 rt. #3 lt.
R' 2-22 Hopkins, R. R., RT3c - out at 5 lbs. - 0 rt. #3 lt.
R' 3-21 Jordan, J. F., RT3c - out at 3 lbs. - 0 rt. #2 lt.
R' 3-27 Moran, J. P. Jr., S1c - out at 5 lbs. - #4 rt. #2 lt.
Peeples, J. D., RT2c - out at 5 lbs. - #3 rt. #3 lt.
R' 2-23 White, V. L., S2c - out at 3 lbs. - #2 rt. #2 lt.

Passed:

R' 3-28 Carter, C. H., F1c - 0 rt. 0 lt.
Fargason, R. E., S2c - #1 rt. #2 lt.
R' 3-21 Gilmore, W. H., F1c - #3 rt. #3 lt.
Kohran, V., RT3c - #2 rt. #3 lt.
R' 3-22 Lasette, J. B., S2c - #1 rt. #1 lt.
R' 4-4 McCormack, E. C., S1c - #1 rt. 0 lt.
R' 3-15 Morton, W. I., S1c - 0 rt. #4 lt.
R' 3-27 Robinson, J. E., S2c - #4 rt. #3 lt.
R' 3-22 Smith, H. O., S1c - #2 rt. hole in lt.
Thomas, W. H., RT2c - #1 rt. #2 lt.
R' 3-30 Turner, C. W., S1c - #4 rt. #2 lt.
R' 3-28 Vondra, F., S2c - #4 rt. #4 lt.

5 April 1945, Thursday

3 new Radium
2 old Radium

29 Pressured
7 Aero-Otitis Media
2 Failures:

R'4-14 Bixler, M. E., S1c - out at 12 lbs. - #2 rt. #4 lt. - enormous ads. - tubes covered.
R'4-14 Serpiello, J. S., F2c - out at 9 lbs. - 0 rt. #4 lt. - large ads. - tubes covered - nodules over lt.

Passed:

Behiends, K. R., S2c - #3 rt. 0 lt. - small ads. - tubes flat.
R'4-14 McDonald, W. A., F1c - #4 rt. #4 lt. - enormous ads. - tubes covered.
R'4-17 McGinnis, C. W., S2c - #4 rt. 0 lt. - moderate ads. - tubes covered.
R'4-17 Myers, R. D., S2c - #4 rt. #3 lt. - enormous ads. - proj. tubes covered.
R'4-14 Upchurch, T. C., F1c - #4 rt. #4 lt. - moderate ads. - tubes open.

6 April 1945, Friday

3 new Radium

30 Pressured
6 Aero-Otitis Media
1 Failure:

15 Gum
3 Aero-Otitis Media
0 Failures

R'3-18 Babcock, J. M., S1c - out at 21 lbs. - #1 rt. #4 lt. - enormous ads. - tubes covered.

Passed:

R'4-17 Castner, D. E., S1c - #4 rt. #4 lt. - large ads. - tubes flat, closed.
R'4-17 Hawkins, W. C., S1c - 0 rt. #4 lt. - enormous ads. - proj. - right open - left covered.
R'4-18 McGehee, F. T., S1c - #4 rt. #4 lt. - enormous ads. - tubes covered. (Gum)
R'4-17 Ralston, R. B. Jr., S1c - #3 rt. #4 lt. - small ads. - tubes open. (Gum)
R'4-6 Robbins, Dr. A. I. - 0 rt. #4 lt. - small ads. - cold - tubes flat. (Gum)

7 April 1945 Saturday:
Conference groups today
4 Old radium cases treated today
CCC

Radium Treatment ..... Dr. Haines ..... As of 7 April 1945

Number under treatment 392
Number transferred 5
Totals 397

(119)

9 April 1945, Monday.

2 new radium
" old "

24 Pressured	10 Gum
5 Aero-Otitis Media	2 Aero-Otitis Media
2 Failures:	1 Failure

R' 4-9 Pepsin, E. M., Slc - out at 6 lbs. - #4 lt. #2 rt. - large projecting adenoids - tubes covered.

R' 4-9 Pierce, J. D., Slc - out at 7 lbs. - #3 rt. #1 lt. - modgeads. - tubes narrow (Gum)

Passed:

R' 4-14 Allison, L. L., Slc - 0 rt. #4 lt. - small ads. - tubes narrow - swollen.

R' 4-18 Downey, W. H., S2c - 0 rt. #4 lt. - small ads. - tubes opened.

R' 4-18 Robb, T. A., Slc - #4 rt. #4 lt. - small ads. - tubes covered, flat (Gum)

0 new Radium

10 April 1945, Tuesday

24 Pressured	Gum	10
6 Aero-Otitis Media	A O M	1
2 Failures:	Failure	1

R' 4-14 Allen, E. M., Flc - #4 rt. 0 lt. - out at 10 lbs. - moderate ads. - tubes flat.

R' 4-14 Siembieda, E. J., Flc - out at 9 lbs. - 0 rt. #4 lt. - moderate ads. - tubes not seen - cold. (Gum)

Passed:

Hansen, J. T., RT3c - #2 rt. #4 lt. - small ads. - nodules in both tubes

R' 4-14 Montgomery, A. T., Slc - #4 rt. #4 lt. - moderate ads. - tubes flat.

R' 4-17 Osterhant, T. P., Slc - 0 rt. #4 lt. - moderate ads. - tubes narrow, open.

Patterson, D. L., Slc - 0 rt. #3 lt. - moderate ads. - tubes covered - cold (Gum)

6 old Radium
1 new

11 April 1945, Wednesday

25 Pressured
6 Aero-Otitis Media
0 Failures

10 Gum
0 a o m

Passed:

Barthel, L. P., S2c - #4 rt. #4 lt. - enormous ads. - both tubes covered.
Lindlauf, W. R., F1c - #4 rt. #1 lt. - enormous ads. - tubes covered.
Mahaffey, M., F1c - #4 rt. #4 lt. - large ads. - tubes narrow and flat.
O'Connor, T. J., S1c - #4 rt. #4 lt. - enormous ads. - tubes covered
Richardson, C. E., S2c - 0 rt. #4 lt. - large ads. - tubes narrow, flat.
Winnchester, N. C., S1c - 0 rt. #4 lt. - enormous ads. - tubes covered.

11 April 1945, Wednesday afternoon RECHECKS

1 new radium

20 Pressured
20 Aero-Otitis Media
8 Failures:

R' 3-15 Atchison, G. B., QM1c - out at 5 lbs. - #2 rt. #2 lt.
R' 3-27 Barrosse, E. J., S2c - out at 4 lbs. - #3 rt. #3 lt.
R' 4-5 Henry, D. A., RT2c - out at 5 lbs. - 0 rt. #3 lt.
R' 2-22 Hopkins, R. R., RT3c - out at 4 lbs. - #3 rt. #3 lt.
R' 3-21 Jordan, J. F., RT3c - out at 4 lbs. - 0 rt., #3 lt.
R' 3-16 Lloyd, H. F. D., S2c - out at 10 lbs. - #4 rt. #4 lt.
Peebles, J. D., RT2c - out at 4 lbs. - #3 rt. #3 lt.
3-23 White, V. L., S2c - out at 4 lbs. - #3 rt. #3 lt.

Passed:

R' 4-18 Babcock, M. M., S1c - 0 rt. #4 lt.
R' 4-14 Bixler, M. E., S1c - #3 rt. #4 lt.
R' 4-4 Daly, W. E., S2c - #4 rt. #4 lt.
Dorre, L., S2c - #2 rt. #2 lt.
R' 4-18 Green, R. E., S2c - #4 rt. #4 lt.
R' 4-18 Grossheider, R., S1c - #4 rt. 0 lt.
R' 3-27 Moran, J. P. Jr., S1c - #2 rt. #2 lt.
Serpiello, J. S., F2c - 0 rt. #1 lt.
Shepardson, W. C., S2c - 0 rt. #4 lt.
R' 4-17 Shroeder, J. E., F1c - #4 rt. #4 lt.
R' 3-22 Wilcox, H. J. Jr., S1c - 0 rt. #1 lt.
R' 4-17 Wilson, B. D., F2c - #3 rt. #3 lt.

Lack of ~~[illegible]~~ similar findings among audiograms taken after "Air" ascents & those after descent in submarine chamber is that on return from ~~[illegible]~~ flight the ears are still deflated so to speak while after return from bottom (submarine) the ears have been inflated by the lowering of pressure externally & ears drums are bulged

HARVARD UNIVERSITY

RESEARCH ON SOUND CONTROL

Under the auspices of the
National Defense Research Committee

Cruft Laboratory
Communication E
Cambridge 38, M

April 4, 1945

Dr. Henry Haines
Sound Laboratory
Medical Research Department
U. S. Submarine Base
New London, Connecticut

Dear Dr. Haines:

We wish to inform you that your paper entitled "Aero-Otitis Media in Submarine Personnel" has been accepted for presentation at the Acoustical Society meeting May 12. It will be the fourth paper on the Saturday afternoon session commencing at 1:30 o'clock, and your time allotment is 15 minutes.

Sincerely yours,

Leo L. Beranek

Leo L. Beranek

LLB:DEB

12 April 1945, Thursday

1 new Radio

25 Pressured
6 Aero-Otitis Media
2 Failures:

Powell, A. E., EM1c - out at 20 lbs. - #4 rt. #4 lt. - enormous ads. - tubes covered.
Turner, H. C., S1c - out at 6 lbs. - #4 rt. #2 lt. - moderate ads. - tubes flat.

Passed:

Huston, S. P., S1c - #2 rt. #4 lt. - large ads. - tubes covered.
Millett, H. Jr., S2c - #4 rt. #4 lt. - enormous ads. - tubes covered.
Ness, J. S., S1c - #3 rt. 0 lt. - moderate ads. - tubes flattened - left open.
Ranallo, A. A., SO1c - #3 rt. #3 lt. - small ads. - tubes open - Fossae x.

Inflation of middle ear is not a static process in most cases - it is performed by actively opening Eust. tube - those with large channels & open inflate more rapidly & with less effort than those with small channels & openings - A clear tube naturally allows for inflation much more easily than a congested or obstructed tube. Lt. Fowler - at the meeting in Chicago showed cases of polyps in Eust. Canals.

13 April 1945, Friday

2 new Radium
9 old Radium

24 Pressured
6 Aero-Otitis Media
2 Failures:

Brown, F. M., Slc - out at 9 lbs. - #5 rt. #4 lt. - small ads. - tubes flattened - vertigo and naunia
R'4-18 Sears, M. B., Flc - out at 11 lbs. - #3 rt. #4 lt. - small ads. - tubes flat - no cold.

Passed:

Lundburg, R. L., MMlc - 0 rt. #3 lt. - enormous ads. - tubes covered.
McDaniel, V. G., Flc - #3 rt. 0 lt. - moderate ads. - tubes flat.
Ricciuti, L., Flc - #4 rt. 0 lt. - enormous ads. - tubes covered.
Vastyan, E. J., MoMMlc - #4 rt. #4 lt. - enormous ads. - tubes shut, flat - no cold.

14 April 1945, Saturday

20 new Radium cases
11 old Radium cases

20 Pressured
6 Aero-Otitis Media
0 Failures:

Passed:

R'4-14 Albertson, K. S., PhMlc - #3 rt. #4 lt. - very large ads. - tubes covered - bleeding - no cold.
R'4-14 Coleman, P. P., PhM2c - #4 rt. #4 lt. - enormous ads. - tubes covered - bleeding.
R'4-14 Propersi, R. A., PhM2c - #1 rt. #4 lt. - moderate ads. - tubes narrow, open.
R'4-14 Schmidt, O. A., PhM2c - #4 rt. #4 lt. - small ads. - tubes flat, bleeding.
R'4-14 Wilder, G. Jr., PhMlc - #4 rt. #5 lt. - enormous ads. - tubes covered. - audiogram
R'4-14 Williamson, R. B., PhMlc - #4 rt. #4 lt. - enormous ads. - tubes covered.

Wk. Summary.

Saturday April 14th. 440 cases under treatment
24 cases have left base
416 cases here under treatment.

There are 49 cases that have received at least 3 radium treatments & will be in shape to "pass" pressure in two or more wks.

Chewing gum to date is not very "conducing", too few to make any conclusive statements.

CWS

Monday: April 16 28 old Radium

No pressure today
28 radium treatments.

17 April 1945, Tuesday

15 old Radium -
10 new Radium

25 Pressured
5 Aero-Otitis Media
3 Failures:

10 Gum
3 Aero-Otitis Media
1 Failure

Burns, R. M., RT2c - Out at 10 lbs. - #4 lt. #1 rt. - enrs ads. - tubes covered - no cold.
Coddington, R. R., F1c - #1 rt. #3 lt. - out at 10 lbs. - enormous ads. - tubes covered - no cold.
Ward, Ernest, Jr., RT3c - out at 6 lbs. - #4 rt. #4 lt. - moderate ads. - tubes narrow, closed - Gum

Passed:

Murphy, J. J., F1c - #4 rt. 0 lt. - Gum - moderate ads. - tubes flat.
Robertson, G. W., S2c - #4 rt. #2 lt. - Gum - moderate ads. - tubes narrow, crowded.

18 April 1945, Wednesday

13 old cases
9 new cases

25 pressured	10 Gum
5 Aero-Otitis Media	2 Aero-Otitis Media
3 Failures:	1 Failure

Kipila, R., Flc - out at 21 lbs. - #4 rt. #4 lt. - enormous ads. - tubes covered - no cold.
Kratky, R. T., S2c - out at 6 lbs. - #3 rt. #3 lt. - enormous ads. - tubes covered - no cold.
Markland, C. J., S2c - out at 7 lbs. - #3 rt. #4 lt. - enormous ads. - tubes covered - cold - gum.

Passed:

Bagwell, W. C., F2c - #2 rt. #2 lt.
Long, R. W., EM2c - #3 rt. #3 lt. - large ads. - tubes covered - gum.

18 April 1945, Wednesday

Rechecks

19 Pressured
16 Aero-Otitis Media
8 Failures:

R' 3-27 Barrosse, E. J., S2c - out at 3 lbs. - 0 rt. #2 lt.
R' 4-5 Henry, D. A., RT2c - out at 6 lbs. - 0 rt. #2 lt.
R' 2-22 Hopkins, R. R., RT3c - out at 3 lbs. - #2 rt. #2 lt.
R' 3-21 Jordan, J. F., RT3c - out at 6 lbs. - 0 rt. #2 lt.
R' 3-16 Lloyd, H. F. D., S2c - out at 6 lbs. - #4 rt. #4 lt.
R' 4-17 Sears, M. B., Flc - out at 25 lbs. - #4 rt. #4 lt.
R' 3-28 Wetmilly, B. S., Flc - out at 5 lbs. - #3 rt. #1 lt. - Perf
R' 2-23 White, V. L., S2c - out at 3 lbs. - #2 rt. #3 lt.

Passed:

R' 4-14 Allen, E. M., Flc - #4 rt. #4 lt.
R' 2-28 Beek, B. B., Ensign - 0 rt. 0 lt. — OK Radium —
Brown, F. M., Slc - #4 rt. #4 lt.
R' 3-22 Mitchell, W. J., Flc - #3 rt. #1 lt.
Peebles, J. D., RT2c - 0 rt. 0 lt. — OK (Dentist)
R' 4-9 Pepsin, E. M., Slc - 0 rt. #2 lt.
R' 4-9 Pierce, J. D., Slc - #2 rt. #2 lt.
Powell, A. E., EM1c - 0 rt. #2 lt.
R' 4-14 Siembieda, E. J., Flc - 0 rt. 0 lt. — OK
R' 3-22 Streland, F. C., Flc - #3 rt. #3 lt.
Turner, H. C. Jr., Slc - #4 rt. 0 lt.

① Thompson, Howe & Hughson 1934 demonstrate that variations in middle ear pressure are not communicated to the internal ear fluids. –

② Crowe & Hughson 1933 - have shown that there is change in internal ear pressure changes in cerebrospinal fluid pressure.

③ Dr B.H.C. Matthews - Director Royal Air Force Physiological Laboratories has found no ~~[illegible]~~ change in relative pressure of cerebrospinal fluid in ascent or descent below 25,000 ft.

19 April 1945, Thursday

3 new cases
27 old cases

26 Pressured
5 Aero-Otitis Media
1 Failure:

4 Gum
0 Aero-Otitis Media

R' 4-19 Bourne, C. C., S2c - out at 27 lbs. - #1 rt. #3 lt. - moderate ads. - tubes narrow, open.

Passed:

Amburgey, G. M., S2c - #3 rt. #2 lt. - enormous ads. - tubes covered, not seen.
Corrinet, J. L., S2c - #3 rt. #4 lt. - large ads. - cold - tubes not seen.
DeFiebre, Oscar, S2c - #4 rt. #4 lt. - enormous ads. - tubes covered - flat shut.
R' 4-19 Levens, Farral, S2c - #2 rt. #2 lt. - bilat perf. - enormous ads. - tubes covered, closed.

Officers: Recheck - 8 pressured 4 0 rt 4 failures

Failures: - Pressured in 3 min.

R' Magill, A. A., Ensign - out at 5 lbs. - #4 rt. #4 lt.
R' Millar, D. B., Lt. (jg) - out at 5 lbs. - #3 rt. 0 lt.
R' Nuckles, R. E., Ensign - out at 5 lbs. - #3 lt. 0 rt.
too fast can't do it

Passed:

Berman Comdr. - 0 rt 0 lt - medical officer
Brackett, C. A., Lieut. 0 rt 0 lt - dining officer
R' Cole, C. B., Ensign 0 rt 0 lt -
R' Humphreys, C. W., Ensign 0 rt 0 lt -
Wright, J. S., Lieut. 0 rt 0 lt - dining officer

Reschedule

Pressured in 7 minutes:

R 3-12 Sebright, R. D., RT2c - has had radium for sinusitis - ears normal.
R 3-2 Swanson, R. D., RT3c - radium for AOM in flying - no AOM

20 April 1945, Friday

11 old Radium
2 new Radium
2 Gum
2 Oil
1 failure

28 Pressured
7 Aero-Otitis Media
4 Failures:

Hudson, A. H., Flc - out at 5 lbs. - #4 rt. #4 lt. - moderate ads. - tubes open.
Smith, H. O., - out at 24 lbs. - 0 rt. #3 lt. -
R'5-1 Steele, T. H., S1c - out at 11 lbs. - 0 rt. #4 lt. - large ads. - tubes flat - Gum.
R'4-20 Yarmoluk, T. M., Flc - out at 7 lbs. - #4 rt. 0 lt.

Passed:

Daly, O., S2c - #4 rt. #4 lt. - enormous ads. - tubes covered.
Radzik, J. C., S1c - #3 rt. #3 lt. - small ads. - tubes narrow, open - Gum.
Anderson, Willard W., S2c - #4 rt. #4 lt. - moderate ads. - tubes flat.

21 April 1945 Saturday:

\# old Radium
\# new Radium

No pressures today
464 cases treated - treated c̄ Radium
120 given gum in tank - with
a 26% of a.o.m. -
only 12% failures which is high -
142 pressured without gum with
a 28% a.o.m. - and
only 10% failures - this is for
April - CMS

23 April 1945, Monday

8 old Rx

24 Pressured
7 Aero-Otitis Media
1 Failure:

1 Gum
1 Aero-Otitis Media
1 Failure:

Wood, R. P., Flc - out at 3 lbs. - #2 rt. #2 lt. - moderate ads. - tubes flat.

Passed:

DeMille, D. R., S2c - #4 rt. 0 lt. - moderate ads. - tubes flat.
Dockins, R. N., Slc - #4 rt. #4 lt. - enormous ads. - tubes covered.
Edwards, P. R., Slc - #4 rt. #4 lt. - moderate ads. - tubes closed.
Johnson, C. S., Slc - #4 rt. #4 lt. - enormous ads. - tubes covered.
Mummert, E. K., S2c - 0 rt. #4 lt. - enormous ads. - covered.

24 April 1945, Tuesday

11 old Rx

21 Pressured
6 Aero-Otitis Media
4 Failures:

McCullough, E. W., Flc - out at 4 lbs. - #3 lt. 0 rt. - enormous ads. - tubes covered and closed.
Laycock, H. L., RT3c - out at 9 lbs. - #4 rt. #4 lt. - enormous ads. - tubes covered - cold.
Paladini, F. J., Flc - out at 6 lbs. - (fainted) - gum - #2 rt. - 0 lt. - large ads. - tubes covered.
Sherman, O. W., Flc - out at 4 lbs. - 0 rt. #4 lt. - small ads. - tubes narrow and crowded.

Passed:

Clemons, P. B., Flc(EM) - 0 lt. - #3 rt. - moderate ads. - tubes covered.
Jones, Harold, RM2c - #4 rt. 0 lt. - moderate ads. - tubes narrow.

25 April 1945, Wednesday

19 old Rx

25 Pressured
6 Aero-Otitis Media
1 Failure:

Rieger, G. J., Slc - out at 2 lbs. - #3 rt. #2 lt. - enormous ads. - tubes closed.

Passed:

Burdette, J. R., Slc - 0 rt. #4 lt. - small ads. - tubes open - nodules left tube.
Doman, T. R., S2c - #4 rt. #3 lt. - large ads. - tubes flat - cold.
McCormick, R. J., RM2c - #3 rt. #3 lt. - enormous ads. - tubes flat.
Michales, D. K., Slc - #4 rt. #4 lt. - large ads. - tubes flat.
Wilder, H. C., S2c - #4 rt. 0 lt. - enormous ads. - tubes covered.

25 April 1945, Wednesday

Rechecks

17 Pressured
17 Aero-Otitis Media
9 Failures:

R' 3-27 Barrosse, E. J., S2c - out at 10 lbs. - #1 rt. #3 lt.
R' 4-5 Henry, D. A., RT2c - out at 4 lbs. - #3 rt. #3 lt.
R' 2-22 Hopkins, R. R., RT3c - out at 4 lbs. - #3 rt. #3 lt.
Hudson, A. H. - out at 11 lbs. - #4 rt. #3 lt.
R' 3-21 Jordan, J. F., RT3c - 0 rt. #2 lt. - out at 8 lbs.
R' 3-16 Lloyd, H. F. D., S2c - out at 15 lbs. - #4 rt. #4 lt.
R' 3-22 Smith, H. O., S1c - out at 6 lbs. - #2 rt. #2 lt.
R' 5-9 Steele, T. H., S1c - out at 6 lbs. - 0 rt. #3 lt.
R' 2-23 White, W. L., S2c - out at 4 lbs. - #3 rt. #3 lt.
Passed:

R' 3-15 Atchison, G. B., QM1c - #1 rt. #1 lt.
R' 4-19 Bourne, C. C., S2c - 0 rt. #3 lt.
Burns, R. M., RT2c - 0 rt. #4 lt.
Coddington, R. R., F1c - 0 rt. #3 lt.
Kipila, R., F1c - #4 rt. #2 lt.
Krotky, R. P., S2c - 0 rt. #2 lt.
Markland, C. J., S2c - 0 rt. #3 lt.
Ward, E. Jr., RT3c - #1 rt. #2 lt.

26 April 1945 - No Pressure. 21 old A 1 new A

27 April 1945, Friday 17 Old A

25 Pressured
4 Aero-Otitis Media
1 Failure:

R' 5-9 Wellman, J. F., F1c - out at 3 lbs. - #3 rt. #5 lt. - very large ads. - tubes covered and flat.

Passed
~~Failed~~:

R' 4-30 Aten, R. L., S1c - #4 rt. #4 lt. - very large ads. - tubes flat.
Cobb, J. B., S1c - 0 rt. #3 lt. - enormous ads. - tubes not seen.
Frazier, M. M., S2c - 0 rt. #3 lt. - moderate ads. - tubes flat - right open.

28 April 1945 - No Pressure - C.V.S. pary

Summary of Radiums rechecked thru pressure.
103 pressured 50 lbs in less than 10 min.
5 developed aero-otitis media
1 failed pressure.

UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

30 April 1945.

MEMORANDUM TO THE EXECUTIVE OFFICER:

SUBJECT: Temporary Additional Duty Orders, Request for.

1. It is requested that temporary additional duty orders be prepared for Lieut.(jg) Henry L. HAINES, (MC) USNR, to proceed to New York City, in time to arrive on or about 11 May 1945, at the Hotel Pennsylvania, for a meeting of the Acoustical Society of America, at which meeting Doctor Haines has been requested to present a paper.

C. W. SHILLING
CAPTAIN (MC) USN.

---

1 May 1945, Tuesday

3 Rd Radium

26 Pressured
8 Aero-Otitis Media
1 Failure: 1 ruptured left ear

R 5-9 Coffman, James P., Bkr 2c - out at 8 lbs. - #4 rt. #4 lt. - enormous ads. - tubes covered and closed.

Passed:

Anderson, R. K., RT3c - 0 lt. #4 rt. - moderate ads. - tubes flat, crowded.
Brady, R. J., S1c - #4 rt. #3 lt. - very large ads. - tubes covered, flat.
Dousa, J. J., SM2c - 0 rt. #2 lt. - small ads. - both tubes open.
Fiske, H. A., F1c - #4 rt. #4 lt. - perforated - enormous ads. - tubes covered - closed - no cold.
Hoskins, R. L., F1c - #4 rt. 0 lt. - moderate ads. - tubes narrow, closed.
McCabe, J. P., S1c - 0 rt. #4 lt. - large ads. - tubes covered - slight cold.
Rooney, H. P., S2c - #2 lt. - #4 rt. - moderate ads. - tubes narrow, crowded.

1 May 1945, Tuesday — Rechecks

17 pressured - Officers
2 Aero-Otitis Media
1 Failure:

Radium Treatments

R' 1-22 Younghlood, W. A., Ens. - out at 9 lbs. - Cold #3 rt. 0 lt.

Passed:

R' 2-1 Belt, R. W., Lieut. - 0 rt. 0 lt.
R' 1-22 Cole, C. B., Ensign - 0 rt. 0 lt. - Cold
R' 1-22 D'Arizzo, B. T., Ensign - 0 rt. 0 lt.
R' 1-22 Davis, R. E., Ensign - 0 rt. 0 lt. - Cold
R' 2-1 Doerschak, H. G., Ensign - 0 rt. 0 lt.
R' 2-2 Dungan, T. F. R., Lt.(jg) - 0 rt. 0 lt.
R' 1-22 Foote, E. L., Ensign - 0 rt. 0 lt.
R' 2-2 Gibson, G. O., Ensign - 0 rt. 0 lt.
R' 1-22 Hawley, R. G., Ensign - 0 rt. 0 lt.
R' 1-22 Jefferson, E., Ensign - 0 rt. 0 lt.
R' 1-22 Purdy, J. A., Ensign - 0 rt. 0 lt. - cold
R' 2-2 Rehm, F. R., Lt.(jg) - 0 rt. 0 lt.
R' 2-2 Tapia, H. G., Ensign - 0 rt. 0 lt.
R' 2-2 Tomlin, H. B., Lt.(jg) - 0 rt. 0 lt.
R' 1-22 Warnock, J. W., Lieut - 0 rt. 0 lt.
R' 2-2 Wilcox, J. O., Lt.(jg) - #4 rt. 0 lt.

2 May 1945, Wednesday

2 new radium
5 old

27 Pressured
3 Aero-Otitis Media
1 Failure:

R' 5-9 Earnhardt, E. L., F1c - #4 rt. #3 lt. - out at 19 lbs. very large ads. - tubes covered.

Passed:

Domarecki, E. S., TM2c - #3 rt. #3 lt. - passed pressure - moderate ads. - tubes flat.
Ford, L. W., S2c - #4 rt. #3 lt. - moderate ads. - tubes flat.

2 May 1945, Wednesday

16 Pressured
3 Aero
1 Failure

Failed:

R' 5-2-45 Hoffman, J. R., Ensign - out at 7 lbs. - #4 rt. #4 lt. moderate ads. - tubes open.

Passed:

Middleton, W. G., Ensign - #3 rt. 0 lt.
Pimentel, G. C., Ensign - #4 rt. #4 lt.

3 May 1945, Thursday

2 new Radium
5 old

32 Pressured
9 Aero-Otitis Media
1 Failure:

Blaine, R. R., Lt.(jg) - out at 6 lbs. - #4 rt. #4 lt. large ads. - tubes crowded - closed - cold.

Passed:

Burns, F., S2c - 0 rt. #4 lt. - large ads. - tubes flat.
Kilpatrick, W. C., S2c - #4 rt. #4 lt. - large ads. - tubes flat.
R' 5-3 Latimer, R. A., Ensign - #4 rt. #3 lt. - moderate ads. - nodules in tubes.
R' 5-3 Maynard, C. G., Lt(jg) - #4 rt. #4 lt. - enormous ads. - tubes closed.
Rickard, C. A., S2c - #4 rt. #4 lt. - enormous ads. - tubes flat - closed - proj.
Roberts, R. F., F2c - 0 rt. #4 lt. - enormous ads. - tubes closed - project.
Tate, R., S2c - #4 rt. #4 lt. - enormous ads. - tubes closed.
Whilles, C. C., MoMMlc - #4 rt. #4 lt. - enormous ads. - tubes closed.

3 May 1945, Thursday -

Rechecks

17 Pressured
15 Aero-Otitis Media
7 Failures:

R' 3-27 Barrosse, E. J., S2c - out at 5 lbs. - 0 rt. #0 lt.
R' 4-5 Henry, D. A., RT2c - out at 16 lbs. - 0 rt. #4 lt.
R' 3-21 Jordan, J. F., RT3c - out at 22 lbs. - 0 rt. #4 lt.
R' 3-16 Lloyd, H. F. D., S2c - out at 16 lbs. - #1 rt. #4 lt.
McCullough, E. W., Flc - 0 rt. #4 lt. - out at 5 lbs. Dropped
R' 2-23 White, V. L., S2c - Out at 5 lbs. - #2 rt. #4 lt.
Wood, Robert B., Flc - out at 6 lbs. - #3 rt. #3 lt. Dropped

Passed:

Hudson, A. H., Flc - #4 rt. 0 lt.
Laycock, H. L., RT3c - #4 rt. #4 lt.
Paladini, F. J., Flc - 0 rt. 0 lt.
Rieger, K. J., Slc - #3 rt. #4 lt.
Sherman, O. W., Flc - #3 rt. #4 lt.
R' 3-22 Smith, H. O., Slc - temp.perf. lt. - 0 rt.
R' 3-28 WetmillerB. S. Jr., Flc - old perf. lt. - #4 rt.
R' 4-20 Yarmoulk, T. M., Flc - small perf rt. - 0 lt.

Friday: - offices -

Dr. Bateman suggest checks on those "doping off" under pressure - Men are being watched under pressure & rechecked.

CMC, MOM

4 May 1945, Friday

2 old Radium

19 Pressured 20 lbs. - 1 minute
3 Aero-Otitis Media
1 Failure:

Auer, D. G., Ensign - out at 9 lbs. - #4 rt. 0 lt. - moderate ads. - left tube narrow (50 lbs. in four minutes. rt tube open. Cold -

Passed:

Aggerbeck, L. J., Ensign - #3 rt. 0 lt. - moderate ads. - tubes narrow, open.
Arnick, W. C., Lt.(jg), #4 rt. #4 lt. - moderate ads. - tubes closed.

5 May 1945, Saturday

+ new Rochum
10 old "

17 Pressured 20 lbs. - 1 minute
4 Aero-Otitis Media
0 Failures

Passed:

R'5-5 Dedrick, W., Ensign - #4 rt. #4 lt. - small ads. - tubes flat.
R'5-5 Fallon, L. T., Lt(jg) - #3 rt. #4 lt. - small ads. - tubes open.
R'5-5 Hamilton, R. K., Lt(jg) - #4 rt. #4 lt. - large ads. - tubes narrow, closed.
Trammall, G. T., Ensign - 0 rt. #4 lt. - large ads. - tubes closed.

