

THE USE OF LAMINAGRAPHY IN OTOLARYNGOLOGY

OBJECT:

1. To continue the development of quantitative laminagraphic techniques using single and multiple films.
2. To develop techniques of laminagraphic operation involving equipment modifications if necessary to allow visualization of the Eustachian canal and other portions of the auditory apparatus if possible (middle ear, mastoid air cells, etc.).

BACKGROUND AND JUSTIFICATION

Among the otolaryngologic entities seen in flight personnel, except for common cold, aerotitis media is probably the most common. In twenty-five cases of aerotitis media among civilian air crewmen seen in the Lovelace Clinic between 1947 and 1948, 112 work days were lost, an average of 4.48 days per individual (1). For these 25 cases of aerotitis the actual cost to the air-line and individuals including salary of grounded flight personnel, salary of replacements, allowance for lay-over sustenance and funds for medical care was \$6,130.75 (1).

These figures along with the records of any military flight training base show that aerotitis media which apparently is associated with failure to adequately ventilate the middle ear in flight (2) accounts for a significant number of man-flying-days lost. Consequently, the several factors influencing the function of the Eustachian tube are of prime interest to aeromedical personnel.

Hyde (3), in a recent review dealing with aerotitis media, emphasized the many etiologic factors which influence the incidence of aerotitis media and pointed out the difficulties of assessing Eustachian tube function in the normal, and apparently pathological situations. White, Roberts, and Merideth (4) discussed the relation between dental overbite and aerotitis media and emphasized the high incidence of the habitual use of the Valsalva Maneuver in flight by commercial air crewmen who were free of pathology except for what is ordinarily considered a minor dental malocclusion. These papers, along with many others indicate that more information concerning the patency and ventilatory capacity of the Eustachian tube is desirable.

One means of gaining further knowledge of the middle ear and the several communicating structures is by the refinement of available X-ray techniques, especially Tomography utilizing multiple film cassette, the objective being to obtain adequate visualization to yield both qualitative and quantitative data. Considerable work has been done in Albuquerque (5, 6, 7, 8, 9) using the laminagraph. A multiple film cassette was constructed and quantitative use of the instrument has been studied. The Eustachian tube has been visualized, but the technique needs considerable refinement, particularly with regard to spacing multiple films, intensification screens, tube motion, head alignment, etc.

EXPERIMENTAL APPROACH

The type of work reported in the bibliography (5, 6, 7, 8, 9) will be continued, the object being to further elucidate the quantitative potential of laminagraphy particularly with respect to the image produced by hollow air containing tubes. In addition, attention will be directed specifically to the development of techniques suitable for visualizing the Eustachian tube (both the cartilaginous and boney portions) along with other closely related anatomical structures.

EQUIPMENT

Following is a list of Air Force owned laminagraphic equipment which is on hand, installed, and in full operating condition.

1. Kiefer Laminagraph No. 93204, Serial No. 64
2. Kiefer X-ray Tube and Cables CYS Machlet, Serial No. F8158BD
3. Keleket No. 95100 Multicron, Series 4 Control and Generator to energize the Laminagraph; Control Serial No. 50-254; Transformer Serial No. 50-426.

PERSONNEL

The work will be accomplished by the following individuals:

Dr. Jack W. Grossman
Dr. James E. Roberts
Dr. Allen Strehler
Dr. Clayton S. White

ESTIMATED COST

In view of the already heavy investment of the Air Force in laminagraphic equipment the Lovelace Foundation proposes to undertake this project at a cost of \$300.00 per year (for three years).

DURATION OF THE PROJECT

Three years.

BIBLIOGRAPHY

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4. White, Clayton S., Roberts, James E., and Merideth, Howard W., "The Relation Between Dental Overbite and Aerotitis Media," Report No. 1., Project 21-27-007, USAF School of Aviation Medicine, Randolph Field, Texas, February, 1953.
5. White, Clayton S. and Grossman, J. W., "A Simple Cassette for Simultaneous Laminagraphy," Report No. 1. Project 40.21-23-020, USAF School of Aviation Medicine, Randolph Field, Texas, July, 1951.
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8. Strehler, Allen, Roberts, James E. and white, Clayton S., "A Mathematical Analysis of Magnification and the Related Blurring Effect in Laminagraphy (with circular tube motion)," Report No. 7, Project No. 21-23-020, USAF School of Aviation Medicine, Randolph Field, Texas, 1953.
9. Strehler, Roberts and White, "A Mathematical Analysis of the Blurring Effect in Laminagraphy (with circular tube motion)," Report No. 6, Project No. 21-23-020, USAF School of Aviation Medicine, Randolph Field, Texas, 1953.