18 Pressured 20 lbs. - 2 minutes
5 Aero-Otitis Media
0 Failures
Passed:
Latimer, R. A., Ensign - #4 rt. #4 lt. - rad. yesterday
Maynard, C. G., Lt(jg) - #4 rt. #4 lt. - rad. yesterday
Miller, R. A., Ensign - 0 lt. #4 rt.
Rockwell, D. E., Ensign - 0 rt. #4 lt.
VanSlyke, W. S., Ensign - 0 rt. #3 lt.

19 Pressured 50 lbs.
4 Aero-Otitis Media
1 Failure:

R'5-5 Cobb, M. M., Ensign - 0 rt. #4 lt. - slight cold - enormous ads. - tubes flat.

Passed:

McAulay, K. J., Ensign - 0 rt. #4 lt. - small ads. - tubes crowded - left closed.
Miller, L. F., Ensign - 0 rt. #2 lt. - small ads. - tubes narrow, open.
Uhl, G. A., Ensign - #2 rt. #3 lt. - moderate ads. - tubes crowded, open.

7 May 1945, Monday

19 Pressured
0 Aero-Otitis Media
0 Failures

8 May 1945, Tuesday V-E DAY

3 new radium
4 old

26 Pressured
6 Aero-Otitis Media
5 Failures:

R'5-8 Murphy, G. E., S2c - out at 10 lbs. - #3 rt. #2 lt. - very large ads. - tubes flat.
Titus, P. C., S1c - out at 31 lbs. - 0 rt. #4 lt. - small ads. - nodules in both tubes - no cold.
Weisenberger, F. P., MoMM1c - out at 6 lbs. - #4 rt. #0 lt. - very large ads. - tubes closed.
Weiss, D. L., S1c - out at 8 lbs. - #4 rt. #4 lt. - enormous ads. - tubes flat.
Weyrick, R. K., S1c - out at 6 lbs. - #1 rt. #2 lt. - enormous ads. - tubes closed, open with swallowing.

Passed:

R'5-8 Deverman, G. H., S2c - #4 rt. #4 lt. - moderate ads. - tubes closed - bleeding.

---

9 May 1945, Wednesday

8 new Radium
9 old

29 Pressured
6 Aero-Otitis Media
2 Failures:

R'5-10 Hannah, J. M., S1c - out at 8 lbs. - #4 rt. #4 lt. - large ads. - slight cold - tubes flat, closed.
R'5-10 Parke, H. G., RT3c - out at 3½ lbs. - #3 rt. #3 lt.

Passed:

R'5-10 Chorlton, J. W., F1c - #3 rt. #3 lt. - moderate ads. - tubes open, narrow - no cold.
R'5-9 Jackson, O. S., F1c - 0 rt. #4 lt. - small ads. - tubes open - no cold.
R'5-9 Kehl, N. A., RT3c - #4 rt. #4 lt. - moderate ads. - tubes open - nodules in tubes - no cold.
R'5-9 Tarpey, D. F., S2c - #4 rt. 0 lt. - small ads. - tubes open, narrow.- no cold.

---

9 May 1945, Wednesday

Rechecks

12 Pressured
10 Aero-Otitis Media
7 Failures:

R'5-9 Coffman, J. P., Bkr2c - #3 rt. #4 lt. - out at 10 lbs.
R'4-5 Henry, D. A., RT2c - out at 10 lbs. - #2 rt. #4 lt. (cold)
Jordan, J. F., RT3c - out at 15 lbs. - 0 rt. #2 lt.
McCullough, E. W., F1c - out at 3 lbs. - #3 rt. 0 lt.
R'5-9 Willman, J. F. Jr., F1c - #3 rt. #3 lt. - out at 3 lbs. - cold.
R'2-23 White, V. L., S2c - out at 7 lbs. - #1 rt. #4 lt.
Wood, R. P., F1c - out at 7 lbs. - #4 rt. #4 lt. - gum.

Passed:

R'3-27 Barrosse, E. J., S2c - 0 rt. 0 lt.
R'5-9 Earnhardt, E. L., F1c - #3 rt. #4 lt.
R'1-16 Lloyd, H. F. D., S2c - 0 rt. #2 lt.
Messina, R. J., F2c - 0 rt. 0 lt.
R'5-9 Steele, T. H., S1c - 0 rt. #3 lt.

10 May 1945, Thursday

3 new Recruits
3 old

30 Pressured
8 Aero-Otitis Media
2 Failures:

R 5-12 Alterman, T. S., RT3c - out at 4 lbs. - #4 rt. #3 lt. - very large ads. - tubes flat.
R 5-15 Spaven, H. F., F1c - out at 5 lbs. - #4 rt. 0 lt. - fainted - very large ads. - tubes flat - cold.

Passed:

Bilger, W. R., S2c - #4 rt. #4 lt. - large ads. - nodules on both tubes.
Brady, J. W., S2c - #4 rt. #3 lt. - moderate ads. - tubes narrow, flat.
Frick, R. B., S1c - #3 rt. 0 lt. - large ads. - tubes open - narrow - nodules.
Richardson, D. H., SC1c - #3 rt. #3 lt. - moderate ads. - tubes flat.
Spier, C. J., MM3c - #4 rt. #4 lt. - large ads. - tubes flat.
Wilson, J. H., S2c - #4 rt. #2 lt. - very large ads. - tubes flat.

ADDRESS YOUR REPLY TO
BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT, WASHINGTON 25, D. C.
AND REFER TO
BUMED-B-DLS

A10-1

10 May 1945

WASHINGTON 25, D. C.

To: SecNav (Director of Public Relations).

Subj: Article, "Aero-Otitis Media in Submarine Personnel" by Lt. (jg) H. L. Haines, (MC), USNR, forwarded for filing.

Ref: (a) Article 113(2), N.R.

Encl: 1. (HW) Copy of subject article.

1. In accordance with reference (a), a copy of the subject article is forwarded for filing. There is no objection to its publication in a professional journal or to its presentation at a meeting of the Acoustical Society of America, in New York City, on 12 May 1945.

By direction of the Chief, BuMed:

ROBERT C. RAMSDELL
Commander, (MC), USNR, Ret.

AERO OTITIS MEDIA IN SUBMARINE PERSONNEL

by Dr H. Hanies 5-12-45

The most common injury seen in persons exposed to rapid changes in barometric pressure is the syndrome known as Aero-Otitis Media. In the progress of the war with the increase in aviation, submarine activity, and diving, this injury has become a problem of general interest. In addition it is a recognized occupational injury. Armstrong was one of the first to describe this injury and labelled it Aero-Otitis Media. McGibbon used the term Aviation Pressure Deafness, and the English and Germans refer to Acute Otitic Barotrauma. In this country it is generally called Aero-Otitis Media.

Aero-Otitis Media is the injury occurring from failure to equali pressure within the middle ear. The equalization occurs normally through the eustachian tube; but if blocked, stenosed, or if it fails to open sufficiently to allow for equalization of pressure, Aero-Otitis Media resul Improper ventilation through the eustachian tube may be due to pathological conditions, such as tissue masses or swollen lining membrane, or to inabilit or failure to voluntarily open the tube.

(137) - Sheet 1

The eustachian tube is a slit-like potential tube connecting the nasopharynx with the middle ear. It consists of a bony portion and a fibrocartilaginous portion. The bony portion remains rigid but the yielding walls of the fibrocartilaginous portion is closed and is the portion opens voluntarily in the equalization of pressure. This cartilaginous portion is approximately 24 mm in length and opens into the nasopharynx. The mucous membrane of this part of the tube is thick and very vascular, contains many mucous glands, and is lined with columnar epithelium. Near the mouth of the tube is found a varying amount of lymphoid tissue, such as adenoids. The three muscles attached to the mouth of the tube dilate the tube.

The function of the eustachian tube is to drain and ventilate the middle ear. The ciliary action and the slit-like opening of the mouth of the tube favor discharge from the middle ear to the nasopharynx and oppose a reverse current. During swallowing, yawning, voluntary inflation, or ciliar action, the dilator muscles open the eustachian tube, allowing intake of air for any pressure equalization or of the middle ear if needed. This function is utilized by those working in changing pressure conditions.

Failure to equalize pressure leads to discomfort and injury of the ears.

There have been many laboratory investigations of the physiolo

of the eustachian tube under varying degrees of pressure. It has been so

that the eustachian tube is forced open when the pressure in the middle e

is from 15 to 11.1 mm of mercury of pressure. The difference is due to t

difference in density of air and its viscosity. The eustachian tube is

forced open by the escaping air and the pressure relieved. On the other

hand, the ears must be voluntarily relieved before the pressure about the

tube reaches 80 to 90 mm of mercury, for at this time the edges of the tub

are pressed closed and it is impossible for the dilator muscles to force i

open. This is what Armstrong calls a flooded tube. If this condition is

not relieved by reducing the pressure to a level where the tube may be ope

voluntarily, Aero-Otitis Media results.

Two of the most frequent causes of eustachian blockage are hyper-

trophed lymphoid tissue about the eustachian orifice, and chronic infection

the nasopharynx. Other causes are, 1st-actual infection of the eustachia

itself; 2nd-acute colds (these have little effect if the eustachian

clear of lymphoid hyperplasia); 3rd-polyps in the eustachian tube (

demonstrated

~~pointed out~~ by ~~Dr. Edward Fowler, Jr.~~; and 4th-paralysis of

muscles as well as mental state of the individual, whether asle

or unconscious. Malfunction of mandible leads to poor ventilation of the middle ear. This angle is under investigation by Kelley ~~at~~ in New London at ~~the present time~~ at present time.

The symptoms of Aero-Otitis depend on the severity ~~of~~ and circumstan of the Trauma. ~~The following findings have been noted.~~ A positive pres of only 3 to 5 mm of mercury within the middle ear is perceptible as a fee of fullness. Pressures of 10 to 15 mm of mercury are outright annoying, a sounds ~~seem~~ are distant. Pressures of 15 to 30 mm of mercury cause tinnitus a some pain. Vertigo may occur. Usually at 15 mm mercury, the eustachian tube opens, equalizing the pressure and relieving the symptoms.

In negative pressure within the middle ear, the symptoms are the same if not relieved by swallowing or opening of the tube. At 60 mm of mercury there is definite pain in the ear, radiating over the side of the head and parotid gland. Symptoms increase with increase in pressure. The ear drums usually rupture between 100 to 500 mm mercury. With rupture of the drum, the symptoms of increased pressure are relieved; even the hearing is very little affected. There may or may not be persistant pain in the ruptured ear. In our experience pain seldom persists more than a few

moments. Many rupture ears with very little pain at all. (If these ruptured drum are left alone they heal in from one to four weeks. If treatment is atten a permanent performation may result from induced infection.

Objectively there is a great variation in the appearance of the drum and the middle ear in Aero-Otitis Media. The drum may be either retr or bulging. The amount of vascular engorgement may be only slight about t malleus and anterior and posterior folds, which we call a #1 ear; or it ma be diffusely injected, which is designated as a #2 ear; or it may have min hemorrhages about ruptured blood vessels in the drum, designated as #3 ear. or the whole middle ear may be filled with free blood and bubbles, which i designated as a #4 ear; or the drum may appear diffusely blue-black as one sees in cases of fracture of the base of the skull. It is the last-mentio type of drum that is accompanied by a rather marked deafness ~~which~~ is desi called a #5 ear. The other types described above show very little hearing los rather than 5 to 10 db. (that, however, is a significant loss).

The blood and fluid seen in these ears originates not only from the drum but appears to come from the lining mucous membrane of the middle ear as well. Campbell in England described the pathological appearance of

the mucosa in the ears of cats after the production of Aero-Otitis Media. In these the vascular disturbances - vascular dilitation, oedema, hemmorr and effusion - are comparable to the effects of "cupping" on the skin.

Thompson, Howe, and Hughson, 1934, demonstrated that variations in the pressure of the middle ear are not communicated to the inner ear f.

An ideal opportunity for the study of Aero-Otitis Media is pres at the U. S. Submarine Base, New London, Connecticut. All candidates for Submarine School are subjected to 50 pounds pressure in a period of 5 to 1 minutes in a dry recompression chamber before being permitted to enter the water for submarine escape training. Over 3000 men were examined just pri to and immediately after emerging from pressure. Audiograms were made pri to training. All those developing Aero-Otitis Media were sent for repeat audiograms as well as a thorough examination with the nasopharyngescope. No only those candidates that complained of ear difficulty but all candidates were checked for Aero-Otitis Media, for it was noted that only about one-th ever complained of any disturbance. Some of these probably had symptoms bu because of fear of being rejected, did not mention any symptoms of Aero-Oti Media, and others failed to mention any trouble because they suffered very

little discomfort.

About 30% of this 3000 developed Aero-Otitis Media to some deg Shilling and Teed have found this percentage to be a little less in summ and a little higher during the cold months. This figure of 30% agrees cl with the incidence of Aero-Otitis Media reported by the First U. S. Army Force; and with reports by Major Fowler ~~by~~ with the U. S. Army Air Force in En and with the figure of 33.5 reported by E. D. Dickson in England.

Preliminary nasopharyngoscopic examination of our cases disclos that almost 98% of those who later develop Aero-Otitis Media had lymphoid hyperplasia blocking and crowding the Eustachian tube. It seems clear th the mechanical action of this excess tissue may prevent proper ventilatior However, a certain number of cases which exhibited rather extensive ly mph hyperplasia were able to withstand increased pressure without ever developing A Otitis Media. Among those of us who have been attempting to predict the occurrence of Aero-Otitis Media in particular subjects, it is a common (an ~~unexplained~~) fact that certain men with enormous amounts of lymphoid tissu completely covering the eustachian orifices are able to withstand repeated exposures to 50 pounds of pressure (3.4 atmosphere) without developing Aer

Otitis Media. ~~These statements are, of course, not contradictory~~. It is significant to note that of those who develop Aero-Otitis Media, almost a have a history of symptoms of obstruction and evidence of crowding in the nasopharynx; while of those not developing Aero-Otitis Media, only 43.6% report previous symptoms of obstruction and show evidence of crowding in t eustachian tubes.

The treatment of lymphoid hyperplasia by radiation, whether radi radon, or X-Ray, is not new. It has been extensively used at the Johns Hopkins Hospital, Baltimore, for more than 15 years by Crowe and his associ His technique is to apply a 50 mgm radium applicator of 0.3 mm monel metal which is inserted in the inferior meatus to the region of the eustachian tu on each side for 6 minutes and 30 seconds. This procedure is repeated ever 25 days until the lymphoid mass is reduced in size and the eustachian tubes are free and open. The number of treatments depends upon the appearance of the nasopharynx. At least three treatments are given. There are no ill effects from this amount of radiation, which is well within the limits of a safe dosage. Even an exposure of ~~three times~~ twice the regular dose would have little or no unfavorable effects. There is no more discomfort than would be

experienced from a sunlamp treatment to develop that winter tan.

When the nasopharynx and the eustachian tube have been cleared of lymphoid tissue by treatment, these men are again subjected to pressure. In those that have completed radium treatment, there is only 8% incidence of Aero-Otitis Media. Those cases who have not had any kind of treatment show over 80% recurrance.

It is interesting to note that contrary to the findings in the aviation group, cases of Aero-Otitis Media in the submarine service show very little deafness except in cases of non-air containing middle ears (85 ears). Those that are air containing, with bubbles seen through the drum, show at most only 5 - 10 db loss of hearing. The eardrums of the flyers show marked retraction and loss of hearing, while the drums of the submarine men are bulging except in the cases mentioned above. This differ[illegible] is due to the inflation of the middle ear ~~and tube~~ occurring on return to the [illegible]rface. ~~(Explain)~~ This also accounts for the difference in the appearance [illegible] the drums.

~~Mr. Harris will present the audiometric findings on these cases...~~

One inflation occurs after damage + other occurs after [illegible]

Submariner — Flyer

(137) Total of 9 Sheets Attached

2 copies of original paper were mailed to Bureau —

After the meetings Dr Fowler Jr. — discussed aero otitis in adults after flight trips. Has found little response to radium therapy in older age groups — Did not qualify statement as to why or what the response mentioned blowing balloons during descent to surface. —
Audience was made up of sound engineers — psychologists — musicians etc. —

11 May 1945, Friday

24 Pressured
3 Aero-Otitis Media
2 Failures:

R'5.14 Johnson, C., F2c - out at 14 lbs. - #4 rt. #4 lt. - large ads., red - both tubes closed tight.
R'5.14 Monroe, H. C., CM2c - out at 10 lbs. - #4 rt. 0 lt. - moderate ads. - tubes narrow, open - rt. slit-like.

Passed:

Wilderman, R., S1c - #4 rt. 0 lt. - enormous ads. - tubes covered - not seen.

14 May 1945, Monday

20 Pressured
5 Aero-Otitis Media
2 Failures:

Granger, B. G., Flc - out at 6 lbs. - #3 rt. 0 lt. - moderate ads. over whole nasoph. - tubes crowded - narrow - no cold.
Rowe, W. L., Flc - out at 6 lbs. - 0 rt. #3 lt. - small ads. about tubes - Fossae xx - no cold.

Passed:

Coshow, A. E., Flc - #3 rt. 0 lt. - large ads. - tubes narrow, open.
R'5-26 Hosmer, G. C., Flc - #4 rt. #4 lt. - moderate ads. - tubes flat.
Johnson, A. E., Flc - #2 rt. #4 lt. - large ads. - left closed - right open.

15 May 1945, Tuesday

25 Pressured
6 Aero-Otitis Media
4 Failures:

Coleman, T. P., Slc - Out at 11 lbs. - #1 rt. #4 lt. - large ads. - tubes flat.
R'5-26 Mascari, P. M., Slc - out at 8 lbs. - #4 rt. #4 lt. - enormous ads. - tubes closed - slight cold.
McCormick, A., QMlc - out at 22 lbs. - enormous ads. - tubes closed.
Richards, P. M., Slc - out at 10 lbs. - #2 rt. #4 lt. - large ads. - tubes narrow, open.

Passed:

R'5-26 LeBow, L. E., Slc - #4 rt. #4 lt. - large ads. - tubes flat, bleeding.
Murray, R. V., Slc - 0 rt. #4 lt. - enormous ads. - left tube closed, bleeding.

16 May 1945, Wednesday

Rechecks:

14 Pressured
14 Aero-Otitis Media
7 Failures:

R' 5-12 Alterman, D. S., RT3c - out at 5 lbs. - #4 rt. #4 lt.
R' 5-10 Dirg. Hannah, J. M., S1c - out at 5 lbs. - #4 rt. #4 lt.
R' 4-5 Henry, D. A., RT2c - out at 16 lbs. - 0 rt. #3 lt.
Jordan, J. F., RT3c - out at 5 lbs. - 0 rt. #4 lt.
Dirg Titus, P. C., S1c - out at 8 lbs. - 0 rt. #4 lt.
Weyerick, R. K., S1c - out at 8 lbs. - #3 rt. #4 lt.
R' 2-23 White, V. L., S2c - out at 5 lbs. - #3 rt. #4 lt.

Passed:

R' 5-8 Coffman, J. P., Bkr2c - #3 rt. #2 lt.
R' 5-14 Monroe, H. C., QM2c - #4 rt. 0 lt.
R' 5-8 Murphy, G. E., S2c - #3 rt. 0 lt. -
R' 5-10 Parke, H. G., RT3c - #4 rt. #4 lt.
R' 5-15 Spaven, H. F., F1c - #3 rt. 0 lt.
Weisenberger, F. P., MoMM1c - #2 rt. 0 lt.
Weiss, D. L., S1c - #3 rt. #4 lt.

17 May 1945, Thursday

24 Pressured - Gum
6 Aero-Otitis Media Gum
2 Failures: Gum

R' 5-18 Auger, R. A., S2c - out at 4 lbs. - 0 rt. #3 lt. - moderate ads. - tubes flat - open with swallowing
R' 5-18 Michel, H. A., RM2c - out at 22 lbs. - #4 rt. #4 lt. - moderate ads. - tubes flat, bleeding.

Passed:

Greco, J. P., S1c - 0 rt. #4 lt. - enormous ads. - tubes covered, closed.
R' 5-26 Hill, G. E., RT3c - #4 rt. #4 lt. - moderate ads. - tubes covered, closed, bleeding.
R' 5-26 Scelza, F. P., S1c - #4 rt. #4 lt. - large ads. - tubes flat, bleeding.
Stingelin, J., S1c - #4 rt. 0 lt. - moderate ads. - tube closed right - left open.

18 May 1945, Friday

19 Pressured
9 Aero-Otitis Media
0 Failures

Passed:

Ball, W. E., Slc - #4 rt. #3 lt. - large ads. - tubes covered and flat.
Cartwright, W. F., Flc - #4 rt. 0 lt. - large ads. - right tube closed - left open.
R'5-26 Clise, D. E., Flc - #4 rt. #4 lt. - moderate ads. - tubes flat.
Finkel, F. I., Slc - #3 rt. #3 lt. - moderate ads. - nodules over tube.
Fiske, H. A., Flc - ruptured right ear.
Holt, R. G., Flc - #2 rt. #4 lt. - moderate ads. - tubes covered.
R'5-26 Kukal, M., Flc - #4 rt. #4 lt. - enormous ads. - tubes covered.
R'5-18 Mayer, C. J., Flc - in 50 ft. developed #4 ear - enormous ads. - tubes flat - bleeding lt. - right tube narrow, open.
R'5-26 Radcliffe, C. H., Flc - #4 rt. #4 lt. - enormous ads. - tubes covered.

Saturday - 19 May 1945
No pressure today -
Conference c' Capt. Shilling and Mr. Harris on Sound Conference for ... on 14-15th.
Making to be used in routine hearing tests + physical Exam.
Rechecking these figures for officers treated with Gadium for aero-otitis media shows only 8.1% develop a.o.m. after treatment when subjected to pressure while untreated cases ~~develop~~ over 80% develop a.o.m on repeat exposures to pressure -
These figures based on a exam of over 120 cases. - The same appears to be the case with enlisted personnel.
1 Conference with Harris + Mrs. Smith on data as to # of failures due to unilateral deafness + the

(141)

number mixed by present [illegible] masker to be used [illegible] to be [illegible] important of masking of opp. ear as well. - this will be about 5 - 10 db. - (2 [illegible])

In Reply
Refer To:

Serial:

UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

16 May 1945.

COMMENT ON FLYING PERSONNEL RESEARCH COMMITTEE LETTER NO. 126-11 FROM COMMANDER VORHAUD TO ADMIRAL SMITH:

The following comments were made by members of the Medical Research Department, U. S. Submarine Base, New London, Connecticut.

We would be most happy to have the minutes of the meeting of 16 February 1945.

C. W. SHILLING,
Capt., (MC) U.S.N.

- -

Only 39 cases reported, with only 9 cases showing improvement. Thi is low compared to indications of results to be expected in this country with radium therapy. The fault may be in methods of applic tion or in allowing cases to return to flight duty before the effec of post radiation (edema and injection) have worn off.

The dosage used here is 50 mgm radium in a 0.3 mm of monel metal to each side of the nasopharynx for eight and one half minutes. In over 1000 applications there have been only 3 post radiation reactio with an acute flare up of a beginning cold.

H. L. HAINES,
Lt.(jg), (MC) U.S.N.R.

- -

Paragraph III: Training in U.S.A. for hearing in noise. S/ldr. Goldie evidently heard the Words-in-Noise records. The criticism of their use by S/ldr. Fry is valid, but his objection is overcom in the Sentences-in-Noise records. The use of pure-tone audiometry is certainly not the best means of predicting whether a ma

NEW LONDON, CONNECTICUT.
UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

Serial:

16 May 1945.

COMMENT ON FLYING PERSONNEL RESEARCH COMMITTEE LETTER NO. 126-11 FROM COMMANDER VORWALD TO ADMIRAL SMITH: Continued

can hear speech satisfactorily in noisy surroundings; but I know of no service activity where anything but a test in quiet is a pre-selection test.

The U. S. Standards Committee decision that "Normal" constitutes an average hearing loss of not more than 10 db at the frequencies 512, 1024, and 2048 is a fairly rigid definition, and certainly much better than the 15' Whispered Voice figure. In terms of our acuity record scores, a man who has an average loss of 15 db through this range, will be lower than those whose audiograms are normal (average loss = 10 db or better). Accordingly, I think we should support the Committee's definition of "Normal".

J. DONALD HARRIS,
Ensign H-(S), U.S.N.R.

(142)-Sheet 2 of 2

21 May 1945, Monday

22 Pressured
7 Aero-Otitis Media
1 Failure:

Kompelien, A. D. - Flc - out at 3 lbs. - #2 lt. - 0 rt. moderate ads. - tubes closed.

Passed:

Herbot, A. O., Slc - #4 rt. #2 lt. - moderate ads. - tubes closed.
Hylton, B. H., Flc - #4 rt. #2 lt. - enormous ads. - tubes closed.
R 5-26 Kiernan, A. E., Flc - #4 rt. #4 lt. - enormous ads. - tubes closed.
R 5-26 SWIFT, C. W., Flc - #4 rt. #4 lt. - enormous ads. - tubes closed.
Taggart, R. H., Bkr3c - 0 rt. #3 lt. - small ads. - tubes clear.
Wilber, R. J., S2c - #4 rt. #4 lt. - enormous ads. - tubes closed.

---

23 May 1945, Wednesday

12 Pressured
3 Aero-Otitis Media
1 Failure:

Frieling, E., RT3c - #3 rt. #1 lt. - out at 8 lbs. - enormous ads. - tubes covered, flat.

Passed:

Moreno, D., QMlc - #3 rt. 0 lt. - large ads. - tubes covered.
Sharp, H. L., RT3c - #3 rt. 0 lt. - enormous ads. - right tube closed - left tube open.

"Schundel" project applied for - BIG PROBLEM

23 May 1945, Wednesday

Rechecks

13 Pressured
13 Aero-Otitis Media
7 Failures:

R 3-12 Alterman, D. S., RT3c - out at 4½ lbs. - #3 rt. #3 lt. Dropped
Granger, B. G., Flc - out at 4½ lbs. - #4 rt. 0 lt.
McCormick, A., QMlc - out at 4½ lbs. - #3 rt. #3 lt.
Richards, P. M., Slc - out at 32 lbs. - #1 rt. #3 lt.
Rowe, W. L., Flc - out at 1½ lbs. - #4 rt. #3 lt.
R 5-9 Wellman, J. F. Jr., Flc - out at 4½ lbs. - #4 rt. #4 lt.
Weyrick, R. K., Slc - out at 11 lbs. - #4 rt. #3 lt. dropped

Passed:

Angle, R. A., S2c - 0 rt. #3 lt.
Coleman, T. P., Slc - #4 rt. #2 lt.
Kompelien, A. D., Flc - 0 rt. #1 lt.
R 5-26 Mascari, P. M., Slc - #3 rt. #3 lt.
R 5-18 Michel, H. A., RM2c - #4 rt. #4 lt.
R 3-22 Smith, H. O., Slc - #4 rt. #2 lt.

24 May 1945, Thursday

21 Pressured
6 Aero-Otitis Media
1 Failure:

Cocolin, T. C., S1c - out at 5 lbs. - enormous ads. - #3 rt. 0 lt.

Passed:

three with #1 ears - two with #2 ears.

---

25 May 1945, Friday

50 lbs. in 9 minutes

10 Pressured
3 Aero-Otitis Media
3 Failures:

Adams, P. E., S1c - out at 8 lbs. - #4 rt. #3 lt. - very large ads. - tubes covered.
Batts, J. A., S2c - out at 18 lbs. - #2 rt. #2 lt. - severe cold.
K 529 Lipe, W. E., F1c - out at 8 lbs. - #4 rt. #4 lt. - enormous ads. - tubes covered.

---

26 May 1945 Saturday -
No pressures -
All of Sprity (Sub sch.) men are to be checked not only on visual appearance of inflation of ear drums but also from sound to see if any better correlation can be made.
Checking men under pressure has not yielded any additional information - Congestion can be seen occurring with increase in difference of pressure across drum but is relieved c̄ inflation -
Drum is seen to move in & out - ~~there~~ is a wide variation in excursions of drums - in individuals & with ~~varying~~ inflations in same individual
No pictures have been taken

EM

(144)

Monday May 28th 1945
No Lecture -

29 May 1945, Tuesday

22 Pressured
6 Aero-Otitis Media
4 Failures:

Barnes, LeRoy, MoMM1c - out at 7 lbs. - #4 rt. #4 lt. - slight cold - very large ads. - flattened post wall - tubes closed.
Kessler, L. D. - EM2c - out at 11 lbs. - #4 rt. #4 lt. - enormous ads. - tubes covered.
Lynch, G. W., F1c - out at 26 lbs. - 0 rt. #4 lt. - enormous ads. - tubes open, crowded.
Vernosky, Michael, S2c - out at 7 lbs. - #4 rt. #4 lt. - enormous ads. - tubes flat, covered.

Passed:

Hinkler, H. F., TM3c - #4 rt. #4 lt. - perforation rt. - moderate ads. - tubes flat, crowded.
R'-6-26 Smith, W. A., F1c - #2 rt. #4 lt. - very large ads. - tubes flat.

---

30 May 1945, Wednesday

Rechecks

10 Pressured - in 10 minutes
8 Aero-Otitis Media
3 Failures:

Frieling, RT3c - out at 18 lbs. - #3 rt. #2 lt.
Lipe, W. E., F1c - out at 10 lbs. - #4 rt. #4 lt.
R'2-23 White, V. L., S2c - out at 10 lbs. - 0 rt. #4 lt.

Passed:

Batts, J. A., S2c - #1 rt. #1 lt.
Cocolin, T. C., S1c - #2 rt. #1 lt.
Granger, B. G., F1c - perf. rt. - #3 lt.
R'4-5 Henry, D. A., RT2c - 0 rt. 0 lt.
R'3-21 Jordan, J. F., RT3c - 0 rt. 0 lt.
McCormick, A. - OM1c - #1 rt. #1 lt.
R'2-13 Tieman, L. W., RT2c - #1 rt. 0 lt.

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May 23, 1945

Dr. Henry Haines,
Sound Laboratory,
Medical Research Department,
U.S. Submarine Base,
New London, Connecticut.

My dear Dr. Haines:

I would be glad to have you present for publication your paper entitled "Aero-Otitis Media in Submarine Personnel". If this paper is to appear in our July issue it should reach me within a week after you receive this letter.

Very truly yours,

Floyd A. Firestone

Floyd A. Firestone

FAF:ak

Paper has been sent in.

NAV1.967000.029
COPY

31 May 1945, Thursday

18 Pressured
7 Aero-Otitis Media
2 Failures:

Durham, L., S1c - out at 6 lbs. - 0 rt. #3 lt. - enormous ads. - tubes closed.
Thurber, R. L., S2c - out at 6 lbs. - #3 lt. #4 rt. moderate ads. - tubes flat.

Passed:

Davis, N. C., QM1c - #4 rt. #2 lt. - very large ads. - large mass-left tubes flat.
Sands, M. D., RT3c - #3 rt. #4 lt. - moderate ads. - tubes closed, flat, bleeding.

Three with #2 ears.

20 June 1945.

Lt. H. H. Bennett

Seen today. audiogram shows high tone loss which is also down on bone and air conduction is better than bone conduction.

Exam. of ears neg. except some contraction in Shrapnel's area both sides - slow on inflation.

Hist: Stuffiness in ears with colds and off and on at present. Chr. post nasal discharge.

Nasopharynx: Small amount of actively infected adenoids with purulent discharge and infection in Eust. tube orifices.

Wait for subsidence of acute phase and then radium removal of lymph tissue in and about Eust. tubes.

Return one week.

H. L. Haines
Lt. (jg) (MC) USNR

[illegible] July 1945.

Less infection, still swollen

1st Radium - 6 mg. with 0.5 mm. nickel

Very slight to each side nasopharynx.

Return August 2, 1945.

H. L. Haines

Friday June 1st -
[illegible]
Dr Kelly's equipment arrived
& is being set up.

Saturday June 2nd.

4 June 1945, Monday

21 Pressured
6 Aero-Otitis Media
0 Failures

Passed:

Charron, L. H., SClc - #4 rt. #4 lt. - very large ads. - tubes flat, bleeding - more ads. on rt.
Fahy, J. K., Flc - #4 rt. #4 lt. - enormous ads. - tubes covered, not seen.
Mundinger, K. K., RM2c - 0 rt. #3 lt. - moderate ads. - tubes open.
Palmer, M. B., Y2c - #4 rt. #3 lt. - moderate ads.- tubes flat, open.
R' 6-6 Renck, W. A., Flc - #1 rt. #4 lt. - moderate ads. - tubes crowded - right free.
Trimble, K. R., S2c - #4 rt. 0 lt. - enormous ads. - tubes covered - left open.

---

5 June 1945, Tuesday

22 Pressured
5 Aero-Otitis Media
0 Failures

Passed:

Burnette, D. T., F2c - #3 rt. #4 lt. - very large ads. - tubes flat.
Faber, E. G., Slc - #3 rt. 0 lt. - very large ads. - tubes flat right - cold.
Larimer, J. W., Flc - #4 rt. #4 lt. - enormous ads. - tubes covered, closed.
VanBelle, C. C., S2c - #4 rt. #4 lt. - moderate ads. - tubes covered, closed.

---

5 June 1945, Tuesday

Recherks.
Have had radium: ~~X~~/ 40mm

7 Breaths 7 min 1 away Ofatal

ALTIG, J. R.	S2c	0	0
~~BOHN, S. W.~~	~~S2c~~	~~#3 rt. ear. too soon after Rad~~	
BURGESS, L. L.	F2c	Negative	0
~~CHRISTIAN, R. M.~~	~~MM2c~~	~~#2 rt. ear. F. F. @ 23# - too soon after Rad~~	
DILORENZO, D.	S2c	Negative	0
HASHAGEN, V. E.	F1c	Negative	0
OURAND, R. C.	S1c	Perforation, rt ear Passed pressure	
SMITH, G. A.	S1c	Negative	0
THORPE, W. C.	F1c	Negative	0

see July 4th.

see July 4th

6 June 1945, Wednesday

28 Pressured
11 Aero-Otitis Media
3 Failures

Kozicki, W. R., F1c - out at 5 lbs. - 0 rt. 3 lt - mod ads. tubes open, cold nodule lt.
Corbin, J. F. Jr., S1c - out at 9 lbs. - 4 rt 0 lt. enor ads, tubes cor.
Jillson, C. C., S2c - out at 9 lbs. - 4 rt. 0 lt. mod ads.
Hubert, D. W., S1c - 4 rt. 0 lt.,- large ads, tubes crowded closed

Missed.

Three cases with #2 ears

Payton, C. R., F2c - 3 rt 1 lt - large ads, tubes covered no cold
Pearson, G. H., RT3c - 3 lt 1 rt - mod ads, tubes open crowded
Valiton, E. L., S1c - 4 lt. 3 rt - very large ads tubes covered

One case with #2 lt.

6 June 1945, Wednesday

11 Pressurdd
10 Aero-Otitis Media
0 Failures

Altig, J. R., S2c - 0 lt. 0 rt.
Adams, P. E. S1c - #2 lt #e rt.
Barnes, L. A. Jr., MM1c - #2 lt. #4 rt.
Frieling, E., RT3d - #e lt #2 rt.
Klasler, L. D., EM2c - #3 lt #2 rt.
Lipe, W. E., F1c - #4 lt. #3 rt.
Lynch, G. W. Jr., F1c - #3 lt #2 rt.
Thurber, R. L., S2c - #4 lt. #4 rt.
Vernosky, M., S2c - #4 lt #4 rt.
Wellman, J. F. Jr., F1c - #3 lt. #3 rt.
Durham, L., S1c - #2 lt. #2 rt.

In Reply
Refer To:

UNITED STATES SUBMARINE BASE,
NEW LONDON, CONNECTICUT.

Serial:

1 June 1945.

MEMORANDUM TO CAPTAIN SHILLING:

Subject: Otological Examination.

Doctors D. D. Dickson and Bateman discussed the very important and universally neglected otological examination.

The standardization of the simple hearing tests and the grading of pathological findings as I, II, III, IV according to qualifications for various types of duty should be adopted.

In place of Dickson & Bateman's extra orderly to occlude the ear not tested, a masker of a mixture of tones at 60 decibell should be substituted to cover the ear not being tested. The candidate himself can be trusted to do this, for if the masker is improperly applied to the ear, the deafness if present is still apparent, and the patient will be sent for an audiogram or fork tests by the otologist.

The use of standard selected words and presentation is important. It is well known that 3 and 8 are frequently reversed by individuals with some high tone deafness, 5 and 6 are other words reversed, etc.

The ability to voluntarily inflate the midear is of questionable value but should be checked as it often reveals other pathological conditions and is instructive in teaching individuals to inflate the ears.

Less pathological conditions would be overlooked in the routine examination if an otoscope were used similar to the Welch Allyn diagnostic head with a large lense and a closed speculum that allows for easy application of positive and negative external pressure over drum and watching drum action through speculum.

The addition of Radium treatment of adenoids about the eustachian tube enables more candidates to pass and remain in active air or submarine service.

A similar program should be adopted by the U. S. Navy. On June 14th at the U. S. Submarine Base, New London, Captain Shilling is undertaking a study of this problem.

H. L. HAINES.

Rough Draft not for publication

IRRADIATION OF THE EUSTACHIAN TUBE OF AIRMEN

An anatomical, physical and clinical study of a treatment for otitis media.

BY

EDMUND P. FOWLER, JR., Major, M. C. *

* The temporal bone material in this paper was prepared in parrafin by S/Sgt M. Brewler, under the direction of Lt. Col. Murray Angevine, MC, in a General Medical Laboratory, European Theatre of Operations.

(151) - Sheet 1

Exposure of the eustachian tube to radon, radium, or X-ray will often prevent recurrent otitis media when it is due to excess lymphoid tissue about the pharyngeal ostium of the eustachian tube. (1) It is particularly valuable for certain cases of otitis media due to barotrauma (aero-otitis). This communication will concern itself with some of the problems which have been encountered in irradiation of the eustachian tube of airmen, for its value in recurrent otitis and deafness in other groups has been established by Crowe, Burnam and their co-workers. (2, 3)

The known susceptibility of lymphoid tissue to radiation is the basis for its use in the nasopharynx. Although this susceptibility was first observed on lymph nodes, experience has shown that adenoid tissue is quite as sensitive. This has been confirmed by Schenk on biopsy material. (4) It is remarkable how little radiation is required to produce a profound effect. (Fig. 2) After one treatment the germinal centers throughout the specimen have disappeared and the number of lymphocytes are greatly reduced. Many of those which remain have pyknotic nuclei. The capillaries in the irradiated tissue are very prominent. Their endothelium is thickened and their walls are hyalinized. Connective tissue cells are much more prominent than in the control biopsy. (Fig. 1) The aviator from whom these biopsies were taken sustained marked relief from his aero-otitis and his "scratchy" throat after one radium treatment

There is considerable difference of opinion as to the amount of lymphoid tissue which is normally present in and about the eustachian

(151) - Sheet 2

tube. The difference of opinion concerning the distribution of lymphoid tissue has caused controversy as to the theoretical value of different types of radiation. For this and other reasons, various types of filtration have been used for radon and radium while some radiotherapists have suggested that deep X-ray therapy should be employed.

A review of the anatomy and pathology of the eustachian tube should be made before it can be decided which variation in radiation technique is most desirable. It is necessary to determine the absorpti characteristics of various filters to beta and gamma radiation and the expected dose at the various depths found by anatomical study to be of importance. To be of value the method must be readily available, free from danger and convenient for both patient and physician.

When excess lymphoid tissue is seen about the torus tubarius and there is improper function of the tube, it has been assumed that the lymphoid tissue is responsible. (2,3) The best basis for this belief has been the clinical observation that radiation of the mouth of the tube reduces the lymphoid tissue that may be present and this usually is followed by an improvement in the function of the tube. The improvement can be demonstrated by the Valsalva maneuver using a manometer. cf. Perlman. (5) If the otitis was long standing and severe, transudates disappear from the middle ear and deafness improves. Furthermore airmen subjected to conidtions which require especially good function of the tubes are able to fly again after the treatment. (6,7) They can also withstand severe pressure chamber tests so that the treatment

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should also be applicable to submarine crews and deep sea divers.

The literature is not very voluminous or specific about the location of the lymphoid tissue in and around the eustachian tube. "Gerlach's tonsil", gross lymphoid tissue in the cartilagenous part of the tube, is always mentioned but there is considerable question whether this is ever a normal structure, even in children. Gerlach's only case was in a six month's old child grossly dissected No mention is made in either of his articles as to whether the middl ear was normal. There may well have been a history of otitis media or a low grade eustachian salpingitis. Wolff (9) in examining 500 temporal bones from 250 individuals of all ages, found lymphoid tissue between the isthmus and the mouth only once. Again it was in a six month's old infant. Teutelben and Zellner (10) describe cases in adults but conclude that when lymphoid tissue is present it is pathological.

Full length sections are occasionally shown from infant or embryo material but few authors have reported histologic material covering the entire length of the eustachian tube in adults. Wolff (11) has one article in which conclusions were derived from two completely sectioned adult temporal bones, one horizontal, the other vertical. How many, in her series of 500 mentioned above, showed the pharyngeal orifice, she does not say, but very few collections show the tube beyond the isthmus in routine sections, even in children. Graves and Edwards (12) write of a "lymphoid layer" in the eustachian tube but their detailed description is of an embryo. Farrior (13) from a study of "100 histologic sections of tube", states

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that "There is no lymphoid tissue in or about the normal eustachian tube."

In civilian life it is extremely difficult to obtain normal anatomical material from the respiratory tract. In war it is possibl to obtain specimens from young adults which give a proper anatomical background for therapy. Material from airmen killed in action substantiates the statements of those who believe that infection is the cause of lymphoid tissue in the eustachian tube and any excess about its mouth. This material suggests that lymphoid tissue is rarely abundant enough to block the tube except at its nasopharyngeal orifice precisely where it is easiest to attack with radium. (Fig.3)

In the European Theater of Operations 95 pairs of temporal bones have been removed from deceased airmen and examined grossly preparator to microscopic study. Eight pairs of bones have been removed from ground personnel of the same age group. Most of the bones were removed so as to preserve not only the mastoid, middle ear, and labyrinth but also the entire length of the eustachian tube and the adjacent portions of the nasopharynx. This material shows that nasopharyngeal lymphoid tissue is very common in American airmen in England. The tissue covers the torus tubarius in many airmen who never had enough aero-otitis to report to their Group Surgeon. It can be seen bumpily protruding from the torus tubarius and both the salpingo-pharyngeal and salpingo-palatine folds in about a third of the gross specimens examined. It was abundant posteriorly in about one-half of the specimens. Lymphoid tissue tends to make the pharyngeal orifice of the tube a narrow slit to which mucus adheres. One

(151) - Sheet 5

wonders if it is not thick mucus in a narrow opening which is the final lock in many non-functioning eustachian tubes. Many airmen have been found to have excess lymphoid tissue and no complaints of aero-otitis. Others get along very well until they develop a slight "cold" with a post nasal drip. It is noteworthy that those who can fly with a nasopharyngitis rarely have excess lymphoid tissue about the lips of their eustachian orifices.

To date, one bone from each of 16 individuals has been cut and stained so as to allow analysis of the microscopic appearance of the entire length of the tube. Most interesting in the sections is the low grade eustachian salpingitis which is present in 11 out of the 16. (Fig. 4) Whether this is reaction to the English climate or to flying is difficult to say. Two of the temporal bones which did not belong to airmen were from patients with debilitating diseases. They both showed slight eustachian salpingitis. Two members of the ground force who died of gunshot wounds showed none. Much more material must be examined before the incidence of eustachian salpingitis is known.

The salpingitis manifests itself by round cell infiltration, edema, and often hyalinization of the submucosa. Hyperplasia of the lining epithelium and hypersecretion of the mucus glands are also usually present. (Fig. 5) The round cell infiltration becomes more and more extensive as the infection progresses and eventually may form single germinal centers and sometimes masses of lymphoid tissue with multiple centers. The lymphoid tissue appears to push

through the high columnar ciliated epithelium covering it. Actually the highly organized ciliated epithelium sloughs away leaving a few areas covered by undifferentiated low cuboidal epithelium. (Fig. 7) This is very similar to the pathology found in the bronchi and nasal sinuses with chronic infection (Semenov). (14) It is even more striking in the eustachian tubes because there is less possibility of artifacts being produced in the specimens by brushing away the delicate superficial parts of the ciliated epithelium. The tube is so narrow and deep that the lumen is protected from mechanical injury.

Lymphoid masses are rare except near the pharyngeal orifice but may occur anywhere along the length of the eustachian tube. If a chronic infection is present lymphoid tissue may occur anywhere along the tube and even in the middle ear. Figure 6 shows some lateral to the isthmus. The occurrence of lymphoid tissue far from the pharyngeal orifice of the tube makes one wonder if such tissue is not present in the airmen who do not receive benefit from radium in the nasopharynx. Hyperplastic mucous membrane flaps or rugae, such as shown in Figures 4 & 5 also may be responsible for failure of the treatment. These may become edematous and polypoid and so block the tube mechanically. Distant tissue will not be much affected by radium nor will polypoid tissue.

The complete or partial clinical records of 80 airmen who have been treated with radon or radium were available for this study.

Airmen are subjected to violent changes in pressure and it is quickly apparent during descent or ascent if they do not have normal functioning tubes. That 46 airmen out of the 80 with recurrent aero otitis from various causes are known to have returned to full flying duty after radiation treatment is of significance. This means that in 57% of all the cases, marked improvement was observed. Some of the men who were lost to follow up may have also improved.

The cases were selected because they had recurrent attacks of aero-otitis which grounded them. A few had very little excess lymphoid tissue in the nasopharynx but in most of them it was very prominent. Many did not receive a full course of treatment and many had complicating factors in addition to whatever excess lymphoid tissue was present. For example, several had severe sinusitis or nasopharyngitis which in itself necessitated return to the U. S. and therefore discontinuance of the treatment. Fourteen of the 80 airmen received only one treatment or were lost to follow-up after two. Unless a record of improvement was obtained they were considered unimproved. Of the 66 cases who received two or more treatments and were followed, 46, as mentioned above, returned to full flying duties. This means that 69% of those properly selected, treated and followed, obtained relief of symptoms. All had been grounded repeatedly and very few were expected to finish their tours.

There is a possibility that the use of radium might have a psychic effect on the patient; therefore it was decided to do a certain number of controls on airmen. Dummy capsules identical of the therapeutic capsules were supplied at two different hospitals marked so that no one could tell which set was loaded and which was not. This was

done so that the observation of the examiners would not be biased. Out of the 34 alternate cases, 17 were treated with 50 mg. hours of radium to each side and 17 were treated with the placebo. Four out of the 17 treated with the placebo returned to flying duty but only one returned without symptoms. Thirteen out of 17 alternate cases who received the active capsules returned to full flying duty. Two of the 13 had occasional mild aero-otitis. The others were free from symptoms although they had all been grounded repeatedly before the treatments. None of the patients knew that an experiment was being performed and the doctors had no idea at first which case was being treated and which was not. After several weeks it was apparent that one group was doing well and the other badly. This small contro series should answer the queries of those who wondered if the effect of putting radium capsules in the nose is not largely psychic.

In any discussion of irradiation it is essential to describe in detail the applicators used and in particular the amount of filtration employed. The patients described above were treated with two types of platinum applicators one sort containing radon gas and the other radium element. The earlier cases were done with a platinum applicator .65 mm thick containing radium gas. The later cases were done with capsules 0.5 mm. thick containing radium sulfate. The difference of dosage between 0.5 mm of platinum and .65 mm. is less than 5%. The earlier cases were treated with 33 mg. hrs. to each side of the nasopharynx and it was found that four to six treatments at three week intervals were necessary to obtain the desired effect.

The later cases received 50 mg. hrs. to each side of the nasopharynx for 2 to 4 treatments at four week intervals. These have been called respectively 66 mg. hrs. and 100 mg. hrs. to the whole nasopharynx in previous communications. (6,7) Designation for each side of the nasopharynx is more accurate. The amount of radiation across the nasopharynx is negligible (see Table 1 and Fig. 8).

The capsules were 15 mm. long and had 3 mm. outside diameter. The effective length was 12.5 mm. (Fig. 9) When filled with radon they each contained 77 millicuries of gas on delivery. When filled with radium they each contained 50 mg. of radium sulfate.

The importance of the filtration has not been properly understood by some otologists doing this work. Dr. Samuel Crowe (2) used 1 mm. of brass for 2 gm. minutes (33 mg. hrs.) to each side treating at 4 to 6 week intervals. 1 mm. of brass, filters out all but 8% of beta radiation (15) On the other hand beta radiation may have comparatively more physiologic effect than gamma radiation when it reaches the tissues concerned. In adults it is unusual to obtain the same results with a .5 mm. platinum filter as Crowe reports with brass unless 4 to 6 treatments are given. Crowe used 1 mm. brass filter for only 2 or 3 treatments as a rule. When the dosage is increased to 50 mg. hrs. to each side with a platinum filter the results are much more satisfactory than with 33 mg. hours even though the interval between treatments is increased to 4 weeks instead of 3 weeks. .5 mm. of platinum filters out 100% of the beta radiation.

Lately applicators containing 50 mg. of radium and having a filter of .3mm. of monel metal are being tried. These are used for 6 min-

utes and 40 second, (5.56 mg. hour) in contrast with the hour used by the author with .5 mm. of platinum (50 mg. hours). If two applicators are identical except for filtration, the one with .3 mm monel metal delivers at a depth of 1 mm. in tissue, 7 times as much radiation as the one with 0.5 mm P-, as determined by ionization measurements according to Quimby. (16) Erythema tests with the same filter indicate a ratio of about 8 times if calculated from the figures of Dean. (17)

It will be interesting to see if the results with mixed radiation from the monel metal filter are as food as with brass or the pure gamma radiation provided by platinum. From physical measurements (Table I) it would seem that 6 minutes and 40 seconds with 0.3 mm. of monel metal is too short a time to obtain the same result as has been obtained with 50 mg. of radium in 1 mm. brass for 40 minutes or .5 mm. of platinum for one hour. Theoretically to obtain 1900 r, as with brass, 8 minutes would have to be used. To obtain the same result as with .5 mm. of platinum, 8½ minutes would have to be used. Since the potency of beta radiation is not as well understood as is gamma radiation, increase in the dosage time using monel metal will have to be done with caution.

Since clinical observations and all the pathological material available indicate that most of the lymphoid tissue that needs to be treated is on the surface of the nasopharynx, (Fig. 3) it would seem rational to use the monel metal filter whenever possible. If this gives unsatisfactory results, it might be advisable to try deep X-ray therapy to attack the deeper parts of the tube. The gama radiation from a brass or platinum capsule may be adequate to

reduce the lmyphocytic infiltration of the submucosal layers there. (Fig. 5)

It is possible that 1 mm. of brass is just the right filtration. It gives a relatively heavy dose on the surface where autopsy material shows it to be most needed. It also gives a light dose peripherally in the eustachian tube where smaller doses might be adequate. With 3 mm. of monel as used there is again a heavy dose on the surface but practically none in the deeper tissues. (See the figures for the histology at various depths and compare with table I for various filters and dosage times.) Doses of 100 r or less are quite effective on low grade inflammatory processes but have little direct tissue effect.

Some years ago in the Department of Radiotherapy of the Presbyterian Hospital in New York, 63 cases were treated with deep X-ray therapy using 800 to 1,200 r to each side through ports 6 x 8 cm. in diameter. (1) The treatments are directed so that the rays entered through the palate and different skin areas on the cheek and neck with each treatment. Results comparable to those obtained with radon and radium were obtained but there were disadvantages in using x-ray. Flare ups of otitis media were often observed with 150 or 200 r as used in another hospital. It was therefore thought unwise to give more than 100 r to each side at a sitting. This made it necessary for a patient to make several visits to the clinic during a period of 3 weeks. Even then there were a few slight reactions. A few children developed mild otitis media with dose of only 100 r

to each side and a few had transient parotitis. One woman, hypersensitive to radiation, showed an erythema on the neck where the rays passed through the skin after one treatment.

Several practical considerations are involved in the selection of the type of radiation to be used. For example, if radium and radon are not available, there is no choice but to use deep x-ray therapy; in spite of the fact that it requires expensive and cumbersome equipment, is difficult to direct properly, and requires the services of a radiotherapist for every treatment. The whole procedure is much simpler when two to four treatments are given with radon or radium in juxtaposition to the tissue requiring radiation.

If radium is available for other purposes but the containers are of suitable size, potency, and shape for use in the nasopharynx it is absurd to obtain special radium applicators at great expense unless many cases are to be treated over a long period of time. It is often easy to adapt capsules designed for other purposes and to insert them into the nasopharynx. (Fig 9) (1) If radon is available, small groups of cases can be treated by appointment at no great initial expense. On the other hand being able to treat a patient at any time without a special shipment of radon is more convenient. Whenever funds are available to buy it, special applicators containing radium are preferable. Radium deteriorates very little in value so that in the long run the expense should, if anything, be less for all who do not have easy inexpensive access

to radon. It is probable that both radium and radon will be available in suitable applicators on a rental basis from various commercial houses for those who only have occasional patients who need this treatment.

There is said to be no danger to the treatment if it is properly done but otologists are advised to use radium and radon only in collaboration with a competent radiotherapist. He will be of greatest help in seeing that both patient and operator are properly protected and if radon is used, will help in the inevitable mathematics. If a proper type of applicator is used and the dosage is not tampered with, this form of radiotherapy should be done by the otologist, for only he can properly judge the necessity for its use and progress afterwards.

Most of those who have used radiation therapy for improving the function of the eustachian tube are enthusiastic about its efficacy. It is particularly useful in airmen for they rarely have much underlying pathology. Shrinkage of a little excess lymphoid tissue will often permit them to fly comfortably whereas previously they had had much difficulty. In addition to putting flyers back in the air, irradiation of the nasopharynx puts soldiers back in the firing line, civilians back to work, and children back to school. What is more, it forestalls the deafness which develops sooner or later from the recurrent attacks of otitis media, which are almost an inevitable sequal to malfunction of the eustachian tubes.

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Dosage in Roentgens - 50 mg. Radium. All Capsules 3 mm. in diameter and 1.5 cm. in active length

Filter	1mm Depth in Tissue			1cm Depth in Tissue			2cm Depth in Tissue			3cm.
	$6\frac{2}{3}$ min = 5.6mg-hr	40min = 33mg-hr	60 min = 50mg-hr	$6\frac{2}{3}$ min	40 min	60 min	$6\frac{2}{3}$ min	40 min	60 min	60 min
0.5mm Pt.	250	1500	2250		265	400		70	100	45
0.65mm Pt.	DOES NOT DIFFER BY AS MUCH AS 5% FROM 0.5 mm. Pt.									
1.0 mm. Brass		1800	2700		300	450		70	100	45
0.3mm. Monel	1520			55			15			

For the standard 0.3 Monel capsule, which is 1.5cm in active length and 2.3 mm diameter, the doses are essentially the same as those listed.

It should be noted that if the two tubes are 2cm apart, the contribution from each to the local irradiation by the other is unimportant.

A change of active length from 1.5cm to 1.25 cm will also make a neglibible change in dosage.

Radium Tube

(152)

7 June 1945, Thursday

28 Pressured
9 Aero-Otitis Media
4 Failures:

R' 6-8 Appleby, M. C., S1c - out at 4 lbs. - #2 rt. #4 lt.
R' 6-8 Cole, H. F., S2c - out at 18 lbs. - #3 rt. #4 lt.
R' 6-8 Head, R. J., S1c - out at 4 lbs. - #2 rt. #2 lt.
R' 6-8 Zimmo, C. G., FC2c - out at 13 lbs. - #4 rt. #4 lt.

Passed:

R' 6-8 Blevins, R. S., EM1c - #3 rt. 0 lt.
Fadeley, J. H., F1c - #2 rt. 0 lt.
R' 6-8 Gumtz, L. A., F1c - 0 rt. #3 lt.
R' 6-8 Holmes, F. J., RT3c - 0 rt. #4 lt.
R' 6-8 Shires, E., F1c - #2 rt. #3 lt.

1 case #2 rt. ear

8 June 1945, Friday

28 Pressured
5 Aero-Otitis Media
1 Failure:

Lopez, G. L., MoMM3c - out at 5 lbs. - #2 rt. #2 lt.

Passed:

Goodman, J. R., EM3c - #4 rt. #4 lt.
Grimes, E. E., S2c - #4 rt. #4 lt. - perforation.
Moyer, C. G., MoMM2c - #4 rt. #4 lt.
Taylor, J. C., MoMM1c - passed with no trouble at all - has had four radium treatments - "C8"
Wurdock, J. E., SC1c - #3 rt. #4 lt.

11 June 1945, Monday

16 Pressured
5 Aero-Otitis Media
2 Failures:

Brosius, W. L., F1c - out at 8 lbs. - 0 rt. #3 lt.
Warren, R. L., S2c - out at 13 lbs. - #3 rt. #3 lt.

Passed:

Conley, J., S1c - #4 rt. 0 lt.
Jarmon, H. F., S1c - #3 rt. #4 lt.

1 case #2 ear

12 June 1945, Tuesday

21 Pressured
5 Aero-Otitis Media
0 Failures

Passed:

Arbron, T. J., F1c - #4 rt. #4 lt. - moderate amt. ads. - tubes flat, bleeding.
Mahar, J. M., S2c - #4 rt. #2 lt. - moderate ads. - tubes crowded, closed.
Mahoney, R. R., S1c - #3 rt. 0 lt. - moderate ads. - tubes open.
Mason, R. D., S1c - #4 rt. #4 lt. - moderate ads. - crowded - tubes closed.
Fitmon, J. W., S1c - #4 rt. #3 lt. - moderate ads. - crowded, closed.

1 case #2 ear.

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13 June 1945, Wednesday

23 Pressured
9 Aero-Otitis Media
5 Failures:

Bean, C. V., F2c - out at 5 lbs. - #1 rt. #4 lt. - moderate ads. - tubes flat.
R'6-14 Henderson, D. S., S1c - out at 5 lbs. - #1 rt. #4 lt. - large ads. - tubes open, crowded - lt. worse.
R'6-14 Paxson, W. J., S1c - out at 5 lbs. - #4 rt. 0 lt. - enormous ads. - tubes covered, closed.
R'6-15 Schwartzman, S., PhM1c - out at 8 lbs. - #2 rt. #4 lt.
R'6-15 Stanley, R. V., PhM2c - out at 8 lbs. - #4 rt. #4 lt.

Passed:

R'6-9 Casey, F., PhM1c - 0 rt. #4 lt.
Frank, C. F., S1c - 0 rt. #4 lt.
Hopp, H. F., RT2c - #3 rt. #4 lt.
Smith, W. V., S1c - #4 rt. #3 lt.

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13 June 1945, Wednesday Rechecks

8 Pressured
8 Aero-Otitis Media
0 Failures

K APPLEBY, M. C. - S1c - 0 lt. #4 rt.
K CORBIN, J. F. Jr.- S1c - #4 lt #3 rt
K COLE, H. P. - S2c - #4 lt 0 rt
K HEAD, R. J. - S1c - #4 lt #2 rt
JILLSON, C. C. - S2c - 0 lt #2 rt
KOZICKI, W. R. - Y1c - #2 lt 0 rt.
K LOPEZ, G. L. - MoMM3c -#4 lt #4 bt
K ZUMMO, C. G. - FC2c - #4 lt #4 rt

Brockmann, P. W., F1c - #4 rt. #1 lt.
Gordon, J., QM2c - #4 rt. #3 lt.
Johnson, R. L., MoMM3c - #4 rt. #1 lt.
Lugi, F. E., S1c - 0 rt. #4 lt.
Ray, R. L., F1c - 0 rt. #4 lt.
Saffert, S. J., S1c - #4 rt. #4 lt.

3 cases with #2 ears.

No pressure today.

19 June 1945, Tuesday

39 Pressured
6 Aero-Otitis Media
0 Failures

Passed:

Botkin, C. A., MoMlc - #3 rt. 0 lt.
Hladley, J. R., Slc - #2 rt. 0 lt.
Morgan, C. R., Slc - #2 rt. 0 lt.
Muth, G. I., S2c - #3 rt. #3 lt.
VanDerwilt, W. K., RT3c - #4 rt. #3 lt. (K) - Bordado tube-blown.
Ward, R. B., Slc - #2 rt. #3 lt.

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20 June 1945, Wednesday

12 Pressured
3 Aero-Otitis Media
0 Failures

Gampher, B., FC3c - #4 rt. #4 lt. - moderate ads. - tubes covered. (K)
Keeling, J. J., S2c - 4-R Perf. - enormous ads. - tubes closed on rt.-left open.
Smith, Glenn, Slc - #4 rt. #1 lt. - moderate ads. - tubes crowded, open. (K)

---

20 June 1945, Wednesday

Rechecks

6 Pressured
6 Aero-Otitis Media
0 Failures

Bean, C. V. - F2c - #1 rt #4 lt.
Brosius, W. L. - Flc - #2 rt #4 lt.
Henderson, D. S. - Slc - 0 rt #4 lt.
Paxson, W. J. - Slc - #3 rt #1 lt
Warren, R. L. - S2c - #4 rt #4 lt.
White, V. L. - S2c - 0 rt #1 lt.

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21 June 1945, Thursday

30 Pressured
5 Aero-Otitis Media
2 Failures

Golightly, C. E. J. - S1c - out at 12 lbs. - #2 rt #4 lt.
Weingartner, J. K. - F1c - out at 8 lbs. - 0 rt #3 lt.

Passed:

Hoag, J. K. - F1c - 0 rt #2 lt.
Picha, G. L. - RT2c - #4 rt #4 lt.
Wright, J. C. - F2c - #3 rt #4 lt.

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22 June 1945, Friday

21 Pressured
4 Aero-Otitis Media
2 Failures

Flinchbaugh, W. R. - S2c - out at 7 lbs.- #2 rt 0 lt.
Muckelberg, J. C. - S2c - out at 9 lbs. - #2 rt #3 lt.

Passed:

Haenel, E. R. - F2c - 0 rt #4 lt
Wood, J. O. - S1c - 0 rt #3 lt.

Schnörchel study: Tues. Thurs. & Fri.
On board PR 6 - equipped c̄ Schnorchel attached to port engine - our report - making sound in sound in smooth water and at short periods - only 0.286 inches of mercury cho[illegible] in pressure in boat noted when Sc[illegible] shelling & head is dunked only a few sec at a time - change occurred in from 8-10 sec. - no effects on ears or sinuses noted -
Longer runs & rough [illegible] should be done - Checks in g[illegible] type out c̄ larger engines would certainly produce more changes. Cutting down space in PR 6 should make a difference but water around the sound are too smooth for Schnorchel study.

The Washington group has tried manually closing Schnorkel valve while along side of pier — see their reports —

AA.

Tr. Tank to go in overhaul [illegible] of next week but will continue [illegible] men thru pressure.

Tri. — Dec 8-6

Pressure change from [illegible] torpedoes where they are mented [illegible] boat showed between 1 inch & 1.2 inch change of pressure (mer.) in boat which returned immediately to normal on opening main hatch in conning tower — escape 1 air so sudden it lifted [illegible] hat from head. — This produced a sense of fullness in ears.

✓ CWS. WAA

25 June 1945, Monday

2 Officers Pressured
2 Aero-Otitis Media
1 Failure

AUER, D. G. - Ensign - out at 6 lbs. - #4 rt #3 lt.

PASSED:

HAMILTON, G. A. - Ensign - #4 rt #4 lt.
Very large ads - Tubes crowded - cloud.

26 June 1945, Tuesday

HARROP G.E. - F1c - #4 LT #1 rt. - Trouble on 50 ft. - has large red ads. tubes narrow crowded open on right, nodule on left.

23 Pressured
10 Aero-Otitis Media
2 Failures

R-1 6.26 CUTHBERTSON, B. - SC1c - out at 5 lbs. - #2 rt #2 lt.
Enor Ads., Tubes covered, had trouble flying.
DiJOSEPH, A. C. - F2c - out at 5 lbs. - #3 lt 0 rt.
R-1 6.26 Enor ads., tubes covered.

PASSED:

(JONES, M. (n) - TM2c - #3 lt 0 rt. Very large ads,
(tubes flat rt open.
All taken(KOCH, F. H. - S2c - #4 lt 0 rt. Mod ads, tubes flat
by (crowded.
Dr. Kelly(McWHORTER, J. R. - RT2c - #2 lt #3 rt. Enor ads,
(tubes covered.
(TRICONE, F. J. - S2c - #4 lt #4 rt - Enor ads, tubes
(covered, crowded.

Four #2 ears.

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27 June 1945. Wednesday
None Pressured.

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28 June 1945, Thursday

27 Pressured
12 Aero-Otitis Media
6 Failures

ANDERSON, W. C. - SC2c - out at 14 lbs.
#4 rt #4 lt.
BRICKER, P. F. - RT3c - out at 14 lbs.
0 rt #4 lt.
CUTHBERTSON, B. - S1c - out at 7 lbs.
#4 rt #2 lt.
HARTMAN, R. A. - RT2c - out at 6 lbs.
#4 lt #4 rt.
NEE, J. - S2c - out at 7 lbs. #2 rt #4 lt.
WEINGARTNER, J. K. - F2c - out at 7 lbs.
Dr. Kelly--- 0 rt #4 lt.

PASSED:

CRMAER, R. L. - S1c - #3 rt #3 lt.
COLEMAN, A. D. - F1c - 0 rt #3 lt.
DIJOSEPH, A. C. - F2c - #4 rt #2 lt.
JOHNSON, V. A. - Bkr3c - 0 rt #4 lt.
MUCKELBERG, J. C. - S1c - #3 rt #2 lt.
NOBLE, A. J.-S1c- #3 rt #3 lt.

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29 June 1945, Friday

None Pressured

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30 Completed Radium cases for Check 13 on Tues July 3rd. —

Thursday - June 27th 1945

Trip to Portsmouth on Schnorchel project - report will be posted in here.

Problems: ① Dr Fowler - treated 18 men c̄ dummy applicators - he is forwarding data on these for inclusion in this report. - between 75-80% developed aero-otitis media.

② On watching ears developing a bm under pressure in the chamber it was noted that the drums are markedly retracted & hemorrhagic c̄ drapers at 50lbs - the same appearance was reported by the flyers. However the appearance of the drum at sea level is somewhat different from described by the flyers after inflation of Eust. tubes.

③ On figures differ in Western report in that noticable difference in size is not usually noted until after 3rd rad. & 4 weeks after the time of treatment) - In case where adenoids are red & edematous at 1st inspection there is marked reduction even after 1 treatment but this is due to less infection then again some ads. appear larger even after 2 treatments this is explained on acute infection & if examinations are rechecked these subside & are much smaller.

④ At the Sub-Base new men are coming in every day so that there is no cycle of infection with beginning of new classes. Col. Koo reports an influx of colds & U.R.I. with each new class at Randolph with the usual accompanying increase in A.O.M.

30 June 1945, Saturday

59 Pressured
20 Aero-Otitis Media
3 Failures:

Clawson, R. E., S2c - out at 4 lbs. - #4 rt. #2 lt - enormous ads. - tubes covered, not seen.
Griswald, R. C., S2c - out at 12 lbs. - #1 rt. #2 lt.
Hansen, D. E., S1c - out at 7½ lbs. - #2 rt. #4 lt. - enormous ads. - tubes flat, covered - right free.

Passed:

Bardenhagen, A., S1c - #4 rt. #4 lt. - moderate ads. - tubes flat, closed, bleeding.
Blahr, D. A., RM3c - #4 rt. #4 lt. - moderate ads. - tubes narrow, open, bleeding.
Boysel, R. L., S1c - #4 rt. #2 lt. - large ads. around tubes - flat, closed.
Cooper, K. L., S1c - #4 rt. #4 lt. - moderate ads. - tubes flat, bleeding.
Giardina, A. A., MoMM2c - 0 rt. #2 lt. - moderate ads. - tubes open, clear.
Ingalsbe, S. F., MoMM3c - #3 rt. #3 lt. - enormous ads. - tubes closed, no bleeding.
King, W. G., RM2c - #4 rt. #4 lt. - enormous ads. - tubes flat, bleeding.
Proffer, L. O., EM2c - 0 rt. #3 lt. - large ads. - tubes closed, no bleeding.
Tweedie, F. A., RM2c - #4 rt. #3 lt. - enormous ads. - tubes covered.
Vetrano, N. F., Bkr2c - #1 rt. #3 lt. - enormous ads. - tubes open.
Warner, R. L., S1c - #2 rt. #4 lt. - enormous ads. - tubes covered, rt open.
Webster, F. E., RT3c - #3 rt. 0 lt. - moderate ads. - tubes open.
Wiegand, J. E., F1c - #4 rt. #2 lt. - very large ads. - tubes flat - right bleeding - left open.

Miller, R. W., F1c - #4 rt. #3 lt. - very large ads. covered.

3 cases with #2 ears.

SUMMARY FOR JUNE

Over 150 patients have completed radium treatments. 81 to date have been checked back through pressure after completion of radium treatments. Of the others, many have been transferred—but many of these took pressure without developing Aero-Otitis after only two or three radium treatments.

Over 80% of those completing treatment pass pressure easily. Those having trouble are being checked by the dentist for dental origin of Aero-Otitis.

To date over 717 patients have been treated with radium, with over 2100 radium treatments given.

3 July 1945, Tuesday

37 Pressured
10 Aero-Otitis Media
1 Failure:

Winn, J. G., S1c - #3 rt. #3 lt. - out at 13 lbs. - moderate ads. - tubes flat, crowded.

Passed:

Conway, J., F2c - #4 rt. #1 lt. - enormous ads. - tubes flat, rt. closed.
Mathison, J. P., F1c - 0 rt. #3 lt. - moderate ads. - pertubal ads. left - right free.
Phelps, W. G., S1c - #4 rt. #4 lt. - enormous ads. - tubes closed - bleeding both sides.
Puhle, G. H., F2c - 0 rt. #4 lt. - enormous ads. - tubes crowded, open.
Riihiluoma, J. E., S1c - #4 rt. #4 lt. - enormous ads. - tubes ~~closed~~ flat.
Stone, C., S1c - 0 rt. #4 lt. - enormous ads. - tubes closed.
3 cases c̄ #2 ears -

4 July 1945, Wednesday

Rechecks after Radium

19 Pressured
3 Aero-Otitis Media
0 Failures

Passed:

Barwick, G. W., CMoMM - 0 rt. 0 lt.
Bohn, S. W., S2c - 0 rt. 0 lt.
Carlucci, P. R., F1c - 0 rt. 0 lt.
See June 54 Christian, R. M., MM2c - 0 rt. 0 lt.
Christie, L. J., F1c - 0 rt. 0 lt.
Clark, J. C., SM2c - 0 rt. 0 lt.
Cornelison, G., F1c - 0 rt. 0 lt.
Cruzan, E. M., PhM1c - 0 rt. 0 lt.
Gigliotti, B. J., F1c - 0 rt. 0 lt.
Hammett, J. B., F2c - 0 rt. 0 lt.
Hefner, R. D., RM1c - 0 rt. 0 lt.
Jewell, S. E., SM2c - #2 rt. 0 lt.
Johnson, N. C., F1c - 0 rt. 0 lt.
Moore, R. C., S1c - 0 rt. 0 lt.
Munk, G. A., F1c - 0 rt. 0 lt.
Rames, N. G., MoMM3c - #1 rt. #2 lt.
Reed, H. M., F1c - 0 rt. 0 lt.
Slack, W. J., F2c - 0 rt. #4 lt.
Zimmer, B. R., F2c - 0 rt. 0 lt.

6 July 1945, Friday

23 Pressured
5 Aero-Otitis Media
2 Failures:

Goodman, J. T., S2c - out at 5 lbs. - #3 rt. 0 lt.
Wheeler, A. A., S2c - out at 5 lbs. - #4 rt. #3 lt.

Passed:

Ebben, J. J., CM2c - 0 rt. #3 lt. - large ads. - tubes narrow, open - ads. removed twice.
Moreadeth, F. M., MoMMlc - #3 rt. #3 lt. - small ads. - tubes crowded.
Riehl, B. H., S2c - #4 rt. 0 lt. - small ads. - tubes crowded.

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6 July 1945, Friday

Rechecks

8 Rechecked
5 Aero-Otitis Media
2 Failures:

Clawson, R. E., S2c - out at 9 lbs. - #4 rt. #2 lt.
Nee, J., S2c - out at 9 lbs. - #4 rt. #4 lt. - enormous ads. - tubes covered, closed.

Passed:

Anderson, W. C., SC2c - #3 rt. #2 lt.
Bricker, P. F., RT3c - 0 rt. 0 lt.
Cuthbertson, B., SC1c - #4 rt. #4 lt. - perforated.
Griswald, R. C., S2c - 0 rt. 0 lt. — Dr Kelly treat.
Hansen, V. G., S1c - 0 rt. 0 lt. — Dr Kelly treated
Hartman, R. A., RM2c - #2 rt. #4 lt.

---

7 July 1945 - Sunday
No pressure - Tanks in Quonset
CLOSE

9 July 1945, Monday

None Pressured

10 July 1945, Tuesday

14 Pressured
4 Aero-Otitis Media
1 Failure

K...SCHESRENTEZ, RR. - out at 11 lbs. - #2 rt #4 lt.
ans ads tubes covered
PASSED:

K...CHRISTENSEN, R. E. - MoMM2c - #3 rt 0 lt.
very large ads, tubes covered
K...HALL, G. D. - FC2c - #4 rt #1 lt
large ads tubes crowded
K...ZENKE, N. G. - Slc - #3 rt #4 lt
large ads tubes crowded

11 July 1945, Wednesday

20 Pressured
7 Aero-Otitis Media
0 Failures

Recheck:WINN, J. G. - Slc #4 rt #4 lt.
mod ads, tubes crowded - bleeding

PASSED:

BERGMAN, H. E. - GM2c - #3 rt 0 lt
large ads, tubes crowded
GROVE, E. S. - Slc - #4 rt 0 lt
small ads, tubes crowded
SCHMARJE, R. J. - Flc - #4 rt #2 lt
mod ads, tubes flat

3 cases of #2 ears

12 July 1945, Thursday

24 Pressured
10 Aero-Otitis Media
4 Failures

All taken by Dr. Kelly

HOLCOMBE, E. D. - Slc - out at 11 lbs. #4 rt #4 lt.
mod ads - tubes crowded, closed, bleeding
JOHNSON, J. D. - Flc - out at 11 lbs #4 lt #1 rt
large ads - tubes crowded - rt open
RAGONE, V. N. - Flc - out at 42 lbs. #1 rt #4 lt.
mod ads, tubes crowded
SNYDER, J. P. - Slc - out at 11 lbs. #1 rt #3 lt.
mod ads - tubes crowded

PASSED:

CHAMBERS, G. C.- F2c - #4 rt #3 lt.
large ads tubes crowded
JOYCE, G. P. - Slc - #3 rt #2 lt.
small ads tubes open
LOUGHAIN, M. R. - F2c - #3 lt 0 rt
very large ads, tubes covered open
POTTER, T. L. - EM2c - #4 rt #2 lt.
mod ads tubes crowded shut

2 cases with #2 ears.

12 July 1945, Thursday

PRESSURE RECHECKS after Radium: 19 Case

4 Aero-Otitis Media

ATCHISON, G. B. - QMlc - #1 rt 0 lt
GAGER, W. - S2c - #3 rt 0 lt. — Rechecked.
ONODY, F. J. - Flc - #4 rt 0 lt
SEUFERT, W. E. - Flc - 0 rt #4 lt.

PASSED:

		R.	L.
BARLOW, V. D.	S2c	0	0
BARNES, J. S.	Flc	0	0
BAUMAN, M. R.	Slc	0	0
BURGER, F. R.	QMlc	0	0
GILMORE, W. H.	Flc	0	0
HOFFMAN, F. S.	Slc	0	0
MOCOCK, R. E.	S2c	0	0
NISWENDER, D. E.	Flc	0	0
ORMOND, R. L.	MoMMlc	0	0
RICHARDS, W. T.	S2c	0	0
ROBB, T. A.	Slc	0	0
TOBER, L. E. Sr.	Flc	0	0
WACHOB, G. D. Jr.	F2c	0	0
WILLIAMS, J. D. Jr.	Slc	0	0
ZILLNER, F.	Flc	0	0

13 July 1945, Friday

16 Pressured
3 Aero-Otitis Media
0 Failures

LaMONTAGNE, L. A. - SM2c - #4 rt #4 lt - large ads tubes flat
PAUL, J. A. - SClc - #4 rt 0 lt. Had trouble in Pearl Harbor - mod ads, tubes crowded bleeding night
NELSON, C. E. - Flc - #4 rt #4 lt - mod ads tubes covered open

10 PhM Pressured
4 Aero-Otitis Media
1 Failure

R. 1-13 JOHNSON, S. D. - PhMlc - #4 rt 0 lt
Enor ads - project - tubes not seen - bleeding

R. 1-13 FALCONE, J. - PhM2c - #4 rt #4 lt.
Enor ads tubes closed
R. 1-13 SYLVESTER, M. T. - PhMlc - #4 rt #3 rt
Enor ads tubes closed
SNELGROVE, F. T. - PhMlc - #3 lt #3 rt
Small ads tubes crowded open

RECHECK after Radium: -

BURRETT, L. R. - Ylc - 0 rt 0 lt. Radium recheck- Pressured to 50 lbs.

	# Pressured	# c̄ aero-otitis media	% a O M	
Jan	946	238	25%	"cold"
Feb	836	233	28%	"cold"
March	610	182	29%	"rough"
April	473	121	25%	warm
May	493	131	26%	"cold"
June	429	126	29%	"cold & damp"
~~Average~~ Total	3787	1031	27%	

27% average incidence of aero-otitis media. The high % in summer & "warm" months is due to unusually damp cold weather during those months.

Radium rechecks:—

103 checked thru ~~tank~~ pressure chamber to date only 8 cases of aero-otitis-media developed. These cases ~~have~~ completed their radium treatments. 2 men who had not completed their radium treatments both developed aero-otitis.

717 Cases under radium treatment as of July 1st. - Approximately 200 of these have completed their necessary radium treatments and of these 103 have been repressured (5-'25) thru the pressure chamber.

Cases are not ready for recheck thru the pressure chamber until 4-6 wks after last radium treatment and then are allowed to take pressure whether ~~an~~ a cold is present or not.

OLS May

14 July 1945

Lt. Comdr. Lynn S. Beals (MC) USN
Administration Building
U. S. Naval Air Station
Quonset Point, Rhode Island

Dear Dr. Beals:

Re: Lt. (j.g.) Edward Meyer, U. S. Naval Air Corps - CAO 74: -

Lt. Meyer, accompanied by Lt. Chas. F. Gibbons (MC) USNR, of Otis, was seen Wednesday, 11 July 1945, with history of Ethmoiditis. Examination showed a great deal of hypertrophied mucous membrane in both nasal passages, moderate amount red adenoids in mid-line and in both fossae of Rosenmuller - mucous membranes of the nose were pale and watery suggesting allergic bases.

Because of small amount of adenoid tissue and lack of any evidence of chronic sinusitis he was treated with radium to remove adenoid foci of infection. Reports from other radium centers reveal some success in treating allergic rhinitis and sinusitis with treatments to adenoids.

Re: Ensign J. D. Closson: -

Seen at same time with Dr. Chas. F. Gibbons from Otis, gave much the same story of frequent sinusitis and colds. Examination revealed large amounts of chronic infected adenoids and tonsils with large lateral bands. These are too extensive to be treated with any radium. No sinus surgery indicated. A T&A should be done and if any remnants remain in nasopharynx, radium should be used to clean up the tags.

Both these men should be able to continue flying in several weeks and by time of cold weather should be free of any foci of infection. The radium treatment is slow work, taking 3 to 6 months for completion. One treatment a month of 8½ minutes each. No ill effects are experienced and can continue full duty status through out treatment. No more ill effects experienced than taking a mild sun bath for 8½ minutes.

Sincerely,

H. L. HAINES,
Lt. (j.g.) (MC) USNR,
Medical Research Department.

cc: Dr. Gibbons

NAV1.967000.029
COPY

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16 July 1945, Monday

None Pressured

---

17 July 1945, Tuesday

None Pressured

---

18 July 1945, Wednesday

29 Pressured with music, 50 lbs 10 minutes
8 Aero-Otitis Media
0 Failures

Welch, J. A. - S2c - #2 lt 0 rt
Raymond, R. - S2c - #3 lt 0 rt
Gerritson, C. P. - QM1c - #4 lt #1 rt - Mod ads - lt tubes closed with nodules
Strickland, W. F. - S2c - #2 lt 0 rt
Sheie, J. H. - S2c - #3 rt #3 lt - very ads- tubes crowded
Moore, E. F. - RT2c - #4 rt 0 lt. Right open, left closed - small ads
Mocerino, N. J. - S1c - #3 rt 0 lt - enor ads, tubes covered
Kerbel, J. M. - S1c - #3 rt #1 lt - slit like - enor ads - tubes covered

19 July 1945, Thursday

16 Pressured, 50 lbs in 5½ minutes with music
4 Aero-Otitis Media
0 Failures

McCauley, C. J. - S2c - #3rt #3lt -large ads tubes flat closed
Ray, R. L. - S2c - #3rt #0 lt - large ads, tubes flat, closed
Logan, W. E. - S2c - #4 rt #2 lt - mod ads tubes flat bleeding ruptured
Dennis, E. H. - F2c - #4 rt #4 lt/- large ads tubes covered bleeding. Perforated left ear.

19 Pressured, 50 lbs in 14½ minutes with music
8 Aero-Otitis Media
2 Failures - both rechecks.

Rechecks
K---Halcombe, E. D. - S1c - out at 6 lbs #4 rt #4 lt
K---Nee, J. - S2c - out at 4 lbs - #3 rt #3 lt

PASSED:

Rechecks
K---Ragone, V. M. - F1c - 0 rt #3 lt
K---Johnson, J. D. - F1c - 0 rt #3 lt
K---Snyder, J. P. - S1c - 0 rt #2 lt
Leary, J. E. - EM2c - #4 rt #4 lt mod ads tubes closed
Olobman, A. J. - RT2c - #4 rt #1 lt mod ads tubes closed
Stohler, R. P. - S2c - #2 rt #3 lt mod ads tubes closed

20 July 1945, Friday

22 Pressured, 50 lbs in 10 minutes with music
6 Aero-Otitis Media
0 Failures

Otto, J. G. - F1c - #4 rt #4 lt - mod ads, tubes covered
Hudspeth, G. D. - S1c - #2 rt 0 lt - tubes opened small ads
Bramblett, R. E. - S1c - #4 rt #4 lt - Enor ads tubes covered, bleeding
Dickson, L. E. - F2c - #4 lt 0 rt - Large ads tubes flat bleeding left - rt opened
Middleton, C. F. - S2c - #4 rt 0 lt - mod ads bleeding rt, lt open, tubes crowded
Bellile, C. L. - F2c - #4 rt 0 lt - enor ads, tubes covered and closed

Semi Annual Report

AERO OTITIS MEDIA PROJECT: PROJECT X-424 (Sub No. 90)
"Aero-Otitis Media: It's Prediction, Prevention, and Treatment."

This problem was originally investigated by Captain Shilling and Lt. Everley in 1940 and work continued by Comdr. Teed. The formal project was set up in July 1944 for continued investigation and treatment of aero-otitis media. An otologist especially trained in radium therapy, Lt. (j.g.) Henry L. Haines, MC(S) USNR of Johns Hopkins Hospital, was ordered to active duty September 1944, and a dental officer, Lt. Wm. J. Kelly, DC(S) USNR, was ordered to Medical Research Department, Submarine Base, New London, January 19, 1945, to continue this study.

All candidates (officer and enlisted) for submarine school varying from 30 to 70 a day and all men passing through the reprocessing center are examined both otoscopically and nasopharyngoscopically before and after taking pressure tests. All developing aero-otitis media are evaluated and treated either with topical applications, nasal spray, suggestion, X-Ray, radium or dentally. The X-Ray treatment was discontinued in February due to the radiation reaction following X-Ray doses necessary to produce results.

From January 1, 1945, to June 30, 1945, 3612 men passed through pressure tank. Of these: -

27% developed aero-otitis media.

85% of the above 27% continued to develop aero-otitis media when repressured.

717 of the 27% group are being treated with radium.

103 of these have completed radium treatment to date and were checked through pressure.

Only 8% of these developed aero-otitis on repeat examination.

The radium treated cases have a lower incidence of aero-otitis media than those routinely checked through pressure.

The 8% failing after radium treatment are being checked by the dentist. 2% of the 8% had had mastoid operations on the affected ear which probably occluded the Eustachian tube.

The incidence of unilateral aero-otitis media is a little less than the bilateral and by no means unusual as has been suggested by some authors.

The work here shows striking results which may be explained on bases of availability and cooperation of the men and their officers in returning for treatments and following instructions. All the men are followed closely by Captain Shilling and Lt. (j.g.) Haines. Aero-otitis media in Schnorchel operations is being investigated.

Several aviators from Navy Otis Field, Mass., Quonsett Air Station, and Groton Air Station are under radium therapy for frequent upper resp. infections and aero-otitis media.

Treatment of aero-otitis media with topical applications and nose drops has proven only temporary. Psychotherapy has reduced the number actually failing pressure but has not changed the incidence of Aero-otitis media.

The radium treatments are given once a month, taking about 10 minutes each for examination and treatment. At least three treatments are necessary and as many as eight have been given. In over 3,000 treatments no ill effects have been seen. Men continue on full active duty throughout this period of treatment, even on the days of treatment. All radium treatments are entered in the health record. Close contact has been kept with the progress of this work being done in the U. S.

Army and with Dr. S. J. Crowe, who instructed the Army otologist in the use of radium for this condition.

A preliminary report on aero-otitis media and its instrument will be prepared in a short time.

Personnel:

Captain C. W. Shilling, (MC) USN

Lt. Wm. J. Kelly, DC(S) USNR

Lt. (j.g.) H. L. Haines, MC(S) USNR

Ens. D. J. Harris (HC) USNR (Sound)

Papers:

(1) "Aero-otitis media in Submarine Personnel" in the Journal of the Acoustical Society of America for October 1945.

Meetings attended and speeches given:

(1) On 11 January 1945, Captain Shilling and Lt. (j.g.) Haines attended the Aero-Otitis Media conference at Westover Field, with representatives of the U. S. Army, R.C.A.F., Dr. Samuel J. Crow, civilian consultant in Radium therapy for U. S. Army and Navy, and representatives from Navy Bureau of Medicine and Surgery.

(2) On 16 January 1945, Lt. (j.g.) Haines conferred with Comdr. J. Gershon Cohen, (MC) USNR in charge of X-Ray at U. S. Naval Hospital at Newport, concerning X-Ray treatment of adenoids at that hospital. Too small an X-Ray machine is used there and the U. S. Naval Hospital at Brooklyn was suggested.

(3) Comdr. Chrisman and Lt. (j.g.) Haines, on 8 February 1944, conferred with Comdr. Cramp (MC) USNR and Lieut. Dubilier (MC) USNR at U. S. Naval Hospital in Brooklyn, concerning X-Ray treatment to adenoids for aero-otitis media.

(4) Captain Shilling, Lt. (j.g.) Haines, Ensign Harris attended annual meeting of American Acoustical society in New York City, on 12 May 1945.

(5) 14-15 June 1945, Captain Shilling, Lieut. Kelly, Lt. (j.g.) Haines, Ensign Harris, were hosts for the Sound Conference Group.

(6) 13 June 1945, Captain Shilling, Lt. (jg.) Haines visited Portsmouth, N.H., for conference on aero-otitis media in Schnorchel operations. German prisoners were interviewed.

Should be a group checked thru presume who did not develop aom on previous attempts. — H.

(169) - Sheet 4

21 July 1945, Saturday

None Pressured

(169) - Total of 4 Sheets Attached

Maj. E.P. Fowler Jr. 0400230
Regional Hospital AAF
Lincoln, Nebraska

U.S. ARMY AIR FORCES

July 8

Dear Haines -

Here is page 12 from the manuscript I gave you also some of the pictures.

I had a swell time in New London and am trying to set up a pure tone gong audiometer test like the one I saw in your lab. The main difficulty is the sound proofed room.

Remember me to Captain Shilling and tell him how much I appreciated being asked to such an august affair

Ned Fowler.

Fig. 1, Lymphoid tissue from the salpingo-pharyngeal fold of a young aviator taken one month after treatment with 50 mg. hrs. exposure to radium in a platinum capsule with a 0.5 mm wall. Biopsy taken approximately 1 cm. from site of the capsule. Note absence of germinal centers and prominence of endothelium of capillaries. Mag. x500.

Fig. 2, Lymphoid tissue from portion of salpingo-pharyngeal fold corresponding to that shown in Fig. 1, before treatment. Note germinal center and relative insignificance of capillaries and connective tissue as compared to Figure 1. Mag. x500.

Fig. 3, Eustachian tube and adjacent nasopharynx of an airman who had recurrent nasopharyngitis but never clinical aero-otitis. Note adenoids and lymphoid tissue on the torus tubarius (arrow). If these should grow any more they would interfere with the function of the tube. Mag. x7 U. S. Army Medical Museum Neg. No. 82362.

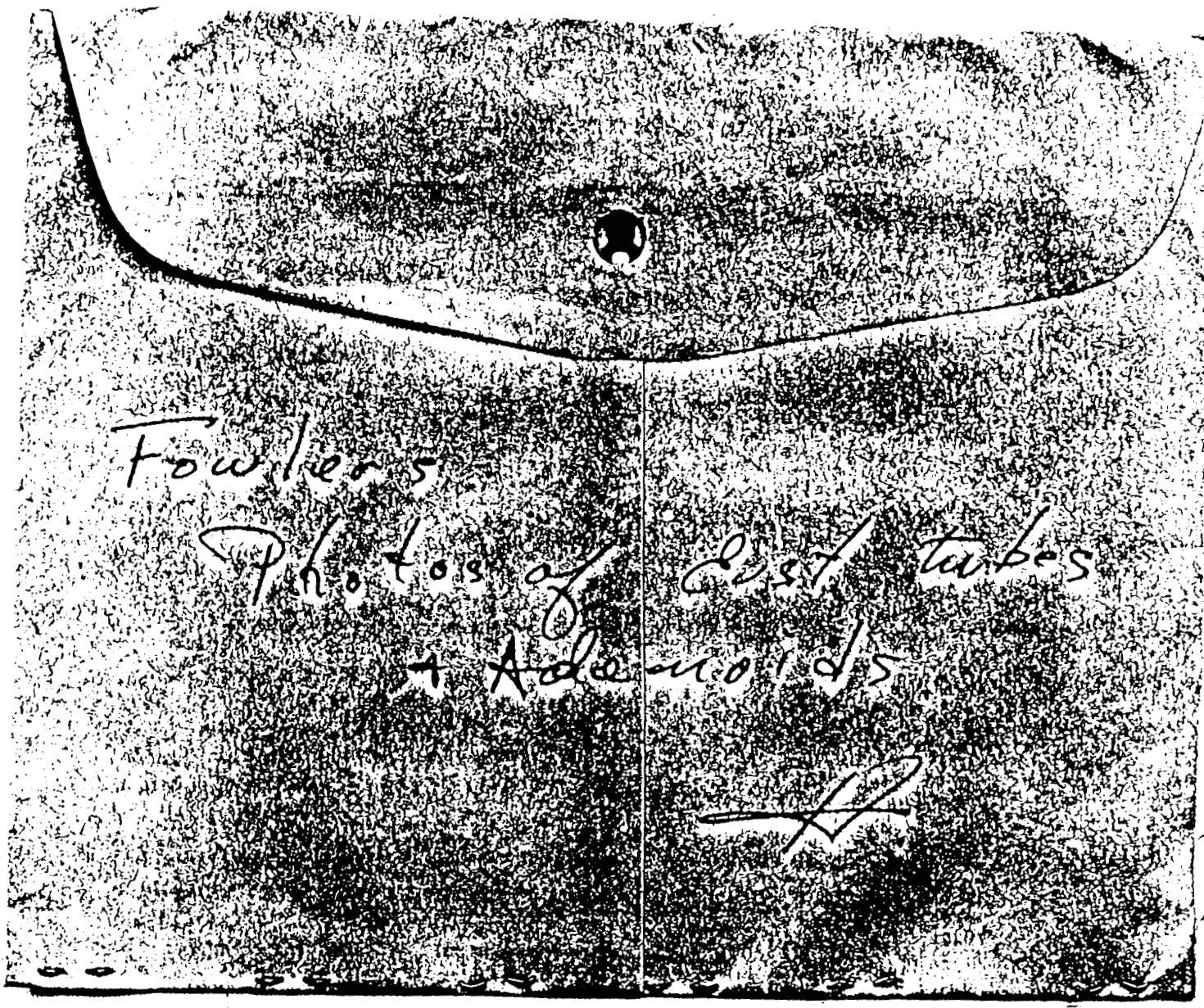
Fig. 4, Eustachian tube of airman shown in Fig. 3, near the isthmus. Note low grade salpingitis manifested by round cell infiltration and hyalinization of the submucosa (most marked in one of the rugae) also exudation into the lumen. Mag. x40 U. S. Army Medical Museum Neg. No. 82613.

Fig. 5, Eustachian salpingitis near the middle of a tube. Note beginning lymph follicle formation (arrows) and hyperactive glands (G) Mag. x25.

Fig. 6, Higher power of upper infiltrated area shown in Figure 5., Mag. x100.

Fig. 7, High power of lymphoid mass shown in Figure 8, showing how high columnar cilliated epithelium sloughs away on the surface. This is similiar to the pathology found in low grade sinusitis and bronchitis.

Fig. 8, Section of the eustachian tube at 30 degree angle to the horizontal. Note inverted "S" shape and lymphoid mass lateral to the isthmus. These are very rare in this position. Mag. x10, U. S. Army Medical Museum Neg. No. 82360.



✓ CMS.

NOTE: EMPTY - NO PHOTOS

23 July 1945, Monday

None Pressured

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24 July 1945, Tuesday

None Pressured

---

25 July 1945, Wednesday

13 Pressured--50 lbs in 11 minutes with music
5 Aero-Otitis Media
4 Failures

DALY, G. E. - GC2c - out at 9 lbs - #0 rt #~~4~~ 5 lt
large ads - tubes crowded - narrow - cold
ROSS, D. W. - S1c - out at 6 lbs - #4 rt #4 lt.
very large ads - tubes flat - closed - bleeding
WILAND, A. L. - TM2d - out at 32 lbs - #1 rt #4 lt
mod ads - tubes crowded
ZERBY, G. A. - RT2c - out at 6 lbs - #4 rt 0 lt
R. - 8-1-45 very large ads, tubes covered - rt tube closed

PASSED:

CROMER, J. N. - Y2c - #4 rt #3 lt - large irreg. ads, with nasopharyngeal Bursa - rt tube crowded - lt. free

---

25 July 1945, Wednesday

5 rechecks - 50# 11 min c̄ music.
4 Aero-Otitis Media
0 Failures

CLAWSON, R. E. - S2c - #3 rt 0 lt
GOODMAN, J. T. - S2c - 0 rt 0 lt
HOLCOMBE, E. D. - S1c - #4 rt #4 lt
SCHESRENTER, R. R. - S1c - #1 rt #4 lt
WHEELER, A. A. - S2c - #3 rt #1 lt - small central Perforation.

---

26 July 1945, Thursday

None Pressured

---

27 July 1945, Friday

15 Men Pressured 50 lbs in 5'30" with music
1 Aero-Otitis Media
0 Failures

WRIGHT, F. G. - F1c - #4 rt #4 lt - Very large ads, tubes crowded, bleeding.

Five men have had pressure before in Pearl Harbor.

14 Men Pressured 50 lbs in 11' without music
5 Aero-Otitis Media
4 Failures

BROWN, E. C. - Y2c - out at 7 lbs - #4 rt #4 lt enor ads tubes covered - has had trouble flying
WEHMEYER, K. S. - S1c - out at 3 lbs - #3 rt #4 lt very large ads tubes crowded - flat - slt. cold.

RUSSI, J. L. - S1c - out at 18 lbs - #2 lt #4 rt mod ads, tubes crowded open
PERKINS, F. J. - S2c - #4 rt #4 lt - very large ads tubes crowded bleeding - out at 18 lbs.

R. - 8-1-45

1 man with hilat #2 ears.

28 July 1945, Saturday

None Pressured

30 July 1945.

MEMORANDUM [redacted]

Subject: [redacted] Method of helping aviators clear ears [redacted] bombing.

1. [redacted] While visiting Westerly Naval A[redacted] several of the aviators [redacted] in our pressure [redacted] were interested [redacted] during A di[redacted] hands from [redacted] This [redacted]

2. [redacted] are aviators with no history of [redacted]

3. [redacted] seems to be the answer and can be easily [redacted]

4. Can it be [redacted] examine the aviators and investigate this problem?

H. L. HAINES.

Subject: Minutes of the Committee on Medical Problems of Civil Aviation.

1. In agreement with the British, according to D. D. Dickson and Bateman the whispered voice test is the best we have for the purpose though it varies greatly depending who and how administered. Whispered voice test with masking, conducted in a large room—not sound proof and with reasonable precautions should give adequate screening for routine examinations. All discrepancies should then be checked by audiometer. Other niceties may be standardized recordings for source of whispered voice, the sound proof box over ear examined or back-ground noise recordings for checking hearing.

2. The sound conference held at Medical Research Department, Submarine Base, New London, Connecticut, 14 June 1945 discussed this problem and the paper published in Navy Medical Bulletin, January 1945, by Shilling, Everley and Harris.

H. L. HAINES,
Lt. (jg) (MC)(S) USNR

Box 49,
Medical Research Dept.,
31 July 1945.

K. W. Davis, Lt. Comdr. (MC) USN,
U. S. Naval Air Station,
Quonset Point, Rhode Island.

Dear Dr. Davis:

Ensign Vernon was examined this morning and found to have a chronic nasopharyngitis custacian salpingitis. In view of the history written out by Dr. Shepard, and the findings, it appears as if the radium treatment should help this man to get back into full flying status.

Ensign Vernon had his first radium treatment today, and an audiogram. He should return for another radium treatment sometime during the last week in August. He will require from four (4) to six (6) treatments.

Thank you very much for such a complete report, and for sending Ensign Vernon to us.

Sincerely yours,

H. L. HAINES,
Lt. (j.g.) (MC) (S) USNR

cc: Dr. Shepard
Ensign Vernon

30 July 1945, Monday

None Pressured.

31 July 1945, Tuesday

15 Pressured in 9 minutes, 50 lbs no music
3 Aero-Otitis Media
2 Failures

R1-9-1 CAMP, G. J. - TM2c - out at 21 lbs - #4 rt #1 lt.
Enor ads - tubes cov. not seen.
R1-8-1 HOWARD, R. H. - F1c - out at 14 lbs - ruptured #4 rt
#4 lt - Enor ads - tubes cov. bleeding.

Passed:

CAMP, G. J. - TM2c - #3 rt 0 lt - small ads - tubes
covered with mucous.

- - - - - - - - - - - - - -

15 Pressured in 11'00 no music
6 Aero-Otitis Media
3 Failures

DAMMAN, G. H. - RT2c - out at 4 lbs - #4 rt #4 lt
large ads - tubes crowded flat
HOREHLER, R. G. - Y1c- out at 6 lbs - #4 rt #3 lt
small ads - tubes crowded open
BOSWELL, R. D. # S1c - out at 6 lbs - #1 rt 0 lt
large ads - both tubes open - clear

Passed:

WILSON, T. J. - S1c - #4 rt #4 lt - very large ads
tubes cov. - bleeding
WILSON, L. A. - S1c - #3 lt - very large ads - tubes
crowded closed
BENCH, V. W. - S2c - 0 rt #3 lt - mod ads tubes
crowded open

July Summary after Aug 3rd -

1 August 1945, Wednesday

12 Pressured - 50 lbs in 11 minutes with music
3 Aero-Otitis Media
2 Failures

KEITHLEY, G. G. - FC2c - out at 8 lbs - #3 lt #4 rt
very large ads tubes crowded flat
STIMITS, C. F. - S1c - out at 11 lbs - #4 lt 0 rt
large ads tubes crowded bleeding left

Passed:

HEINZ, R. H. - GM2c - #2 rt #4 lt - mod ads tubes
crowded.

1 August 1945, Wednesday

8 Rechecks ([redacted]) 50 lbs in 11 minutes with music
8 Aero-Otitis Media
2 Failures

ZERBY, G. A. - RT2c - out at 8 lbs #4 rt C lt
PERKINS, F. J. - S2c - out at 5 lbs - #5 rt #4 lt

WILAND, A. L. - TM2c - 0 rt #3 lt
BROWN, E. C. - Y2c - 2 rt #2 lt
DALY, G. E. - FC2c - 0 rt #3 lt
ROSS, B. W. - S1c - #1 rt #2 lt
ROSSI, J. L. - S1c - #3 rt #2 lt
WEHMEYER, K. L. Jr. - S1c - #3 rt #3 lt

2 August 1945, Thursday

20 Pressured - 50 bls in 8 minutes no music
2 Aero-Otitis Media
1 Failures

HURLEY, D. B. - S2c - out at 9 lbs - #3 rt #3 lt
Very large ads - tubes crowded flat

*****

RUSSO, G. J. - F1c - #3 rt #3 lt - mod ads tubes crowded - open.

2 August 1945

MEMORANDUM TO DR. [illegible]

Subject: [illegible] Lt. R. M. Bassett, Radium treatment.

[illegible] Lt. R. M. Bassett received a second radium treatment [illegible] Four treatments and possibly more, depending on the disappearance of the lymphoid tissue with radiation. The radium is given once every four weeks, taking about 10 minutes for examination and treatment. Mr. Bassett should return August 31st for the third treatment. As yet there are no other places in the U. S. Navy where patients can receive this radium therapy [illegible]

H. L. HAINES,
LT. (MC) USN.

3 August 1945, Friday

20 Pressured 50 lbs in 8 minutes, with music, no speaker
4 Aero-Otitis Media
0 Failures

RACE, G. F. - Flc - #3 lt 0 rt - very large ads - tubes cov - rt open
LOCKHART, R. B. - GM3c - #4 rt #4 lt - very large ads - fills tubes
DICK, R. L. - Flc - #3 rt #4 lt - enor ads - tubes covered.
GIBSON, W. H. - Flc - #4 rt #4 lt - small ads - mod in tubes.

11 Pressured 50 lbs in 8½ minutes no music
3 Aero-Otitis Media
0 Failures

HARGROBE, C. E. - Slc - #4 lt #3 rt - enor ads - tubes covered - bleeding.
EVANS, R. M. - RM2c - #4 lt #3 rt - mod ads - tubes crowded - close
MCGURK, R. C. - Slc - #4 lt #4 rt - mod ads - tubes crowded - close

RECHECKS after radium treatments---

12 Pressured 25 lbs in 4 minutes no music
2 Aero-Otitis Media
0 Failures

THOMAS, I - StM1c - #2 rt 0 lt
SCHMIDT, O. A. - PhM2c - 0 rt #3 lt
~~MCGEHEE, F. T. - Slc - #3 rt #1 lt~~

PASSED:

SNYDER, L. C. - Flc - 0 rt 0 lt
FINLEY, D. B. - RM1c - 0 rt 0 lt
SCHROEDER, J. E. - Flc - 0 rt 0 lt
HAWKINS, T. C. - Slc - 0 rt 0 lt
FEHRITE, M. D. - MoMM1c - 0 rt 0 lt
RALSTON, R. B. - Slc - 0 rt 0 lt
JERNIGAN, C. B. - MoMM2c - 0 rt 0 lt
PISHLO, M. E. - SC1c - 0 rt 0 lt
DOWNEY, W. H. - S2c - 0 rt 0 lt
SULLIVAN, R. M. - Slc - 0 rt 0 lt
STREIAND, F. C. - Flc - 0 rt 0 lt

MEDICAL RESEARCH LABORATORY
U. S. SUBMARINE BASE
NEW LONDON, CONNECTICUT

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5 August 1945.

Captain N. W. Brown, (MC) USN
Research Division
Bureau of Medicine and Surgery
Washington, 25, D.C.

Dear Captain Brown:

Several of the aviators in nearby Naval Training Stations have been in seeing Doctor Haines, getting treatment for aero-otitis media and have presented the problem of rapidly clearing the ears during dive bombing. We are anxious to help them in any way we can, but do not like to go ahead without some sort of approval.

The local Base authorities have told us to go ahead. Would a Form "X" such as the one enclosed herewith be acceptable? If so, please drop us a line and we will forward it at once.

Kindest personal regards.

Most sincerely,

C. W. Shilling
Captain, (MC), U.S.Navy.

CWS:JWK
Enclosure

Copy to Dr. Haines

ADDITIONAL INFORMATION (use additional sheets as required)

A number of aviators who have been tested for aero-otitis media and many who have never had actual aero-otitis media observed, state that they have difficulty holding their targets during diving attacks when they can't equalize air pressure in middle ear. This applies to those cases where both hands are busy with controls and cannot be freed to hold nose to inflate the ears. Swimmers in Escape Training Tank use this clip and under much more radical changes in pressure than the aviators.

PROJ
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RESEARCH DIVISION

PROJECT NO.	SECTION	DATE
to be assigned by Bureau	II 1	August 1945

TITLE OF PROPOSAL

A Procedure for Helping Aviators Equalize Pressure in Middle Ear in Dive Bombing.

ESTIMATED DURATION

undetermined.

LOCATION(S) OF STUDY

Medical Research Department, U.S.Submarine Base, New London, Conn.

OBJECTIVE(S) AND EXPERIMENTAL DESIGN

(1) To study efficiency and advisability of use of nose clip by aviators for equalizing air pressure in middle ear during various types of operations such as dive bombing when both hands are occupied.

REQUIREMENTS TO BE PROVIDED

SUBJECTS

Aviators at Naval Auxilliary Air Field, Groton, Connecticut; Naval Air Stations, Quonset Point, Rhode Island; Naval Air Station, Westerly, Rhode Island;

MATERIEL (List separately)

500 nose clips similar to those used at Lung Escape Training Tank, U. S. Submarine Base, New London, Connecticut

FUNDS (requiring allocation)

$50.00

PRINCIPAL INVESTIGATOR

Captain C. W. Shilling, MC USN

COLLABORATOR(S)

Lt. (jg) H. L. Haines, MC V(S) USNR

CONSULTANT(S)

none Bsl

ADDITIONAL INFORMATION (use additional sheets as required)

A number of aviators who have been tested for aero-otitis media and many who have never had actual aero-otitis media observed, state that they have difficulty holding their targets during diving attacks when they can't equalize air pressure in middle ear. This applies to those cases where both hands are busy with controls and cannot be freed to hold nose to inflate the ears. Swimmers in Escape Training Tank use this clip and under much more radical changes in pressure than the aviators.

(179) - Sheet 2 of 2

JULY REPORT

Training tank is in overhaul. Only 288 cases checked through pressure. Of these 19 failed pressure and 84 developed aero otitis media. That is 6.6% failed pressure but 29% developed aero-otitis media. This high percentage of aero-otitis is same as that in January. This brings up the problem of allergy as a factor in Eustachian tube blockage.

Cases treated with radium this month 171. Cases that have completed radium therapy and rechecked through pressure 49, of which seven (7) developed mild aero otitis.

During July the effects of music on those taking pressure is being studied. Results to date:-

	Without Music	With Music
Number pressures	164	126
Cases Aero otitis	48	35
% Aero otitis	29%	27.7%
Pressure failures	8%	6.7%

These are too few to draw any conclusion and the investigation is continuing.

The use of a nose clip to enable dive bombers pilots to equalize pressure in middle ear during the 10 to 15 sec. dive is being investigated.

6 August 1945, Monday

17 Pressured to 50 lbs in 10 minutes NO music
4 Aero-Otitis Media
1 Failure

DAVID, Robert - S1c - out 6 lbs - #3 rt #3 lt - Enor ads - tubes covered - closed

Passed:

ASPINWALL, A. J. - S1c 0 rt #4 lt - Enor ads - tubes crowded.
SHERMAN, H. - S1c - #4 rt #1 lt - Very large ads - tubes crowded.
WILLIAMS, W. H. - S2c - #3 lt 0 rt - mod ads, tubes wide open - clear - no R_x.

7 August 1945, Tuesday OFFICERS

23 Pressured - 50 lbs in 7 minutes NO music
4 Aero-Otitis Media
3 Failues

SCHULZ, C. J., Ens. - out at 5 lbs - #3 rt 2 lt
Sm. ads - tubes crowded.
HASELTON, F. R. - Ens. - out at 5 lbs - #3 rt 0 lt
trouble with alt. chamber - mod ads - tubes crowded and red - sore.
FRANCIS, S. - Ens. - out at 5 lbs - 0 rt #3 lt
Trouble in alt. chamber, very large ads - tubes closed - red.

Passed:

HAUPT, J. W. - Ens. USN - #2 rt 0 lt

One case with #2 rt ear.

---

8 August 1945, Wednesday

23 Pre-Selected Officers Pressured--50 lbs in 14 minutes
WITH music
3 Aero-Otitis Media
1 Failure

Davis, J. A. - Ens. - out at 11 lbs - #4 rt #4 lt.
Very large ads- tubes cov. bleeding. no cold

Passed:

Burki, A. A. - Ens. #2 lt
Carlson, A. C. - Ens. #4 rt #1 lt - small ads, tubes sore, bleeding right.

* * * * * *

1 Instructor:

Young, J. T. - CMoMM - 0 rt #4 lt - out at 23 lbs
very large ads, rt crowded open - lt sore closed.

---

8 August 1945, Wednesday

23 Pre-Selected Officers Pressured -- 50 lbs in 5 minutes
NO music
5 Aero-Otitis Media
2 Failures

Mozina, A. L. - Ens. - out 6 lbs - #3 rt #4 lt
large ads - tubes crowded, lt closed.
Schricker, O. - Ens. - out 6 lbs - #1 rt #4 lt
sm ads - nodules in both tubes. more on left.

Three cases with #2 ears.

---

8 August 1945, Wednesday

20 Pre-Selected Officers pressured 20 lbs in 4 minutes
NO music
1 Aero-Otitis Media
0 Failures

Haupt, J. W. * Ens. - USN - #3 rt - large ads - tubes crowded

9 August 1945, Thursday

23 Pressured (Pre-Selected Officers) 50 lbs in 9 minutes-
NO music
6 Aero-Oitits Media
1 Failure

Thompson, R. D. - Ens. - out 13 lbs - #4 rt #1 lt
very large ads tubes crowded.

Passed:

Kennelly, C. W. - Ens. - #3 ~~#5~~ #1 lt - large ads,
post wall - tubes crowded.
Miller, C. R. * Ens. - #1 rt #4 lt. - large ads -
small tubes - blocked.
Snider, B. L. - Ens. - #3 rt #2 lt - mod ads.
Warmath, M. C. - Ens. - #3 rt #3 lt - small ads,
tubes open
Woods, C. E. - Ens. - #3 rt 0 lt - small ads - tubes
flat

---

9 August 1945, Thursday

19 Pre-Selected Officers Pressured - 20 lbs in 2 minutes
1 Aero-Otitis Media
0 Failures.

Johnson, J. R. - Ens - #3 rt 0 lt - very large red
ads - tubes cov. open.

---

9 August 1945, Thursday

24 Pressured Pre-Selected Officers - 50 lbs in 7 minutes
WITH music
4 Aero-Otitis Media
1 Failure

Page, R. A. - Ens. - out at 6 lbs - #4 lt 0 rt
mod ads - tubes crowded nodules - had trouble
at Jacksonville.

Passed:

Parsons, R. C. - Ens. USN - perforation #4 rt - #4 lt
mod amt ads, tubes crowded - closed--trouble
at Jacksonville.
Pillen, D. F. - Ens- #3 rt 0 lt - sm ads tubes open
no treatment.
Savage, S. - Ens. - #2 rt 0 lt

---

9 August 1945, Thursday

22 Pre-Selected Officers pressured 20 lbs in 3 minutes
3 Aero-Otitis Media
0 Failures.

Norris, N.B.-Ens. - #B rt - sm ads tubes flat
Burki, A.A.-Ens. - #4 rt #4 lt - large ads tubes closed
Carlson, Ens. #3 rt - (Had trouble) - ~~[illegible]~~
at Pensacola

10 August 1945, Friday

14 Pressured - no music - 50 lbs in 9 minutes
2 Aero-Otitis Media
0 Failures

Sloss, Slc - #2 lt 0 rt

One other case with #2 ears.

10 August 1945, Friday

2 Rechekcs - 50 lbs in 9 minutes NO music
2 Aero-Otitis Media
2 Failures

Damman, G. H. -RT2c - out 7 lbs #4 rt #2 lt
Perkins, F. J. - S2c - out 6 lbs - #4 rt #4 lt

10 August 1945, Friday

14 Pressured - 50 lbs in 12 minutes with music
3 Aero-Otitis Media
2 Failures

O'Donnell, W. R. - Slc - out 8 lbs - #4 rt #4 lt
very large ads - tubes covered - closed
Anderson, R. R. - F2c - out at 8 lbs - 0 rt #4 lt
Enor ads - tubes crowded - bleeding
Kramer, J. B. - F2c - #4 rt #4 lt - Enor ads tubes
closed - nodules.

10 August 1945, Friday

6 Rechecks - 50 lbs in 12 minutes with music
6 Aero-Otitis Media
3 Failures

Hurley, D. B. - S2c - out 5 lbs - #3 rt #3 lt
Camp, G. J. - TM2c- out 8 lbs - #4 rt 0 lt
Boswell, R.D.- Slc - out 20 lbs - 0 rt #4 lt

Passed:

Keithley, G.G. - FC2c - #3 rt 0 lt
Stimits, C. F. - Slc - #4 rt 0 lt
Horchler, R.G.-Ylc - 0 rt #3 lt.

10 August 1945, Friday

22 Officers Pressured 20 lbs in 1 minute no music
2 Aero-Otitis Media
0 Failures

Warmath, M.C. - Ens. #4 rt #4 lt
Woods, C.E. - Ens. - #4 rt 0 lt

10 August 1945, Friday

21 Officers Pressured 30 lbs in 1 minute no music
0 Aero-Otitis Media
0 Failures.

11 August 1945, Saturday

None Pressured

13 August 1945 Monday:
None Pressured.

13 August 1945

Lt. Comdr. George W. Dyson, USNR,
Ship Characteristics Board,
Navy Department,
Washington, D. C.

Subject: Report on Stephen Dyson:

There is persistant fever and frequent rather severe upper respiratory infections. Sore throats and some deafness noted with colds, and an occasional earache. There is no history of otitis media. There has been pains in the legs, particularly the right leg, with colds. He is less active and has no appetite. Father states child is a bit awkward and stumbles occasionally.

Examination shows:

Normal alert, active youngster. Age 6 yrs, weight 39 lbs, height 51½"
Skin: Clear — no gross deformity.
Pupils: equal and active. Extra ocular motion well formed.
Fundi and vision normal (Tested by Dr. John Sulzman)
Ear, nose throat: Has very red adherent scarred tonsils, slight mucoid discharge in nose. Large very red adenoids. Ear drums slightly retracted—clear.
Audiogram: Normal with high tones above the [illegible]
Neck: [illegible]
Chest: [illegible] well.
Lungs: [illegible]
Heart: Regular [illegible]
Abdomen: Negative.
Extremities: Normal.
[illegible] Normal.
Neuromuscular: Normal, [illegible] thereafter [illegible]
XRT: Normal.
Sediate: Not done—should be done.
Imp: Only positive finding in suspicious history of [illegible] fever — and the active chronic infected tonsils and adenoids.
Rx — Should have T&A in October—

H. L. HAINES,
Lt. (jg) (MC)(S) USNR

P.S. I hope you and "gang" can stay longer next visit and celebrate end of Asiatic activities. (That won't be far off??) I hope!!

Haines.

14 August 1945, Tuesday

23 Pressured to 50 lbs in 6 minutes with music
7 Aero-Otitis Media
3 Failures

Kelly-Roushar, G. P. - S2c - out 6 lbs - #1 rt #3 lt.
large ads, tubes crowded -(cold)
" -Anderson, E. W. - F2c - out 6 lbs - #3 rt #3 lt
Enor. ads - tubes cov. open
" -Stanley, R. V. - PhM2c - out 6 lbs - #4 rt #2 lt
Large ads - has had 2R

***** ****** ******

Passed:

Pearce, B. F. - TM1c - #4 lt #3 rt - mod ads tubes closed
McRae, C. L. - F1c - #1 lt --rt perforated
Enor ads - tubes crowded

2 with #2 ears.

---

15 August 1945, Wednesday

14 Pressured to 50 lbs in 4 minutes NO music
4 Aero-Otitis Media
2 Failures

White, L. E. - S1c - out 6 lbs - 0 rt #4 lt -
Enor ads - lt closed - rt crowded
Walkemeyer, T. H. - TM2c - out 6 bs - #2 rt #4 lt
Enor ads - tubes closed - covered

Lowe, H. C. - S1c - 0 rt #3 lt - mod ads tubes open

1 case with #2 lt ear.

---

15 August 1945----OFFICERS SUMMARY

NAME	RANK	OUT AT	COMMENT
Thompson, R. D.	Ens.	8 lbs	
Mozina, A. W.	Ens.	6 lbs	
Schricker, O. Jr.	Ens.	6 lbs	
Haselton, L. J.	Ens.	5 lbs	
Schulz, C. J.	Ens.	5 lbs	
Francis, S.	Ens.	5 lbs	
Davis, J. A. Jr.	Ens.	10 lbs	
Page, R. A.	Ens.	8 lbs	
Kennelly, C. W.	Ens.		out in 50 ft lock
Miller, C. R.	Ens.		out in 50 ft lock
Burki, A. A.	Ens.		out in 100 ft lock
Parsons, R. C.	Ens.		Ruptured rt ear drum in 50 lb pressure
Reckie, W. R.	Ens.		Ruptures lt drum in 50 ft lock.

"V.J. day" - Aug 15th -

August 16th - no pressure.

17 August 1945, Friday

14 Pressured to 50 lbs in 7 minutes NO music
(New Men)
5 Aero-Otitis Media
2 Failures

R'-8.22 Thomas, C. D. - TMlc - out # - #4 rt #4 lt - Enor ads tubes closed (same in a plane?)
Carter, J.W. - Slc - out # - #4 rt 0 lt - very large ads - tubes crowded - rt closed

Gallo, E. F. - EM2c - #4 lt - small ads tubes crowded
Flora, L. L. - Slc - 0 rt #3 lt - very lg. ads tubes flat - open
Reilly, J. E. - Slc - #4 rt 0 lt - mod ads tubes crowded

17 August 1945, Friday

13 Rechecks - 50 lbs in 17 minutes, no music
12 Aero-Otitis Media
5 Failures

David, R. L. - Slc - out 4 lbs. #3 lt 0 rt
R'-8.22 O'Donnell, W. R. - Slc - out 4 lbs - #4 rt #4 lt
Zerby, G. A. - RT2c - out 4 lbs - #4 rt 0 lt
Hurley, D. B. - S2c - out 6 lbs - #4 rt #2 lt
Stanley, R. V. - FhM2c - out 2 lbs - #3 rt #2 lt

Passed:

Roushar, G. F. - S2c - #2 rt #2 lt
White, L. E. - Slc - #4 rt #2 lt
Anderson, E. W. - F2c - #4 rt 0 lt
Dammann, G. H. - RT2c - #4 rt #1 lt
Anderson, R. R. Jr. - F2c - #4 rt #4 lt
out 22 lbs---Perkins, P. J. - S2c - #4 rt #4 lt
Camp, G. W. - TM2c - #4 rt #4 lt
Boswell, R. D. - Slc - 0 rt 0 lt

18 August 1945, Saturday

21 Pressured to 50 lbs in 12½ minutes NO music
6 Aero Otitis Media
5 Failures

R'-8.21 Shaw, A.M. - FClc - out 4 lbs - #4 rt #4 lt - large ads tubes covered bleeding.
R'-8.22 Huston, W. H. - Slc - out 4 lbs - #4 rt #4 lt - Enor ads tubes covered not seen
R'-8.20 Hill, W. D. - S2c - out 7 lbs - #4 rt #4 lt - Enor ads tubes covered
R'-8.21 Linn, P.W. Slc - out 10 lbs - #4 rt #4 lt - Enor ads tubes covered
R'-8.20 Cervelli, L. B. - TMlc - out 22 lbs - #3 rt #4 lt - Large ads tubes flat

Gault, J. C. - Slc - #4 rt #4 lt - large ads nodules in both tubes

MOH

20 August 1945, Monday

None Pressured

---

21 August 1945, Tuesday

14 Pressured to 50 lbs in 6 minutes NO music
4 Aero-Otitis Media
3 Failures

Siedlecki, E. A. - RM2c - out at 17 lbs - #4 rt 0 lt
large ads tubes flat, left open
Zawacki, W. E. - S2c - out at 17 lbs - #1 rt #1 lt
Barres, S. J. - EM1c - out at 30 lbs - #0 rt #4 lt
R' - 9-5-45 mod ads tubes covered - both open

Passed:

Willis, E. - S1c - #4 rt #4 lt - mod ads tubes open

Inspected by Admiral Dallas G. Sutton
Inspector of Medical Dept. Activities
East Coast.
Bureau of Med. & Surgery, U.S.N.

Summary of Officers examined in pressure cases: -

	Cases	aOM	%
Total: - 116	116	21 cases aOM	20%
Naval Academy -	97	16	16%
MIT	19	5	25%

of the above group from Naval Academy there were 6 - all had trouble and who volunteered having trouble on previous before - so that among those selected group there was less than 10% aOM.

---

22 August 1945, Wednesday

None Pressured

22 August 1945, Wednesday

RECHECKS:

7 Pressured 50 lbs in 8 minutes
6 Aero-Otitis Media
4 Failures

Stanley, R. V. - PhM2c - out 2 lbs - #3 rt #1 lt
Zerby, G. A. - RT2c - out 3 lbs - #3 rt 0 lt
Huston, W. H. - S1c - out 4 lbs - #4 rt 0 lt
David, R. L. - S1c - out 4 lbs - #3 rt #4 lt
Earnhardt, E. L. - F1c - #2 lt 0 rt
Cole, H. B. - S2c - #4 rt 0 lt
Roushar, G. P - S2c - 0 rt 0 lt.

---

23 August 1945, Thursday
Non-Pressured.

24 August 1945, Friday

12 Pressured to 50 lbs in 5 minutes NO music
3 Aero-Otitis Media
1 Failure

Kelly-----PAULES, C. S. - Y2c - out 8 lbs - #4 rt #4 lt
Enor ads tubes cov. bleeding..

PASSED:

ROUX, R. R. - S1c - #4 rt #4 lt - very large ads tubes crowded
SLAVIN, R. H. - S2c - #3 rt 0 lt - small ads tubes crowded open

---

24 August 1945, Friday

15 Pressured to 50 lbs in 4½ minutes NO music
2 Aero-Otitis Media
1 Failure

KEZER, W. A. - Y1c - out 8 lbs - 0 rt #4 lt - very large ads - tubes cov. closed

Passed:

ALAGER, D.W. - S2c - #3 rt #3 lt (fld) - large ads cold - tubes open

---

24 August 1945, Friday

U-858 ----

11 Pressured 20 lbs in 3 minutes
5 Aero-Otitis Media
0 Failures

EDWARDS, T. D. - EM3c - 0 rt 0 lt
LEUNIS, C. A. - MoMM2c - 0 rt 0 lt
VICTOR, A. V. - CY - 0 rt 0 lt
CASO, F. A. - CMoMM - rt - lt (small round scar lt OK)
BROWN, A. R. - CEM - 0 rt 0 lt
MAELHORN, L. E. - CO - #2 rt #2 lt
BRYANT, W. A. - S1c - #1 rt #4 lt - small ads tubes crowd
ERICKSON, E. - RM1c - 0 rt 0 lt
CAMPBELL, C - MoMM1c - #1 rt 0 lt
KLINE, C. A. - F1c - #3 lt 0 rt
SEBREE, T. W. - F1c - #1 rt 0 lt

3 men Pressured 50 lbs in 5 minutes

TERRY, R. V. - SC1c - 0 rt 0 lt
LINDLEY, V. Z. Jr. - TM1c - 0 rt 0 lt
BARNES, R. A. - F1c - 0 rt 0 lt

---

24 August 1945, Friday

U-858-----

14 Pressured 20 lbs in 4 minutes NO music
6 Aero-Otitis Media
0 Failures

BOWELL, J. H. - Lt. Comdr. - 0 rt 0 lt
BOWDEN, D. G. - EM1c - 0 rt 0 lt
GEHRT, E. H. - EM2c - #1 rt #1 lt
RESS, H. C. - F1c - 0 rt 0 lt
SHEINER, B. - MoMM3c - 0 rt 0 lt
ARRUIZA, J. H. - OCk2c - #4 rt #4 lt - Enor ads bleeding both sides Ant. - ruptured rt. ear
SEAVY, L. M. - S2c - 0 rt 0 lt
SCHNEIDER, B. - F2c - 0 rt 0 lt
REED, - S1c - #4 rt #3 lt - Enor ads tubes cov. bleeding
RENCK, R. B. - F1c - #1 rt #1 lt
KAY, G. B. - F1c - 0 rt #1 lt
CADWELL, R. L. * S1c - 0 rt ~~#lock~~ 0 lt
FARONE, F. A. - TM2c - 0 rt 0 lt
VAN ORDEN, C. W. - F1c - #2 rt #1 lt - small ads tubes open

- -

1 Recheck

WHITE, J. R. - SC3c - 0 rt #4 lt.

---

25 August 1945, Saturday

None Pressured

27 August 1945, Monday

None Pressured

---

28 August 1945, Tuesday

17 Pressured to 50 lbs in 9 minutes WITH music
4 Aero Otitis Media
0 Failures

ANDERSON, E. G. - S2c - #4 lt 0 rt - Enor ads tubes covered lt bleeding rt open
BARTH, R. V. - S2c - #4 rt #4 lt - large ads tubes crowded closed.
GILCHRIST, J. - S1c - #4 lt 0 rt - large ads tubes narrow
TELLER, W. W. - TM1c - #4 lt 0 rt - largeads tubes narrow.

29 August 1945, Wednesday

14 Rechecks— to 50 lbs in 10 minutes
12 Aero-Otitis Media
9 Failures

Name	out at	rt	lt
THOMAS, C. D. - EM1c.	5 lbs	3	0
WALKEMEYER, T. H. - TM2c	8 lbs	4	2
STANLEY, R. V. - PHM2c	5 lbs	2	3
O'DONNELL, W. R. - S1c	5 lbs	3	3
HILL, W. D. Jr. - S2c	8 lbs	2	4
BARRES, S. J. - EM1c	5 lbs	4	0
KEZER, W. A. - Y1c	14 lbs	4	4
PAULES, C. S. - Y2c	8 lbs	4	4
DAVID, R. L. - S1c	5 lbs	3	1
CERVELLI, L. B. - TM1c		0	2
ZAWACKI, W. E.- S2c		0	0
LINN, P. W. - S1c		4	4
SIEDLECKI, E. A. - TM2c		0	0
ZERBY, G. A. - RT2c		4	4

---

29 August 1945, Wednesday

9 Radium Rechecks ---50 lbs in 10 minutes
0 Aero-Otitis Media
0 Failures

	rt	lt.
HAWKINS, W. C. - S1c	0	0
SCHROEDER, J. E.	0	0
SNYDER, L. C.	0	0
RAWLSTON	0	0
MCGEAGE, F. T. - S1c	0	0
CHORLTON, J. W. - F1c -	0	0
JACKSON, O. S. - F1c	0	0
ALLEN, E. N.- F1c	0	0
STRELAND, F. C. - F1c	0	0

---

30 August 1945, Thursday

16 Pressured to 50 lbs in 7 minutes WITH music
7 Aero-Otitis Media
5 Failures

R' 8.30 SPIRK, J. A. - F2c - out at 5 lbs - #3 rt #3lt - Enor ads tubes open crowded.
R' 8.30 SCHINDELL, J. M. - F1c - out 5 lbs - #3 ~~#3~~ #4 lt Enor ads tubes closed
R' 8.30 HENSLEIGH, M. A. - F2c - out 10 lbs - #4 rt #4 lt Enor ads tubes closed crowded
R' 8.30 MCDONOUGH, C. T. - F1c - out 10 lbs - #8 rt #0 lt mod ads tube s crowded
APGAR, E. J. - GM2c - out 10 lbs #4 rt #4 lt mod ads tubes ~~crowded~~ covered closed.
R' 8.30

- - - - -

FLOOD, G. J. - S1c - #4 rt #1 lt - mod ads tubes crowded open, no cold.
FREIMUTH, D. V. - S2c - #2 rt #2 lt

---

31 August 1945, Friday

15 Pressur d to 50 lbs in 10½ minutes, no music
6 Aero-Otitis Media
3 Failures

BRUNER, F. J. - EM3c - out 3 lbs - #3 rt #3 lt - large ads tubes flat
FUNK, F. E. - F1c - out 3 lbs - #3 rt #1 lt very large ads tubes closed nodule rt.
COOK, P. H. - F1c - out 12 lbs - 0 rt #3 lt - mod ads tubes crowded flat.

- - - - - - -

HAZELWOOD, G. L. - S1c - #4 rt 0 lt - enor ads covered
HILL, M. "E", * QM1c - #3 rt 0 lt - very large ads tubes crowded open.
KOHRMANN, G. A. - S1c- #4 rt #1 lt - mod ads tubes crowded.

11 Pressured 50 lbs in 7 minutes with music
1 Aero-Otitis Media
0 Failures

MUSSER, C. D. - F1c- #4 rt #2 lt - enor ads tubes covered.

AUGUST SUMMARY

	Pressured	Aero-Otitis Media No.	Aero-Otitis Media %	Failures No.	Failures %
Enlisted Men:	295	79	27%	30	10%
Rechecks	50	46	90%	25	50%
Radium Rechecks	22	2	10%	0	0%
Checked with Music	90	25	28%	10	11%
Officers:	116	21	18%	13	11.2%
Previously checked and no trouble	91	10	9%		
Unchecked	25	11	44%		

Men checked through pressure with history of no previous trouble:

August 30	20	2	10%	1	5%

It appears there is an expectant incidence of Aero-Otitis Media of 9-10% in all groups regardless of selection — However, the extent of Aero-Otitis Media is much less severe.

MEDICAL RESEARCH LABORATORY
U. S. SUBMARINE BASE
NEW LONDON, CONNECTICUT

31 August 1945.

Lt.Col. John L. Matthews, MC
Aero Medical Assoc. of U.S.
AAF School of Aviation Medicine
Randolph Field, Texas

Dear Colonel Matthews:

As you know by now, our letters crossed, --ours dated August 4th, yours dated August 6th.

We are wondering now what change the peace will make. Will you plan to have the meeting in Chicago on the date originally scheduled? Or will it be held later, or will it be postponed until next year?

Our feeling about the joint publication of the three papers remains the same, that is, the papers by Doctors Haines, Kelly, and Harris, should all be published at one time. If you feel that Dr. Haines' paper should be presented at the meeting, we would like to hold the other two papers for publication with his.

Sincerely,

C. W. Shilling
Captain, (MC), U.S.Navy.

CWS:JMK

1 September 1945, Saturday

None Pressured

3 September 1945, Monday

LABOR DAY ---- No men.

4 September 1945, Tuesday

None Pressured

5 September 1945, Wednesday

22 Pressured to 50 lbs in 6 minutes with music
7 Aero-Otitis Media
3 Failures

GILSON, W. A. - SM3c - out at 7 lbs - very large ads-tubes closed - #3 rt #3 lt
HOOD, J. W. - TM1c - out 7 lbs - very large ads tubes covered - #4 lt #2 rt
SAULTZ, R. N. - S1c - out 12 lbs - large ads tubes closed #4 rt #4 lt
- -
BREWSTER, R. I. - MM1c - 0 rt #4 lt - large ads tubes crowded, closed. Had some trouble in November.
EISERT, R. F. - S1c - #2 lt 0 rt - enor ads tubes covered.

Two cases with #2 ears.

6 September 1945.

MEMORANDUM TO THE EXECUTIVE OFFICER:

SUBJECT: Temporary Additional Duty Orders, Request for -

1. It is requested that temporary additional duty orders be prepared for Lieut.(jg) Henry L. HAINES, (MC) USNR File Number 345325, to proceed to the Naval Air Station at Quonset Point, R.I. on or about 7 September 1945, for one day's duty in connection with Research Project X-434 (Sub No.90). This project concerns aero-otitis media and it is intended that Doctor Haines shall observe this condition among flying personnel, as compared with the same condition found in submarine personnel.

2. If this request is granted, Doctor Haines intends to drive his own privately owned automobile.

C. W. SHILLING
CAPTAIN (MC) USN

5 September 1945, Wednesday Rechecks. Pressure

12 Pressured to 50 lbs in 8 minutes NO music
11 Aero-Otitis Media
7 Failures

	out at	rt.	lt.
FUNK, F. E. - F1c	7 lbs	4	4
SCHINDELL, J. M. Jr. -F1c	4 lbs	3	2
WALKEMEYER, T. H.- TM2c	4 lbs	3	3
BRUNER, F. J. - EM2c	4 lbs	3	3
BARRES, S. J. - EM1c	10 lbs	0	3
THOMAS, C. D. - EM1c	4 lbs	3	3
FAULES, C. S. - Y2c	10 lbs	4	1

PASSED:

	RATE		
COOK, F. H.	F1c	0	0
MCDONOUGH, C. T.	F1c	1	1
SPIRK, J. A.	F2c	2	2
APGAR, F. J.	GM2c	3	3
KEEZER, W. A.	Y1c	3	4

6 September 1945, Thursday

15 PhM's pressured to 50 lbs in 7 minutes NO music
2 Aero-Otitis Media
0 Failures

GOELZMAN, J. A. - PhM1c - #4 rt #2 lt - mod ads tubes covered
LAWRY, H. W. - PhM1c - 0 rt #3 lt - large ads right clear left closed

8 September 1945

MEMORANDUM TO CAPTAIN SHILLING:

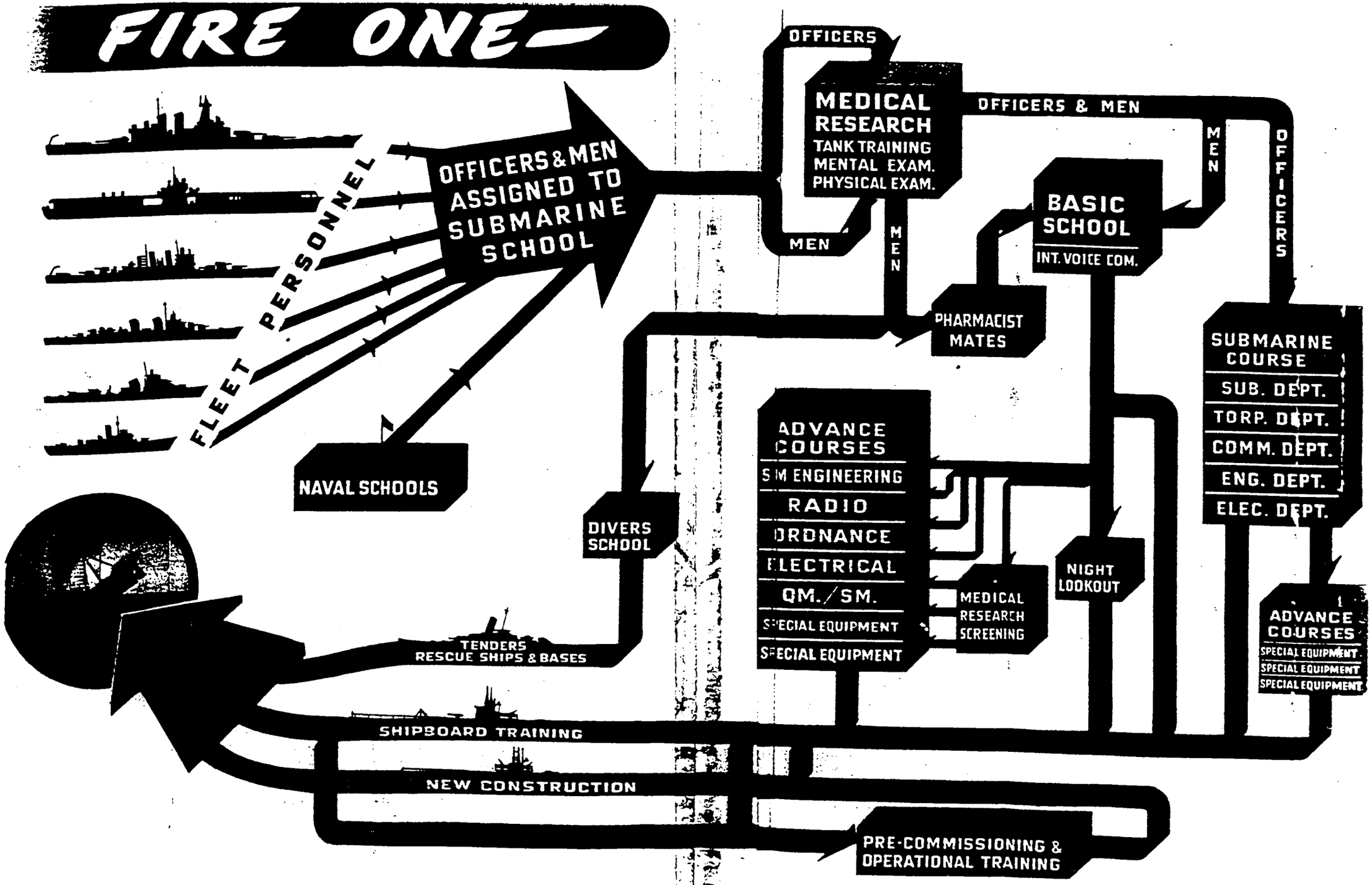
Arrived Quonset Air Station about 10 A.M., Friday, 7 September. Called on Comdr. Beals, whose relief Lt. Comdr. Collings, is in. Dr. Beals is assigned to the carrier PRINCETON, and Friday was his last day at Quonset.

I told him about the nose clips and the problem to be investigated. He was very enthusiastic and very willing to serve as consultant. He called Commander Widhelm, commander of the dive bombing squadron at Quonset, who gave us permission to test the nose clips and carry out the experiment on his men, and also on Squadron 81, which is coming to Groton within the next two days (approximately 35 men) of which 17 will be used in the experiment.

In talking over the problem with Commander Widhelm and Commander Beals, we decided to use half of the squadron including those with the lower bombing scores, and use the others as controls. Dr. Beals when called Otis Field and talked to Dr. Gibbon, who had two paitents that he wanted me to see. It was decided that I was to go to Otis Field in the afternoon and contact the dive bombing squadron there. I had a very nice dinner with Dr. Gibbons, was introuduced to Lt. Marvin M. Arthurs, and Lt. Joe Riley, in charge of the dive bombing squadrons there. Gave Gibbons 30 noseclips, which will be distributed to each of the squadrons after a lecture by Dr. Gibbons. It was decided that I was to visit the field from time to time (about once a week) to check on the progress and to keep tabs on the data.

Dr. Riley is bringing a patient for radium treatment Monday morning. Comdr. Gressly, the Senior Medical Officer at Otis Field was on leave; I carried on my business with Dr. Gibbons. Dr. Beals wishes to be remembered to Dr. Shilling, Mrs. Kohl, and Bill Verplanck.

FIRE ONE


FLEET PERSONNEL
OFFICERS & MEN ASSIGNED TO SUBMARINE SCHOOL
NAVAL SCHOOLS
OFFICERS
MEDICAL RESEARCH
TANK TRAINING
MENTAL EXAM.
PHYSICAL EXAM.
MEN
OFFICERS & MEN
MEN
OFFICERS
BASIC SCHOOL
INT. VOICE COM.
PHARMACIST MATES
SUBMARINE COURSE
SUB. DEPT.
TORP. DEPT.
COMM. DEPT.
ENG. DEPT.
ELEC. DEPT.
ADVANCE COURSES
SM ENGINEERING
RADIO
ORDNANCE
ELECTRICAL
QM./SM.
SPECIAL EQUIPMENT
SPECIAL EQUIPMENT
MEDICAL RESEARCH SCREENING
NIGHT LOOKOUT
ADVANCE COURSES
SPECIAL EQUIPMENT
SPECIAL EQUIPMENT
SPECIAL EQUIPMENT
DIVERS SCHOOL
TENDERS
RESCUE SHIPS & BASES
SHIPBOARD TRAINING
NEW CONSTRUCTION
PRE-COMMISSIONING & OPERATIONAL TRAINING

195

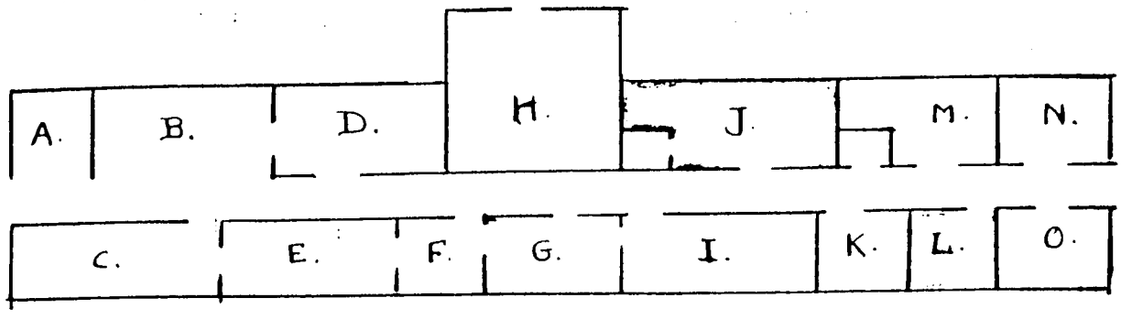
IRRADIATION CLINIC

WESTOVER FIELD, MASS.

JOHN E. HENDRICKS
Capt M.C.

ALFRED T LIEBERMAN
CAPT. M.C.

(196)-Sheet 1



T. O. INFIRMARY TYPE IN-A-T BLDG., 100 Ft. by 20 Ft.

A - Coat Room

B - Waiting Room (Station 1)

C - Record Room

D - Examining Room (Station 2)

E - Laboratory

F - Office

G - Office

H - Furnace Room

I - Treatment Waiting Room (Station 3)

J - Radium Treatment Room (Station 4)

K - Latrine

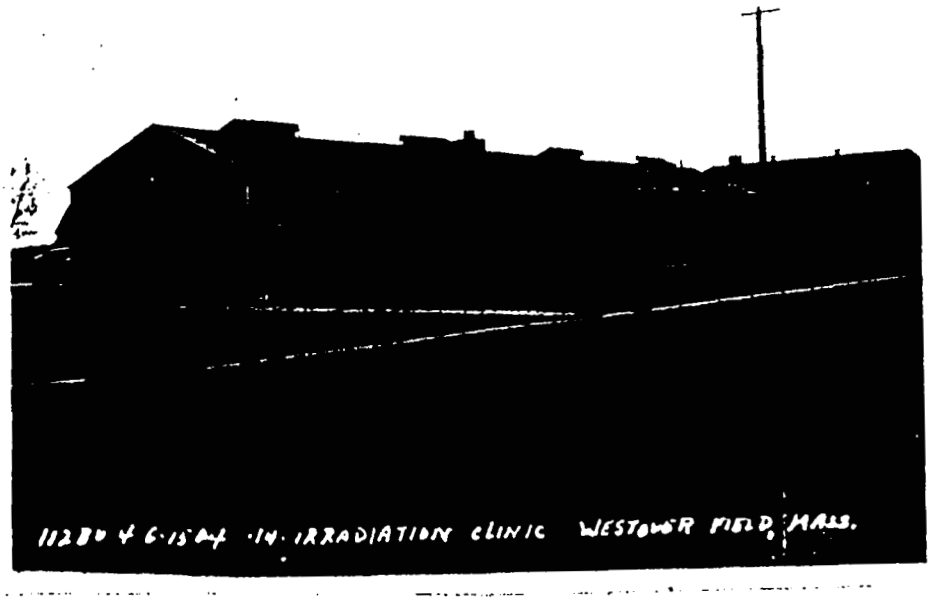
L - Radium Treatment Room (Station 5)

M - Utility Room

N - Storage Room

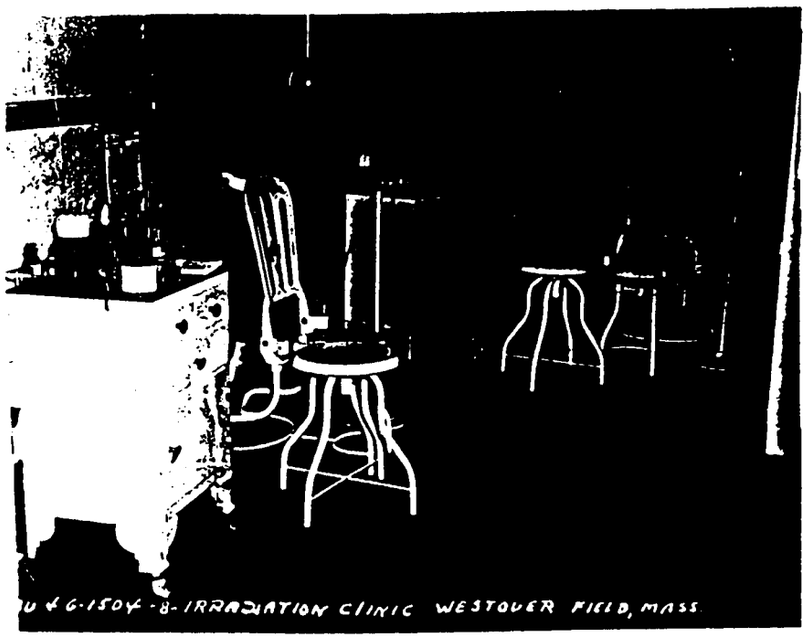
O - Utility Room

(196) - Sheet 2



Looking Southwest. The Irradiation Clinic is housed in this Infirmary type building. The interior as shown on the opposite page is well suited for this clinic. Its length allows the radium cabinets and radium treatment rooms to be distantly separated from the offices and examining rooms. The greater the distance from the radium, the greater is the safety for the personnel.

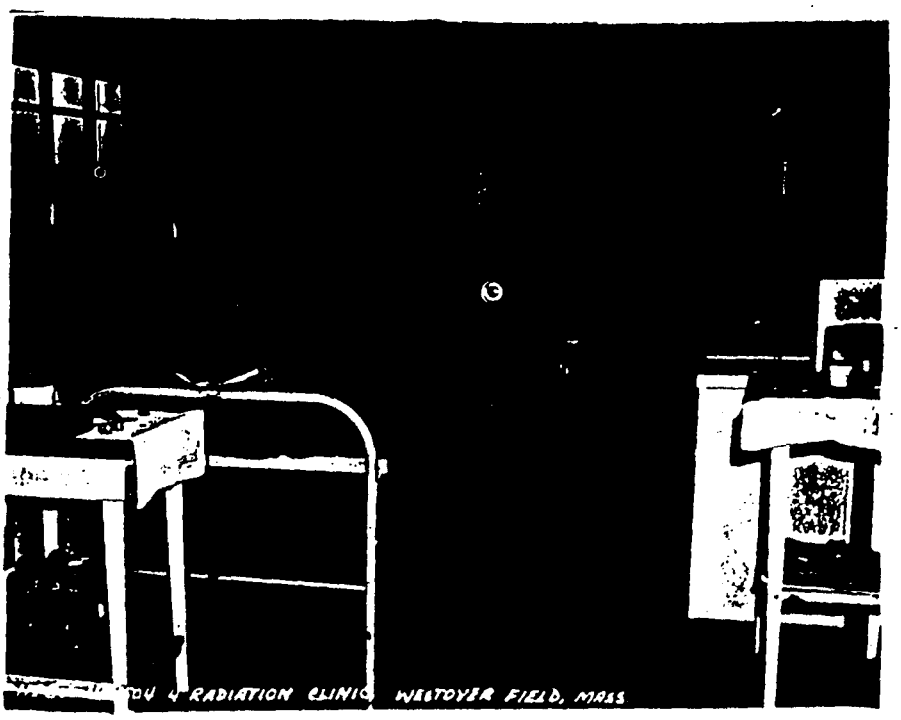
(196) - Sheet 3



Two examining units are placed in Station 2 (Room D). Two medical officers can examine(and treat, when necessary) ten men an hour. Men rejected for treatment return to the waiting room (Room B). Men selected for treatment proceed to Station 3 (Room I) to await their turn. The medical Officers alternate turns in giving Irradiation Therapy each hour to minimize the radiation they themselves absorb.

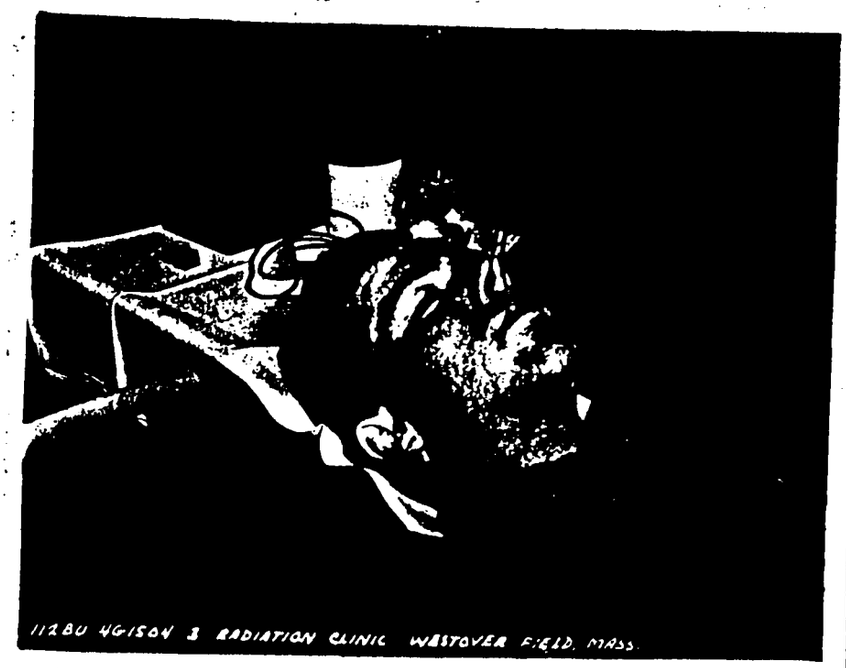
This shows a medical officer using the nasopharyngoscope. With this instrument direct visualization of the entire nasopharynx is possible. The nose is prepared for examination by spraying it lightly with a 5% butyn solution. A cotton swab moistened with 20% Cocaine solution is then passed along the floor of the nose in the path to be followed by the nasopharyngoscope. The examination is entirely without pain and requires between seven and eight minutes.

(196) - Sheet S

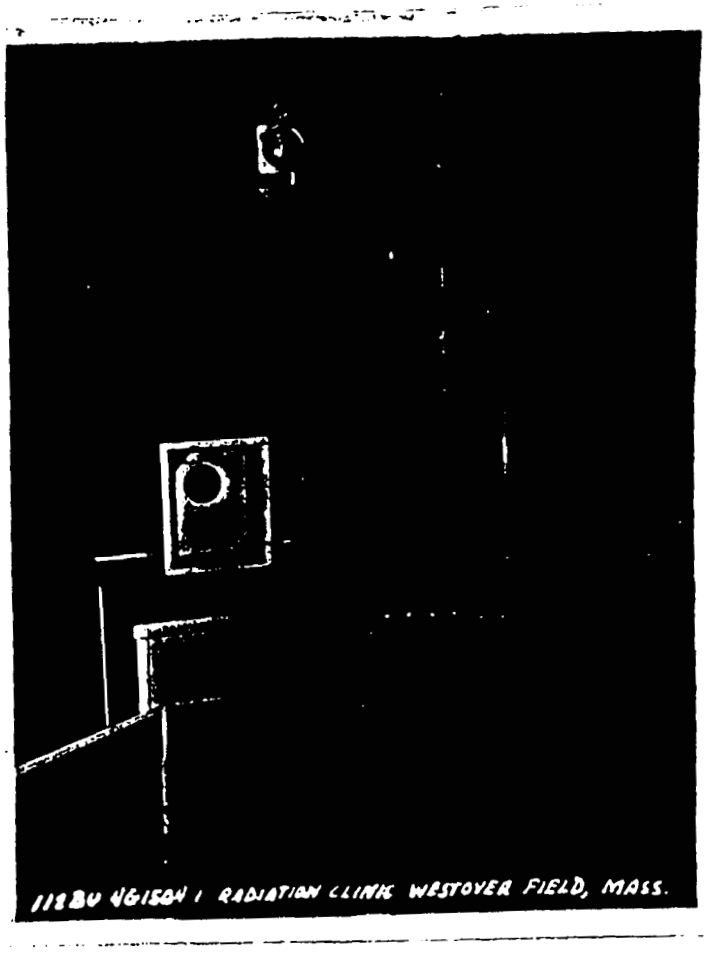


This is Station 4 (Room 7 in the sketch). A patient is shown receiving a treatment. One radium applicator is in place and the second is about to be inserted. Two rubber gloves protect the hands from the caustic Beta rays while the rubber apron (leaded) will absorb only a fraction of the more penetrating Gamma rays. The white cabinet contains the lead radium chamber. The applicators are removed from the glass tubes containing alcohol, rinsed in the sink, dipped in the lubricating jelly (in the glass graduate on the shelf), and placed in the patient. When removed, the applicators are rinsed, rubbed against the scrub brush in the bracket by the sink, rinsed again, and replaced in the alcohol tubes in the lead case. The arrangement of the room is such that a minimum number of steps and seconds are used in handling the applicators. The table at the left contains equipment for using the nasopharyngoscope for checking the position of the applicator when necessary.

(196) - Sheet 6

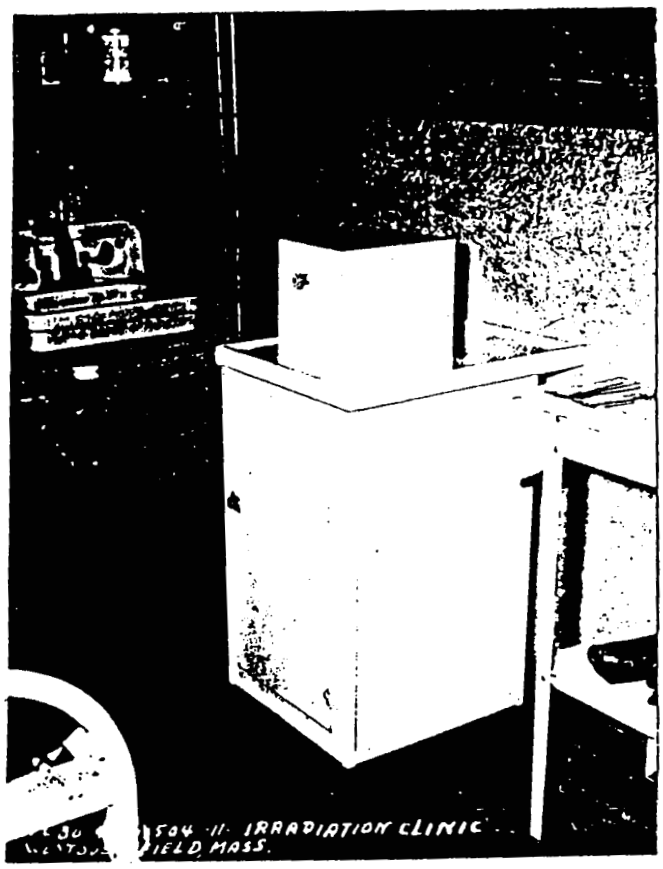


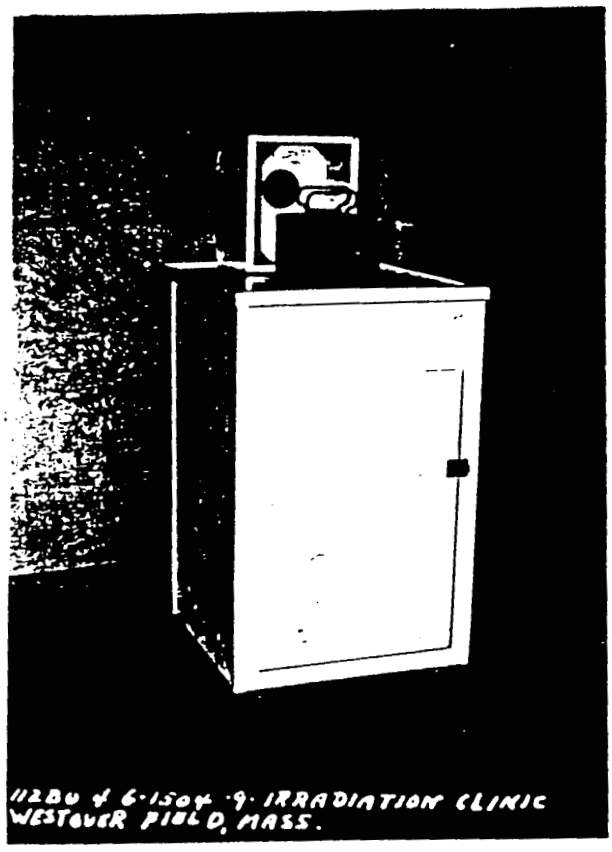
Patient with both applicators in place for six minutes and forty seconds. The plastic block is simply a thimble over the handles of the applicators which forces them together. This forces the radium bearing tips laterally towards each eustachian tube orifice.



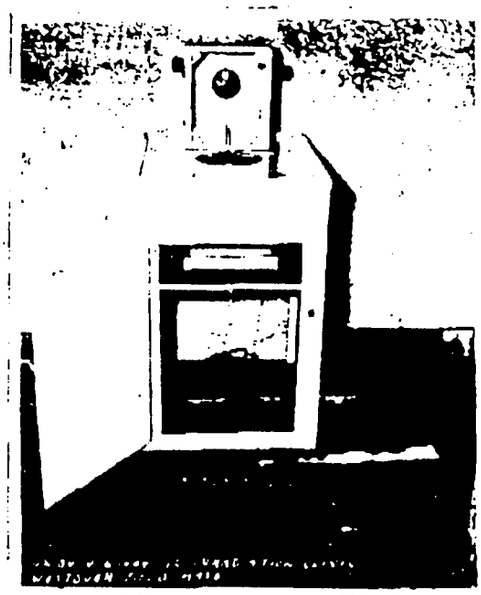
This picture shows the timer clock on a shelf in the corridor under a light and outside the door of the second treatment room, Station 5 (Room L). This can easily be seen the length of the corridor. The technical assistant sets the clock for six minutes and forty seconds as the medical officer inserts the second of the two radium applicators.

(196) - Sheet 8

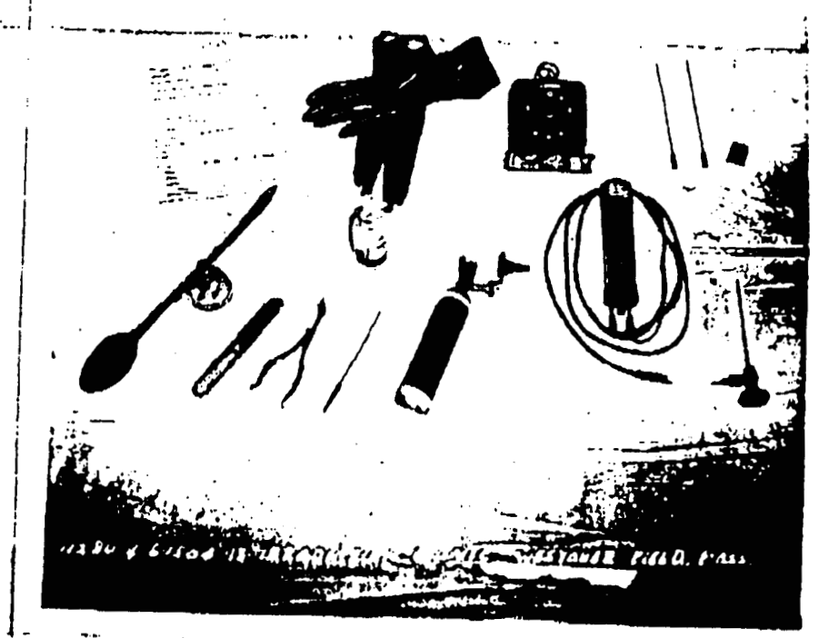




These two pictures and the one on the following page show the semi-portable radium treatment cabinets. The lead radium chamber is housed in the top of the cabinet. Additional protection is afforded by a 3" x 6" lead disk in the lid and another on the shelf directly under the chamber. Total weight is in excess of two hundred pounds.



(196 - Sheet 10



ESSENTIAL EQUIPMENT

Lower area, left to right.
5% Butyn in an atomizer.
Tongue depressor.
Nasal speculum.
Wire applicator with cotton tip moistened in 20% cocaine solution (just above).
Otoscope.
Battery handle with rheostat and cord.

Upper area, left to right.
History and examination record.
Rubber gloves.
Ingersoll timer clock.
Two radium applicators. Each contain 50mgm. which is filtered by 0.5mm. of monel metal.
Plastic block.

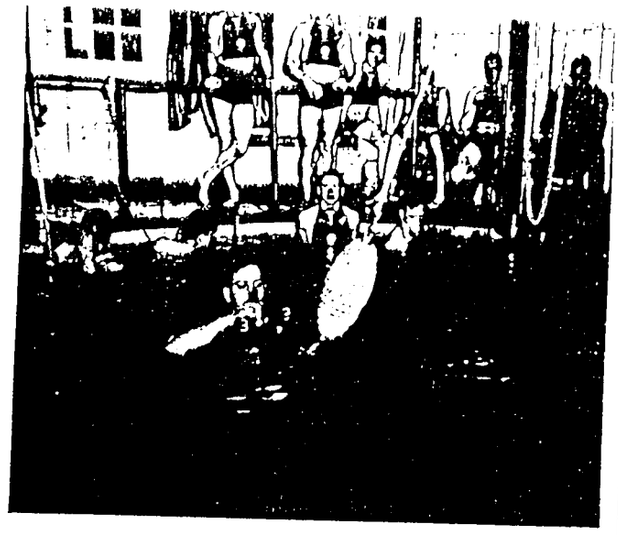
(196) - Sheet 11

Physical standards are high. Here the doctor examines a volunteer's nasal pharynx.

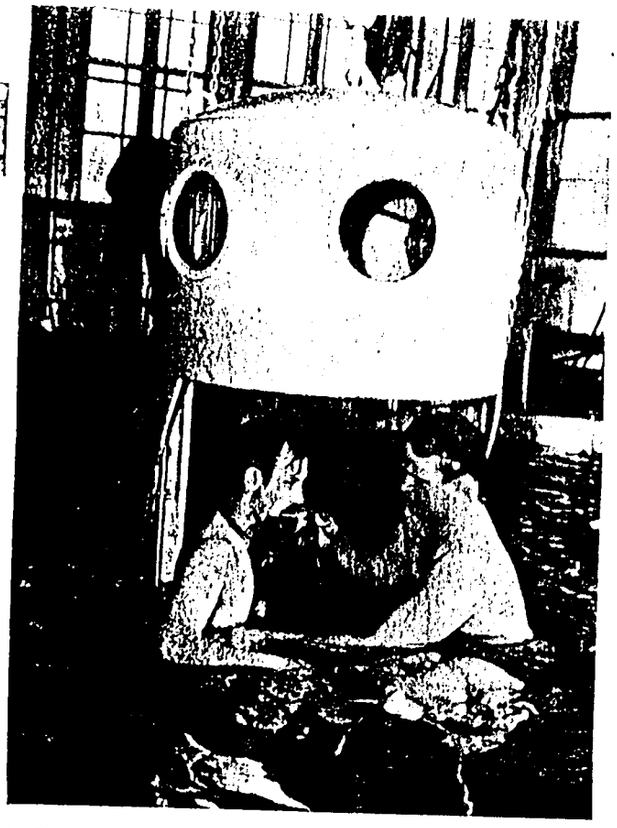
(196) - Total of 11 pages Attached

Submarine escape training tank is used to train men in underwater escape

1. The air pressure chamber gives the men their first test. While the men are subjected to 50 lbs. pressure, their reactions are observed. They receive a thorough physical check after completing the test to determine their ability to withstand pressure. Often, minor physical defects can be corrected.

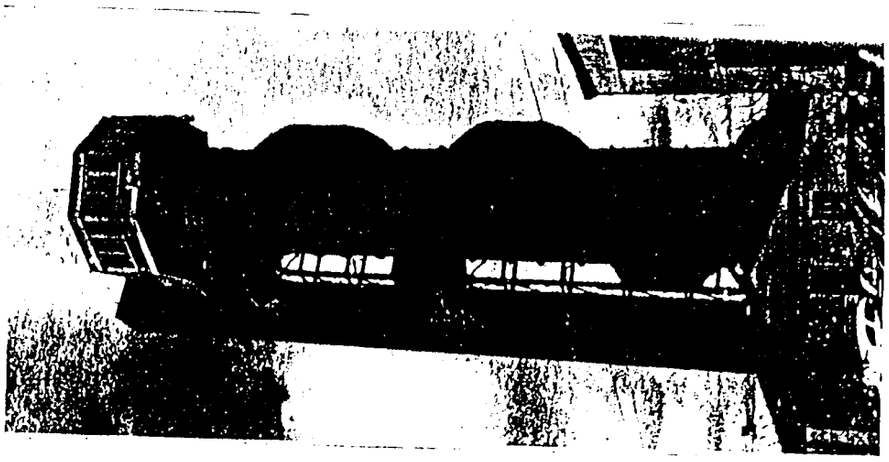


2. In the tank, men are taught how to use the sub escape device which enables them to breathe underwater. This device makes escape possible from a sunken submarine. Knowing how to use the lung increases confidence and contributes to morale. After learning its use, men are ready to make escapes.



3. Practice in escape begins with the diving bell. The bell is lowered to the 12′ depth. Using the escape device, the men rise to the surface. Trainees are observed closely as a safety precaution and to determine their reactions. Failure to properly complete tank training disqualifies trainees.

4. Escapes are then made from the 18′, 50′, and 100′ depths. Locks which are built into the side of the tank are flooded slowly. The hatch is opened and the men ascend a line to the surface of the tank. Escapes are required from the 18′ lock. Those from the 50′ and 100′ locks are voluntary.



The training tank where instruction in the use of the Momsen lung escape device is given.

5. **Underwater photograph** shows how trainees use the escape device as they slide to surface after first escape from bell.

6. **Escaping from the 50-foot lock,** trainees must pause periodically on the way up to adjust body to the reduced pressure. Greatest difficulty experienced is getting trainees to breathe normally through lung.

~~Hydrolic~~ Rechecks -- Failures, Etc.

Month	Number	Aero-Otitis Media No.	Aero-Otitis Media %	Failures No.	Failures %
October	800	?			7½%
November	773	166	21.4%	75	9.7%
December	594	172	29%	46	7.5%
January	946	238	25%	91	9.5%
Rechecks	96	81	84%	15	15%
February	836	233	28%	91	18%
Rechecks	71	59	83%	14	20%
March	610	182	29%	80	13%
Rechecks	90	83	92%	28	31%
April	473	121	25%	36	7.6%
Rechecks	74	73	98%	33	44.5%
Rad. Rechecks	79	5	6.3%	0	0%
May	493	131	26%	38	7.79%
Rachecks	66	60	91%	31	47%
Rad. Rchecks	17	2	12%	1	6%
June	429	126	29%	30	7.0%
Rechecks	27	26	96%	1	3.7%
Rad. Rechecks	7	1	14%	0	0%
July	288	84	29%	19	6.6%
Rad. Rechecks	39	7	19%	0	0%
Rechecks	16	14	90%	4	25%
Music	80	19	22.5%	4	5%
August	295	79	27%	30	10%
Rad. Recheck	22	2	10%	0	0%
Rechekcs	50	46	90%	25	50%
Music	90	25	28%	10	11%
Officers---Selected	116	21	18%	13	11.2%
Total	5853	1553	26.7%	545	9.3%

8 September 1945, Saturday

None Pressured

10-11-12 September 1945

To Portsmouth with Dr. Bateman

10 September 1945, Monday

10 Pressured to 50 lbs in 5½ minutes NO music
2 Aero-Otitis Media
0 Failures

LARSON, R. H. - RT2c - Very large ads tubes crowded open #4 rt #4 lt

- - - - -

One man with #2 ear lt.

13 September 1945, Thursday

15 Pressured to 25 lbs in 4 minutes NO music
2 Aero-Otitis Media
1 Failure

SETTLE, W. K. - S2c - out at 10 lbs #3 rt #4 lt - large ads lt closed rt open--cold
Trouble in January or late December

SKORGAARD, W. - S2c - #1 rt #4 lt - large ads lt tube closed.

- - - - - - - - - - - -

1 man pressured to 50 lbs in 7 minutes
0 Aero-Otitis Media
0 Failure

---

14 September 1945

13 Pressured in 7 minutes NO music
2 Aero-Otitis Media
1 Failures

LICEFI, L. A. - GM2c - out 4 lbs - #2 rt 0 lt --- mod ads acute cold (Hypersinsitive)

BAFFAS, E. D. - EM1c - #4 rt 0 lt
Enor ads tubes closde, nod. right.

15 September 1945, Saturday

None Pressured

17 September 1945, Monday

14 Pressured to 20 lbs in 2 minutes NO music
4 Aero-Otitis Media
0 Failures

KILLEEN, W. J. - EM3c - #4 lt #3 rt (trouble in '43)

Three cases with #2 ears.

- - - - - - - - -

17 Pressured to 20 lbs in minutes NO music
3 Aero-Otitis Media
0 Failures

NARANE, W. H. - S1c - #4 rt #4 lt
MANN, F. L. - CMoMM - #2 rt #2 lt

1 case with #2 ears

18 September 1945, Tuesday

12 Pressured 20 lbs in 9 minutes
3 Aero-Otitis Media
1 Failure

NEILSEN, I. C. - CM2c - out 9 lbs - 0 rt #4 lt - marked scarring drums - had trouble 3 years ago, Enor ads tubes cov. lt closed

R' 9-18

SMITH, K. H. - SC3c - #4 rt #4 lt - very large red gran ads tubes crowded open

DURGIN, E. H. - MoMM2c - #1 rt #4 lt - Enor ads tubes cov.

- - - - - - - - - - -

10 Pressured to 50 lbs in 5 minutes
2 Aero-Otitis Media
0 Failures

MALTON, V. T. - CRM - #3 rt #3 lt
DUNLAP, W. E. - EM3c - 0 lt #4 rt

---

19 September 1945, Wednesday

8 Pressured to 50 lbs in 6 minutes
2 Aero-Otitis Media
1 Failure

WELLS, A. L. - CY - out 11 lbs #4 rt #4 lt - Enor ads tubes crowded.

2 cases with #2 ears.

---

19 September 1945, Wednesday

7 Pressured to 50 lbs in minutes Redchs.
7 Aero-Otitis Media
5 Failures

HUSTON, W. H. - S1c - 2 lbs - #3 rt #3 lt
CARTER, J. W. - S1c - 2 lbs - #3 rt #0 lt
SHINDELL, J. M. - F1c - 5 lbs #2 lt #3 rt
REDDING, J. R. - S1c - 5 lbs - #3 rt 0 lt
OK——LICEFI, L. A. - GM2c - 30 lbs - #4 rt #2 lt
Passed: HILL, W. D. Jr. - S2c #1 rt #3 lt
PERKINS, P. J. - S2c - #4 rt #4 lt

19 September 1945, Wednesday

25 Pressured Rechecks - passed pressure - Routine Qualified
2 Aero-Otitis Media
0 Failures

Name	Rate	Comments
PETERS, W. J. -	S2c	
PUTMAN, J. S.	SM2c	Dr. Kelly
WINDECKER, S. R.	S1c	
WHITCOMB, H. C.	F1c	
WAGNER, R. D.	S1c	
PHILLIPS, W. S.	S1c	#4 lt --- cold
HARRISON, A. E.	S1c	Dr. Kelly
WILSON, H. C.	S1c	
SMITH, G.	S1c	June 2 ~~--Dr. Kelly~~
SCHROEDER, J. E.	F1c	
PFISTER, W. F.	F1c	
SHIRES, E.	F1c	Radium ~~[illegible]~~ OK
STEWART, J. W.	S1c	
STABER, E. J.	S2c	
POFFLEY, R. E.	S1c	
SEILS, I. R.	S1c	
WEEKS, J. R.	S1c	
TATE, M. W.	F1c	
SENSIBAUGH, J. T.	TM2c	
WHITE, C. A.	F1c	
SPARKS, E. B.	F1c	Cold #4 rt April
HOEN, R. M.	RT3c	Dr. Kelly
FADUNCE, D. F.	S2c	Dr. Kelly
EUBANKS, E. W.	GM2c	Dr. Kelly 0 rt 0 lt
FALLIS, S.	F1c	Dr. Kelly

Trip to Baltimore: Sept 20th - Sept 23

Left Thursday afternoon, 20 September 1945. Met Dr. Stacey Guild at 8:30 A.M. Friday, in the Otological laboratory at Johns Hopkins Hospital. Checked over data as collected in log with Drs. Crowe, Guild, Lt. Col. Kos from Randolph Field, and with Drs. Walzl and Lock, also connected with the laboratory. Dr. Peugnet from Randolph Field also was present Saturday. They all feel the work is convincing and well controlled. No additional data needed. Dr. Guild agreed that the work here has been more objective than subjective and therefore better controlled than in the air forces.

Many periodicals and articles in German and French were checked thru with Dr. Guild. One article in German Anatomy text appears to have the answer to the good and rapid results of Kelly's work.

The article appearing in next month's Journal of the Acoustical Society was checked by Dr. Guild, and only minor changes made.

Tuesday, October 2nd, all the Army radium in Aero-Otitis-Media data is to be collected and gone over at Hopkins.

25 September 1945, Tuesday

None pressurdd

26 September 1946, Wednesday

VSS Ling

1st group----20 lbs in 1½ minutes
10 Pressured
2 Aero-Otitis Media
0 Failures

Ferguson, E. C. - S1c - 100 lbs 0 lt OK
Burns, F. - S2c - #3 lt #1 rt - trouble in April
Fulmer, M. F. - TM2c -OK
Broderick, J. L - F1c - March - no trouble #2 lt slt cold
Leland, D. E. - F1c - cold
Boyer, E. J. - S2c - OK
Paxson, W. J. - S1c - 3 radium - Ort 0 lt
Moropoulos, N. J. - F1c - cold
Morgan, T. G. - F1c - OK
Neff, F. C. - S1c - OK - cold

20 lbs and out!

26 September 1945, Wednesday

VSS Ling

5 men pressured to 20 lbs in 1½ minutes
0 Aero-Otitis Media
0 Failures

Estrada, V. A. * TM2c - OK
Davis, T. J. - F1c - slight cold 0 rt 0 lt
Croak, H. B. - S1c - OK
Cobb, C. P. - TM 3c - OK
Carnes, L. I. - F1c - slight cold 0 rt 0 lt

26 September 1945, Wednesday

13 Pressured to 50 lbs in 8 minutes
6 Aero-Otitis Media
5 Failures

Hilliard, W. E. - Sm2c - out 8 lbs - #4 rt #4 lt - very large ads tubes crowded slt cold- margins
R'g.26 Chatard, J. A. - MoMM3c - out 5 lbs #4 rt #4 lt - very large ads tubes crowded closed slt. cold
R'g.26 Todd, T. W. - GM3c - out 3 lbs - #3 rt #4 lt - enor ads tubes covered, crowded no cold
Morgan, R. S. - S1c - out 13 lbs - #4 rt 0 lt - enor ads tubes cov. not seen - slt cold
Latas, R. (n) - GM2c - out 13 lbs #4 rt #1 lt - large ads tubes crowded - open - margins - no cold

Passed:

Evans, J. K. - S1c - #3 rt 0 lt - mod ads tubes open ads on margin cold

26 September 1945, Wednesday

7 Pressure Rechecks--- 50 lbs in minutes
7 Aero-Otitis Media
7 Failures DISQUALIFIED

Licifi, L. A. - GM2c - out 5 lbs - #2 rt #2 lt
Hensleigh, M. A. - F2c - out 5 lbs - #2 rt #3 lt
Redding, J. R. - S1c - out 10 lbs 0 lt #3 rt
Carter, J. W. - S1c - out 12 lbs - 0 lt #4 rt
Hurley, D. B. - S2c - out 10 lbs 0 lt #3 rt
Huston, W. H. - S1c - out 5 lbs #4 rt #4 lt
Schindell, J. M. Jr. - F1c - out 40 lbs #4 rt #4 lt

27 September 1945, Thursday

12 Pressured 20 lbs in 2 minutes USS CORPORAL
0 Aero-Otitis Media
0 Failures

Four of these have evidence of colds in nasopharynx
All denied any history of ear trouble under pressure
or when flying.

---

27 September 1945, Thursday

14 Pressured 20 lbs in minutes USS CORPORAL
4 Aero-Otitis Media
3 Failures

Edgar, T. P. - EM1c - out 3 lbs - #3 rt 0 lt - cold
Settle, W. K. - S2c - out 10 lbs - #2 rt #3 lt - no cold
Pugh, J. C. - MoMM1c - out 10 lbs #4 rt 0 lt - slt cold
R1- 9-27 had trouble 2 weeks ago. mod ads tubes cleared

Passed:
Bukowski, P. J. - MoMM1c-Enor ads tubes covered.

---

28 September 1945, Friday

8 Spritz men pressured to 50 lbs in minutes NO music
2 Aero-Otitis Media
1 Failure

Burgess, R. D. - TM3c - out 3 lbs 0 rt #3 lt

Passed:

Bailey, J. D. - SC3c - #4 lt #4 rt - large ads tubes closed

---

28 September 1945, Friday

18 Men pressured 20 lbs in 2 minutes USS LING
2 Aero-Otitis Media
0 Failures

Fleischmann, W. - MoMM3c - #4 rt 0 lt

one case with #2 ears

---

29 September 1945, Saturday USS Ling

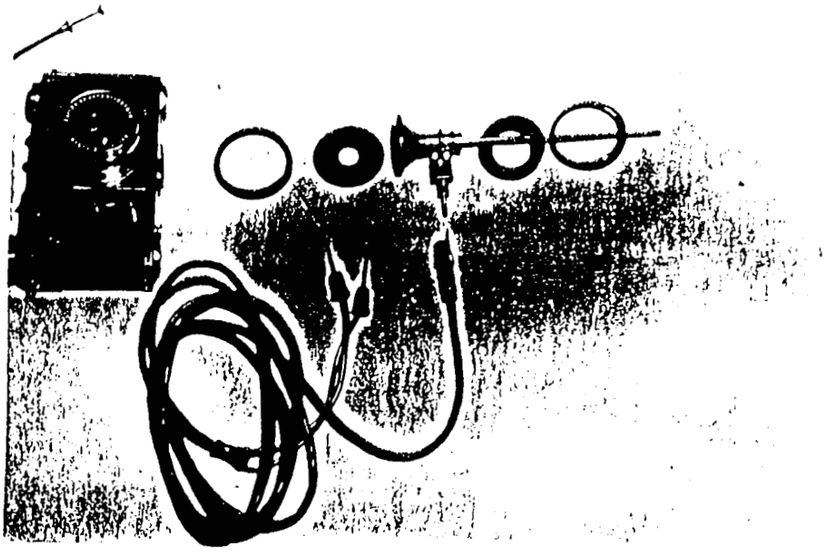
10 Pressured to 20 lbs in 7 minutes
2 Aero-Otitis Media
1 Failure

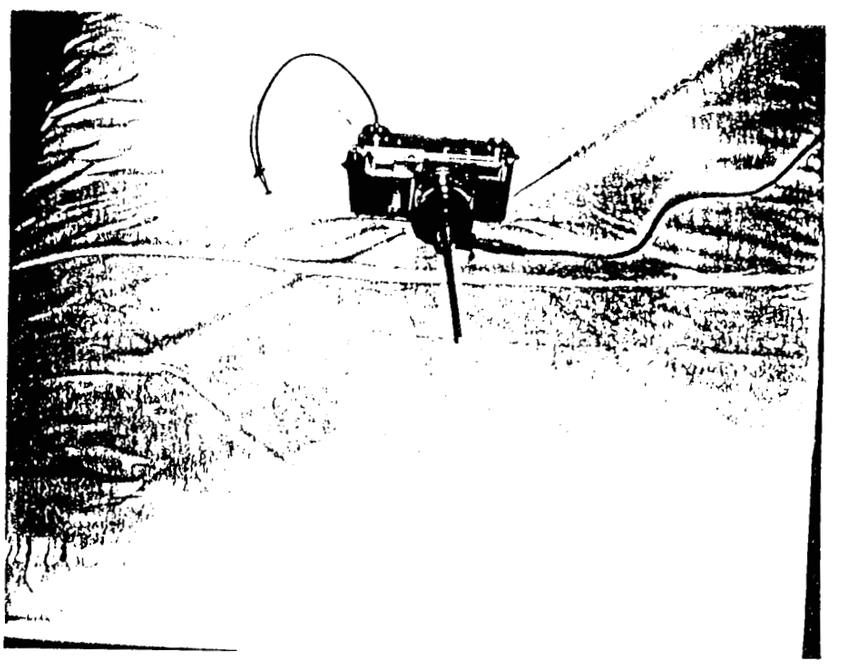
Mitchell, W. J. - F1c - out at 8 lbs - #1 rt #2 lt
has cold.

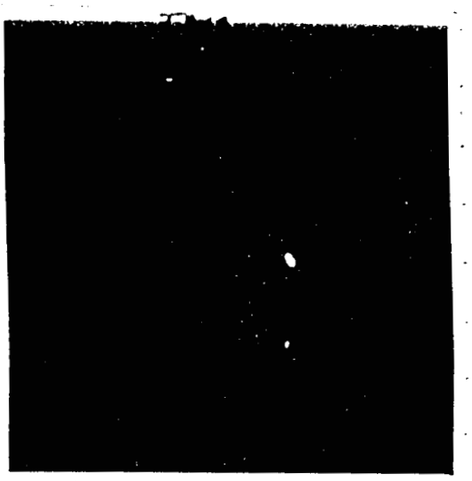
Passed:

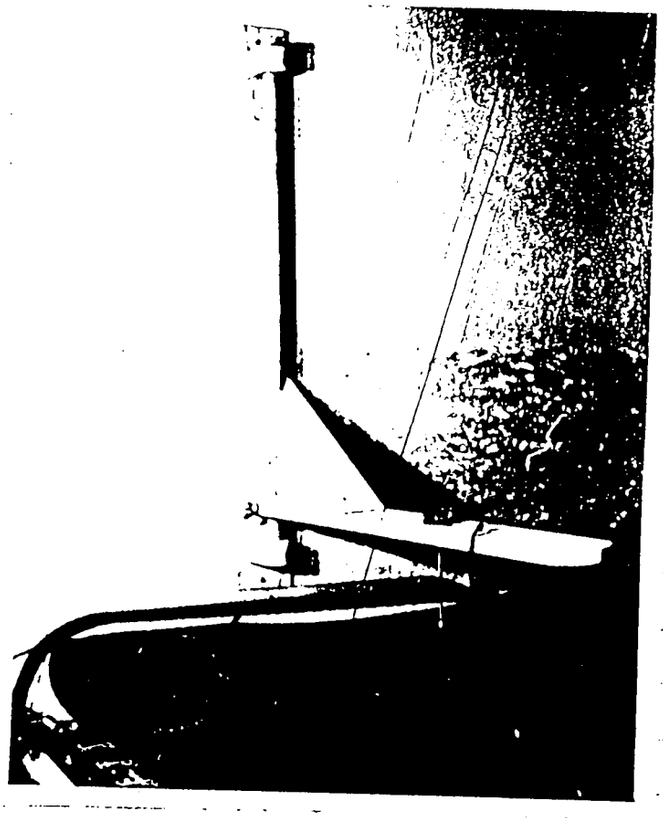
Mahaffey, M. - F1c - #4 rt #4 lt - had trouble in
R1-9-29 April - slt. cold.

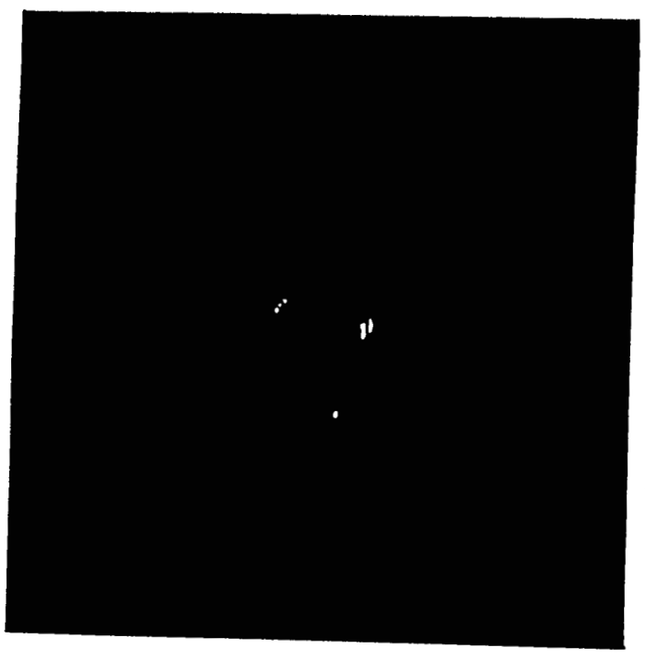
Photos from Wectors Field
Courtesy Capt. John Hendrick

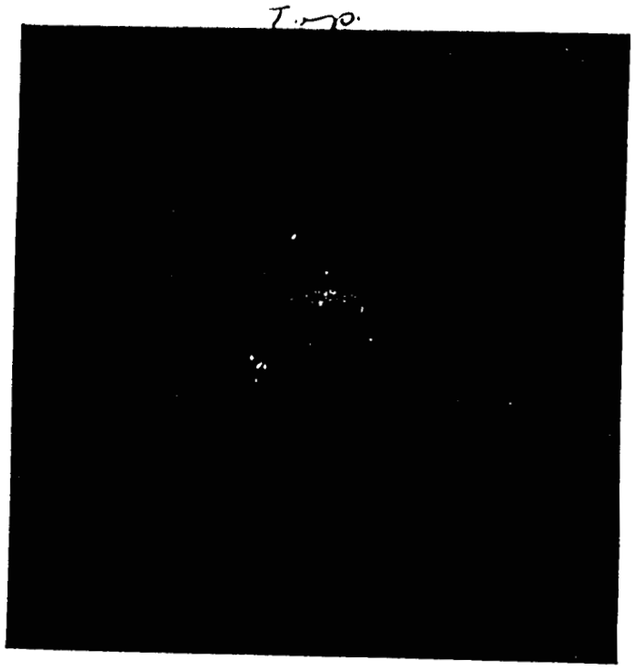


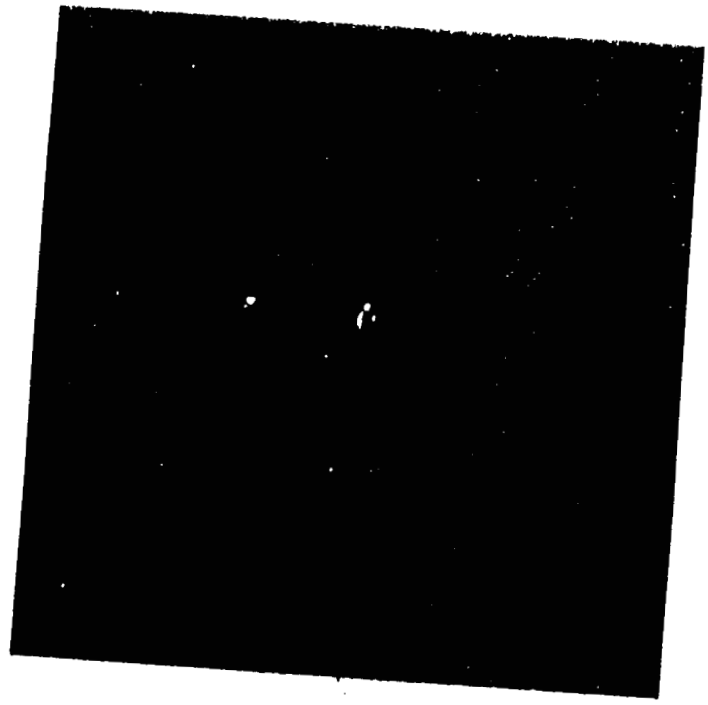




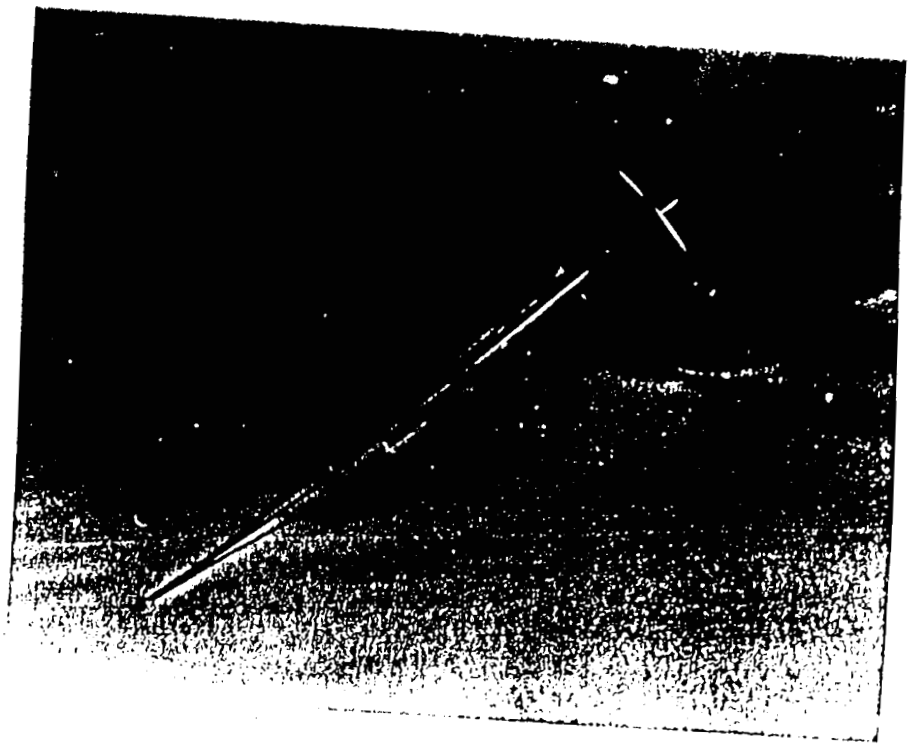








Thimmald Capt. on Buna.



Westover Field Trip:

Thursday, 27 August 1945. Left Groton airport at 2:10 and arrived Westover field at 2:45 P.M. Met Dr. John Hendricks, who informed me that the Col. had called the Irradiation Clinic Tuesday morning discontinuing that activity, so I arrived just in time to go over the scraps. All their data had been sent for the Hopkins conference however there were many photographs of Eustachian tubes and a summary of their work. Much of their data which is abundant however, has had to be based on comparable groups rather than on actually following groups straight through to end of treatment. They did a great deal of prophylactic work which we have not had time to do except on a minor scale.

SEPTEMBER

Pressured: Spritz:

146 --
36 cases Aero-otitis media
13 failures.

Rechecks:

26 pressured
25 cases Aero Otitis media
19 failures.

Qualified selected group rechecks:

25
2 with colds developed Aero-otitis media.

Checked the pressure.

Sept. 8 - trip to Quonset Air Station and Otis field investigating nose clip experiment.

Sept. 10 - 13: trip to Portsmouth with Dr. Bateman for Schnorchel experiment.

Sept. 20 - 23: trip to Baltimore with Dr. Kelly to see Drs. Crowe and Guild. Met there also Colonel Koss and Major Peugnet.

Sept. 27 - Flew to Westover Field for conference with Radiation Clinic there. They have closed out and their work is finished.

The article on Aero-otitis Media sent to the Acoustical Society is to appear in the October Journal.

1-3 October-----Monday, Tuesday, Wednesday.

None Pressured.

3 October 1945---1300

PRESSURE RECHECKS: after Radium:

2 Men pressured to 20 lbs in 1 minute 30 seconds.
0 Aero-Otitis Media
0 Failures

RENEK, W. A. - Flc - 0 rt 0 lt
WELLMAN, J. F. - Flc - 0 rt 0 lt

Motey

Oct. 11 - 14 Pressured (Trained before)
1 AOM 25# in 5 min.
0 Failures (Amberjack)

SHROPE, F.O., CCS. - 4 rt 3 lt
Pressured 2 years ago Has cold.

15 Pressured - 50# (Amberjack)
2 AOM
1 Failures

R'- 10-11 OLIVER, H.G., PhM1c - 4 lt 1 rt
(always trouble with left ear - Enor. ads. - Tubes crowded.

R'- 10-16-45 GREEN, R.J., S1c - 4 rt 4 lt
(Had X-Ray therapy) Throat paralyzed with dip as kid). Rt tube clear wide open - Lt nodule in tube.

Oct. 12 - 13 Pressured - 20# in 4 min.
1 AOM
0 Failures.

OGDON, E.W., CSM. - 4 lt 2 rt.
R'- 10-12 (Large ads. - tubes open crowded lt - cold.)

12 Pressured - 20#
1 AOM
0 Failures

Eldridge, L.E., QM3c - 4 rt 4 lt
R'- 10-12 Large ads. - tubes crowded open.

11 Pressured U.S.S. Amberjack
1 AOM

THOMPSON, W.H.R., StM2c - 3 lt 1 rt

Oct. 15 - 11 Pressured - 20# in 4 min.
4 AOM
0 Failures
4 - #2 ears, all had colds.

10 Pressured - 20# in 3 1/2 min. U.S.S. AMBERJACK
1 AOM
0 Failures

WURDACK, J. E., SC1c - 3 rt 4 lt
R'- 10-11 (Pressured April or May and trouble then)
Enrs Ads. - tubes cov.

SUMMARY OF TRIP TO OTIS FIELD, Tuesday, 16 October 1945.

Arrived about noon. Had dinner with Commander Gressley, Flight Surgeon, Otis Field, and Lieut. Charles Gibbons. A flight in the Beast (Hell diver) had been arranged. Equipped with nose clip, stop watch and a weak heart we took off. The first dive from 12,000 to 500 feet took approximately 12 seconds and with about 3 G pull out. During the descent the nose clip was not used and due to fright, no attempt was made to clear the ears. It was noticed that the ears ached after the pull out but cleared on returning to 12,000 feet. This time since the initial fright had worn off, on second dive, took account of what happened, cleared the ears four times against nose clip. Pilot did not use nose clip as he had been accustomed to clearing ears by holding his nose: had good dive bombing score. Another dive was made and several loops and rolls were performed before returning to the field. There are approximately 34 flying men in Squadron, all experienced pilots, only four are using nose clips. The others claimed to have too much gear to take care of to use nose clip. The 4 that are using them have had trouble clearing ears. The clip has not been used above 12,000 feet where oxygen has been necessary. At Groton there are about 4 or 5 who use clips. No check has been made as to dive bombing score or its relation to Aero Otitis Media.

Oct. 16 - 10 Pressured
2 AOM
1 Failure

R' 10-16 THOMPSON, E. L., MoMM1c - 10# 4 rt 3 lt
Small ads. - tubes crowded - open no cold.

1 with #2 lt ear.

Oct. 17 - 18 Pressured - 4 aom - 0 failures

FINNEY, I. K. 2 lt
PUGH, J.C. 4 rt
SETTLE, W. K. 3 rt 4 lt
STRICKLAND, S.E. 3 lt 4 rt

Oct. 18 - 16 men S/M School - 50# in 10 min.
6 AOM
4 Failures

HALL, R.S., RM1c FP 7# 4 rt
Mod. ads. tubes small - crowded.
JANELLE, A.W., S2c FP 11#
Ens. ads. - covered - op. radium.
SPRINKEL, W.E., S2c FP 11#
Large ads. tubes covered.
NICHOLS, W.W., S2c FP 21#
Ens. ads. tubes closed.
BROOKS, H.I., TM1c 4 rt 4 lt
R' 10-19 Small ads. tubes scarred, narrow, opened.
HAWKINS, T.W., S1c 2 lt 0 rt.
Mod. ads. Tubes open - cold.

14 Pressured - 50# in 10 min. TRUMPETFISH
1 AOM
0 Failures

MILLER, W.L., TM3c 4 rt 4 lt
Has had trouble before - Mod. ads - tubes crowded.

16 Pressured - 50# in 10 min. TRUMPETFISH
1 AOM
0 Failures

SIMPSON, S.M., StM2c out 11 lbs. - 2 rt 0 lt.

Oct. 19 - 14 Pressured - 20# in 1 3/4 min. TRUMPETFISH
Ø AOM
0 Failures

KELAITA, J.B., TM3c - 4 rt 2 lt
R 10-19 Mod. ads. tubes crowded No cold.

8 Pressured - 20# TRUMPETFISH
Ø AOM
1 Failure

CHIARELLI, S.F., CMoMM - 8# out 4 rt 0 lt.
R 10-19 Mod. ads. tubes crowded - red - no cold.
LOSO, M.J., F1c 4 rt 4 lt
R 10-19 Large ads. tubes covered closed - no cold.

au-9-26 TODD, T.W. 4 rt 4 lt - recheck.

---

19 October 1945, Friday

6 ~~10~~ Pressured --- Rechecks after radium
Ø Aero-Otitis Media
0 Failures

	rt	lt	
~~Burki, A. A.~~	~~1~~	~~1~~	~~still being tested~~
~~Davis, J. A.~~	~~0~~	~~4~~	~~" " "~~
Francis, S.	0	0	
Howard, G. D.	0	0	Fsy.
~~Mezina, A. L.~~	~~0~~	~~2~~	~~" " "~~
Reikie, W. R.	0	0	
Schricker, Jr.	0	0	
Schulz	0	0	
Thompson	0	0	
~~Parsons,~~	~~3~~	~~0~~	~~" " "~~

---

20 November 1945, Tuesday

9 Pressured to 50 lbs in 2½ minutes --- New Construction
2 Aero-Otitis Media
0 Failures

FERRY, N. F. - MoMM3c - #1 rt #4 lt - slt cold
ANDERSON, R. R. - RT2c - #4 rt #4 lt - always troubled before - slt cold.

* *

20 October 1945, Saturday

12 NC men pressured to 20 lbs in 3½ minutes
1 Aero-Otitis Media
1 Failure

WALLA, J., CMoMM - out 10 lbs - #4 rt
0 lt - cold

- -

10 NC - 20 lbs in 3 minutes
2 Aero-Otitis Media
0 Failures

Two cases with #2 ears - 2 colds--
one with AOM

- -

22 October 1945, Monday

USS RUNNER
13 Pressured to 30 lbs in 2 minutes
5 Aero-Otitis Media
0 Failures

PRUCHA, F. T. * S1c - #3 lt 0 rt no cold
BERGHOFER, O. - F1c - #4 lt - old mastoid lt no cold
[illegible]
3 cases with #2 ears ---- 2 with colds

********** **********

14 New Construction pressured to 20 lbs in minutes
5 Aero-Otitis Media
0 Failures

Washkuhn, D. W. - MoMM1c - #4 rt #3 lt - no cold
Murch, W. H. - MoMM3c - #4 rt #3 lt - no cold
Williams, G. E. - EM2c - #4 rt #3 lt - cold

2 cases with #2 ears -- 1 with cold

********** **********

7 New Construction Pressured to 20 lbs in 6 minutes
4 Aero-Otitis Media
0 Failures

Irwin, G. V. - CMoMM - #4 rt 0 lt
Kelley, W.P. - MoMM2c - #2 rt #4 lt

2 cases with #2 ears --- 1 with cold

23 October 1945, Tuesday

13 Reprocessed to 50 lbs.
3 Aero-Otitis Media
1 Failure

DAUGHTRY, J. J. - StM1c - out 9 lbs #4 rt #4 lt - large ads tubes crowded

Passed:

[illegible] JOHNSTON, J. J. - RM1c -#1 rt #4 lt - Enor ads - covered closed
[illegible] PALMER, J. H. - CMoMM - #4 rt #4 lt - Large ads - tubes crowded flat

* *

14 Pressured to 50 lbs USS RUNNER
4 Aero-Otitis Media
0 Failures

STEBBINS, T. J. - QM3c - #3 rt 0 lt - no cold
DARIN, R. V. - RT2c - #4 rt 0 lt - small ads - nodules in tubes (Had trouble in February -HR)
2 cases with #2 ears -no cold

* *

6 Pressured USS RUNNER
2 Aero-Otitis Media
1 Failure

MAIN, W. B. - MoMM3c - out 2 lbs - #2 rt 0 lt - asthma

- - - -

BEASLEY, H. - SC3c - #3 lt 0 rt - no cold

24 October 1945, Wednesday

3 Pressured -- Rechecks
3 Aero-Otitis Media
1 Failure

JANELLE, A. M. - S2c - out 3 lbs - 0 rt #2 lt

Passed:

NICHOLS, W. W. - S2c - #4 rt #4 lt
HALL, R. S. - RM1c - #4 rt 0 lt

---

25 October 1945, Thursday

13 School - Pressured 50 lbs in minutes
4 Aero-Otitis Media
2 Failures

COOK, E. A. - RM2c - out 7 lbs - #2 lt 0 rt - no cold
BROWNING, H. P. - TM3c - out 7 lbs - #2 rt #3 lt - slt cold

Passed:

R-10-45 ESTES, S. W. - S1c - #3 rt #3 lt - mod ads tubes closed
R-10-45 MATHEWS, J. L. - F1c - #4 rt #4 lt - large ads tubes closed

---

25 October 1945, Thursday

13 New Constr. Pressured 20 lbs in 6 minutes
3 Aero-Otitis Media
0 Failures

DAUGHTRY, J. J. - StM1c - #4 rt #4 lt recheck - trouble before

2 cases with #2 ears - both with colds.

---

26 October 1945, Friday

16 Pressured
0 Aero-Otitis Media
0 Failures

---

27 October 1945, Saturday

NAVY DAY - 5 doctors visited exhibit -

---

29 to 3 November — Monday thru Saturday

On leave.

---

5 November 1945, Monday

None Pressured

---

6 November 1945, Tuesday

14 Reprocessing - pressured
3 Aero-Otitis Media
1 Failure

MILLER, J. B. - Flc - #4 rt 0 lt

Failed:

ONDELL, E. W. - Slc - out 7 lbs - #3 rt #2 lt

1 man with #3 ears.

---

7 November 1945, Wednesday

13 School Pressured to 50 lbs.
4 Aero-Otitis Media
2 Failures

ALEXANDER, M. L. - S2c - out 14 lbs - #4 rt #3 lt - small red ads tubes closed - slt. cold.
NORTHCOTT, H. E. - S2c - out 14 lbs - #4 rt #1 lt - Enor ads tubes covered - slt cold.

Passed:

BOYA, R. M. - Slc - #3 rt #3 lt - Enor ads tubes covered no cold
EDWARDS, F. L. - S2c - #4 rt 0 lt - large ads tubes covered - cold.

* *

7 November 1945, Wednesday

13 School Pressured to 50 lbs
6 Aero-Otitis Media
3 Failures

SANDBERG, D. O. - Slc - out 6 lbs - #4 lt 0 rt - cold Enor ads tubes covered
MORRIS, J. J. - MM2c - out 18 lbs - #4 rt #4 lt - hole Perforation rt ear - large red ads tubes covered -
WILCOX, J. M. - S2c - out 23 lbs - #4 rt #3 lt - Enor ads - tubes covered - cold

Passed:

PHOENIX, D. A. - S2c - #4 lt 0 rt - no cold - mod ads tubes crowded - rt clear

2 men with #2 ears - both with colds

* *

7 November 1945, Wednesday

11 from CUBERA pressured to 20 lbs
1 Aero-Otitis Media
0 Failures

DUROW, M. E. - SMlc - #3 rt #3 lt - cold. - trouble before + with colds

---

8 November 1945, Thursday

11 New Construction Pressured
3 Aero-Otitis Media
0 Failures

STANTON, W. J. - TMlc - #4 rt 0 lt
TACKETT, W. M. V. - MoMMlc - #3 rt #1 lt - Always has trouble
WOOD, R. R. - TMlc - #4 rt 0 lt - Always has trouble

15 November 1945, Thursday

7 Pressured - School men
4 Aero-Otitis Media
2 Failures

Sandburg, D. O. - S1c - out 7 lbs - #2 rt #4 lt
Wilcox, J. M. - S2c - out 9 lbs - #3 rt #4 lt

Passed:

Stein, J. R. - S2c - #4 rt #4 lt - mod ads tubes crowded - no cold
Nowak, J. F. - S2c - 0 rt #4 lt - mod ads tubes open - clear - no cold

Recheck:

Brumley, B. L. - TM1c - 0 rt 0 lt - OK - has cold

16 November 1945, Friday

8 Pharmacist's Mates - Entering Submarine School
50 lbs pressure
4 Aero-Otitis Media
0 Failures

refused training — CATALDO, R. S. - PhM1c - #3 rt #4 lt - large ads - tubes open - crowded - no cold
O'DONNELL, J. - PhM2c - #4 rt #4 lt - mod ads tubes closed - no cold
ROE, H. L. - PhM1c - #4 rt #1 lt - Enors ads mid line - tubes crowded - no cold
SPITZER, H. H. - PhM1c - #4 rt #4 lt - Enors ads tubes cov. - no cold

21 November 1945, Wednesday

11 Pre-School
2 Aero-Otitis Media
0 Failures

HOGG, D. W. - Slc - #4 lt #1 rt
SCHULZ, R. K. - Flc - #3 lt 0 rt - enor ads tubes covered - no cold

- -

2 Rechecks
2 Aero-Otitis Media
1 Failure

HORTON, R. L. - S2c - out 9 lbs - #4 rt #4 lt - still has cold

Passed:

SKARR, R. W. - Slc - #4 rt #4 lt - Enor ads tubes covered no cold

- -

6 Pressured - pre-school
2 Aero-Otitis Media
0 Failures

2 cases with #2 ears.

23 November 1945, Friday

12 New Constr. pressured to 20 lbs in 2 minutes
3 Aero-Otitis Media
0 Failures

HAAK, H. R. - QM3c - #4 rt #3 lt - had trouble before March '44 — very large ads - tubes closed - no cold

2 other cases with #1 and #2 ears.

QM ~~Cont~~ May admitted trouble previously --

29 November 1945, Thursday

14 Pressured
1 Aero-Otitis Media
0 Failures

MAJURKIEWICZ, R.J., RT2c - #4 rt #4 lt
MOORE, R.C., S1c - 0 rt 0 lt - has had radium - had had trouble previously

14 Pressured
3 Aero*otitis Media
0 Failures

SIMKO, R.M., MoMM1c - #4 rt #4 lt - large ads tubes closed no cold -
HANSON, P.C., Mo M3c - #3 #5 #4 lt - mod ads tubes crowded no cold -
MCKEE, M.., TM3c - #4 rt #4 lt - large ads tubes crowded - bleeding no cold

30 November, Friday

19 Pressured, RIMORA, 20 lbs in 2½ minutes
3 Aero-Otitis Media
0 Failures

HARTMAN, Edward, EM1c - #4 rt #4 lt -
CATON, Raymond, SC1c - #4 rt #3 lt
STILLSON, Leslie, TM2c - #3 rt #4 lt

2 men admitted having had trouble previously at Pearl Harbor.

OCTOBER REPORT

Pressured Groups	No. Pressured	Cases Aero-Otitis Media	Failures
Preschool	29	10 (32%)	6
Rechecks	3	3 (100%)	1
Reprocessing	274	51 (18.7%)	6
After Radium	8	0 (0%)	0

Tuesday, 16 October 1945:

Dive bombing experience at Otis Field — in use of nose clips — it stays on, aids in clearing — not novelty enough to sell" to aviators with all their other facilitating gear. —

Saturday, 27 October 1945, Navy Day:

Very quiet day in Radium Clinic—only five doctors (3 in one group from Hartford — doctor's in office of the Phoenix Life Insurance Company). Dr. Peacock, pediatrician attached to Base, and his family, who received treatment, and Dr. Phillips, also attached to S/M Base.

Sunday, 28 October —— on leave to 3 November.

NOVEMBER SUMMARY:

Pressured Groups:	# Personnel	Cases A O M	Failures
Pre School	58	22 (38%)	7
Rechecks	2	2 (100%)	1
Reprocessing	104	19 (18.2%)	1
Radium Rechecks	4	0	0

Quite a difference in the % aero otitis in the pre school and those of reprocessing group - of this reprocessing group those giving history of trou le previously amounts to 9 cases of the 19 developing A.O M. All taking pressure were questioned and only 4 of those not developing A O M admitted ever having any trouble with ears under pressure previously. These four belong to those also who stated stuffiness in ears associated with usual colds. Of the reprocessing group developing A O M (19) only 4 men had evidence of colds at time of taking pressure.

Thursday - December 6, 1945.

19 Pressured - PreSchool - 50#
8 A.O.M.
4 Failures

Lanallee, J. P., S1c -- out 7# -- 4 lt. 4 rt. no cold.
Gennaro, A. J., S2c -- out 4# -- 4 rt. 4 lt. No cold.
Lipps, E. H., S2c -- out 4# -- 2 lt. 0 rt. No cold.
Dingman, J., S2c -- out 21# -- 4 rt. 0 lt. No cold.
Ball, A.E., F2c -- 4 lt. 4 rt. No cold.
Lockwood, B.P., SM3c -- 4 rt. 4 lt. No cold.

Two with #2 ears -- both with colds.

CMS,

Dec 1st to Dec 10th (except Wed + Thurs.).
to Portsmouth with Dr Bateman on schnorchel operations on the U858 (Returned to Med Res. on Wed + Thursday for 2 days only

AERO OTITIS MEDIA PROJECT: PROJECT X-424 (Sub. No. 90)
"Aero-Otitis Media: It's Prediction, Prevention, and Treatment."

From July 1 to December 31, 1945, 667 men were checked before and after passing pressure tank; 76 of the preschool group developed aero-otitis media; 75 of the 415 of the reprocessing group developed aero-otitis media. All of these are undergoing radium therapy. Many of the cases treated during the early part of the experiment have now been completed and are giving us more of an answer to the effectiveness of radium therapy. Curious enough, the incidence of aero-otitis media has shown little variation during the winter months when there are colds compared to the summer months. However, in the summer one runs into allergic phases of laryngitis which perhaps accounts for the comparable incidence of aero-otitis.

The final report is in preparation and papers are being prepared for the Aero Medical Meeting in Chicago in April. Also papers for publication in the Annals or Archives.

Personnel:

Captain C. W. Shilling, (MC) USN.
Lt. Wm. J. Kelly, DC(S) USNR.
Lt. (jg) H. L. Haines, MC(S) USNR.
Ens. D. J. Harris, (HC) USNR. (Sound).

Papers published:

"Aero-otitis media in Submarine Personnel" in the Journal of the Acoustical Society of America for October 1945.

The second portion of this project deals with the relation of dental defects and mal-occlusion to eustachian tube patency. The

possibilities of the dental correction of the causes of aero-otitis media were first investigated by Willhelmy in 1933. He found that the insertion of splints to restore lost inter-maxillary distance in a group of aviators gave relief from distressing ear symptoms caused by rapid altitude changes.

A review of the literature on Aviation Dentistry shows that this work was continued by other investigators following the same approach, i.e. the insertion of splints to "open the bite". Varying degrees of success were reported.

In starting this project at the Medical Research Laboratories, it was decided to examine not only overclosure of the mandible, but the possible effects of mal-occlusion in relation to aero-otitis media.

Work was begun 20 January 1945, using the facilities of the base dental clinic during off hours. On 1 June 1945, dental equipment was installed for the exclusive use of the project and since then more rapid progress has been made.

By not selecting cases, but taking them at random, all types of adenoids were included raning from enormous to small. A routine method of diagnosis was established as follows:

1. With a suitable material, impressions were taken of both jaws and stone models poured.
2. With the aid of a face bow, the casts were then transferred to an anatomical articulator in a relaxed centric relationship.
3. Protrusive registrations were determined and the condyle paths established.

(220) - Sheet 2

4. Extra oral radiographs were then taken of the temporomandibular articulation in both open and closed position, to determine the extent of traumatic articular relations resulting from occlusal disharmony.

This findings were then studied and evalnated, and treatment instituted as follows:

1. Where an overclosure was present, the lost inter-maxillary distance was restored with suitable splints.
2. Where there was no loss of this distance, but mal-occlusion could be demonstrated, the occlusion was equilibrated to permit unhampered movements in all excursions using the system advocated by Schuyler and Seides of New York University.

These methods were used in 50 cases with the following results:

Number of completed cases that had aero-otitis media . . 50

Number of cases that were free of aero-otitis media following treatment when repressured at 50 pounds . . . 46

Number of cases that still showed aero-otitis media when repressured 4

CONCLUSIONS:

1. Mal-occlusion appears to be a strong factor in aero-otitis media, in that, only two of the 46 successful cases required splints.

2. Because all types of adenoids were present in the cases, we have failed, so far, to find any correlation between the amount of adenoidal tissue present and the success of failure of dental treatment.

3. We believe that there is a relationship between the incidence of aero-otitis media and changes and alterations of contour of the glenoid fossae. These changes are associated with disturbances in the

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balance of the occlusion of the teeth, both in centric and functional relation.

4. It has been noted in unilateral cases of aero-otitis media that the occlusal interference is on the side opposite the affected ear. That freeing the occlusion on this side alone enables the patient to ventilate both ears under pressure.

Dental Treatment of Trismus, Tinnitus, Otalgia, and Obscure Neuralgias.

The dental methods used in treating aero-otitis media were also found to be beneficial in treating cases of trismus, tinnitus, otalgia, and obscure neuralgias caused by mandibular mental position. A series of thirty cases was diagnosed and treated with excellent results.

Clinics given, or papers read:

1. "Dental Aspects of Aero-otitis Media" given before a meeting on Aviation dentistry at the School of Aviation Medicine, Randolph Field, Texas; before the Senior Class at the University of Illinois Dental School before the New London County Dental Society, New London, Connecticut; before the Plainfield Dental Society, Plainfield, New Jersey.

Papers prepared, or in preparation:

1. "Dental Treatment of Trismus, Tinnitus, Otalgia, and Obscure Neuralgias."
2. "A Rapid Dental Treatment of Aero-otitis Media."
3. "Results of Dental Treatment in 50 cases of Aero-Otitis Media of Submarine Personnel Based upon a New Functional Concept of Eustachian Tube Blockage."
4. "Dental Treatment of Chronic Otitis-Media.

These papers will appear in the Annals or Archives; the Journal of the American Dental Association, Journal of Aviabion Medicine, U.S. Naval

Medical Bulletin.

Final reports are being prepared on the project and related work for submission to the Bureau.

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	# Personnel	Cases AOM	Failures
Sept.			
PreSchool	146	36 (25.3%)	13 8.8%
Rechecks	26	25 98%	19
Radium Rechecks	1	0 0	0
Reprocessing	37	5 13.5%	1
Oct.			
PreSchool	29	10 (32%)	6 20.5%
Rechecks	3	3 (100%)	1
Radium Rechecks	8	0 (0%)	0
Reprocessing	274	51 (18.7%)	6
Nov.			
Preschool	58	22 (38%)	7 12.1%
Rechecks	2	2 (100%)	1
Radium Rechecks	4	0	0
Reprocessing	104	19 (18.2%)	1
Dec.			
Preschool	19	8 (42%)	4

DECEMBER SUMMARY:

Due to schnorchel operations and Navy Christmas Holidays, no new work was done on the A O M Project. Radium treatments are continuing. Sick Bay is without an ear, nose, and throat doctor and most of my time has been spent there.

Data is being assembled for the final report and papers for the Aero-Medical meeting in Chicago and for the Annals publication are being prepared. Slow progress.

January - 1946

During this month the data is being collected and assembled for publication. Pictures taken and charts are being made. No "formal" examinations are being done.

Radium treatments are continuing as before but not included in final report. -

1-25-46: -

A talk on ROM in submarine escape training from a Dental point of view as related to C.M.&T. was given before a joint medical and dental meeting in Orange New Jersey. Talk was well received & discussion last for over 2 hrs. -
Dr Kelly gave dental side & carried brunt of discussion
Dr Haines gave background of the work & C.M.&T. side.

Feb 1st. – Friday –

Report is finished except for pictures and history. The radium Rx continues as before & all men from submarine are being followed and treated as necessary.

Feb 4th – Feb 7th –

On board V873 in the submarine experiment – vacuum equivalent to 12700 ft was recorded in the boat while schnorkeling & the lower schnorkel was submerged. 22 of 54 men in boat developed some grade of AE-III (Many of these who had had no trouble previously were asleep & developed trouble at this time). Some sims finally mated. – relieved by Benzedrine inhaler. Colds were present but not a prerequisite for a case – all should have been thus previously & were old hands so to speak in subs. – 4 persons.

Feb 7th – Feb 11th –

Trip to Baltimore to see Dr. Stacy Guild & Dr. Crowe about publication concerning this project. – All data found very convincing –

Data is being mimeographed & charts are being assembled.

Feb 12th - An interval report is being sent to the Bureau, & a publication corresponding to that work done on radiation by the Army Air Force - is being sent to the Bureau.

Feb 12th to Feb 14th -
On board U873 for the schnorchel experiments - Endurance of ADM, seen in 22 out 56 persons aboard (including the Medicos) after a days schnorcheling in which changes of pressure varied from 1 to 2 inches Hg to 12 inches mercury.

Feb 18th - 44 men aboard U873 represented to 254 this ADM -

Data
missing here.

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March.

Monday March 11th.

The work on 20 Mu & radium continues as before. Since 1200 men have been treated. — Mimeographing of internal report & article for publication in Annals is being done. The paper should be ready to send out by the 15th or 18th.

Friday, March 8th. —

The Visitors from Sweden visited the Med. Research department and the A O in project. —

Surgeon Commodore Herbert Westermann, Chief of the Royal Naval Med. Service, & his aide.

Surgeon Lt. Gunnar Biorck. — both spoke excellent English & were (as a change) interested in the work being done. They both were interested in the radium — ~~they~~ In Sweden a solution is used as more drops & helps Eyes & those in pressure to clear tears — Benzidrine & ephedrine & adrenaline were mentioned as some of this type of solution. The nasopharyngoscope aroused some interest in that they both looked thru it with the Commodore saying that he had to come all the way from Sweden to New London to "see a cut throat".

Dr. Haines

More rachinochel operations in May & July (7-8).

12 March 46 - Tuesday.
Assembled internal report on
AOM project - 70 pages +.

April.

Saturday April 13th -
Gave 1 hr talk before the Hartford Hospital Medical Clinic. Very interesting questions followed. Interested in Radium therapy & in starting such procedures in Hartford.

May

Friday May 3rd:
Dr Ned Fowler of N.Y. &
Dr. Norton Canfield ~~[illegible]~~ Prof. E.M.& T. at Yale - visited the ROM project & Med. Res. Dept. They are extremely interested in the sound research & in the radium work.
Dr Harris is to visit Norton Canfield at Yale Friday May 10th.

Friday: May 10th -
Yale trip.