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EFFECT OF SINGLE DOSE X-RAY TO THE NAIL FOLD AREA OF HUMAN SUBJECTS

(Preliminary Report)

by

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[illegible] SUBJECTS

(Preliminary Report)

Margaret Pickson

1) In order to understand further the nature of the changes which occur in the fingers of persons occupationally exposed to radiations, ~~we have observed~~ the nail fold area of 15 subjects before and after a single radiation exposure was observed. Fourteen of these subjects were patients being treated by x-ray or radium for other purposes. None of them had received previous irradiation to the hands. The fifteenth was a staff member who occasionally prepared radium plaques used for treatments. He had previously been exposed intermittently over a period of 7 years. For this study he was observed before and after the preparation of a plaque containing 130 mgm. of radium. The x-rayed patients were given a single dose to the left fourth finger. This finger was chosen as the test site because the skin is fairly thin as compared to the first, second, and third fingers and the vascular pattern is usually readily visible. Also, this finger is less likely to have been subjected to previous trauma.// The x-ray treatments were given while the left arm was extended in a comfortable position with the hand pronated and supported on rice bags. Leaded rubber shields were arranged so that only the fourth finger was exposed. In each case the portal was 3 x 8 cm. The proportion of the finger which was exposed varied somewhat with the length of the digit. Except for one patient, the x-ray was given at 130 K. V. potential, 20 ma and at a distance of 10 cm. from the surface of the finger. The intrinsic factor of filtration was equal to 0.25 mm of copper. No additional filters were used. 2) The total dose ranged from 300 r to 600 r. Microscopic observations were made immediately before treatment, immediately after treatment and as frequently as possible thereafter.//

Counts were made of the number of vessels in the terminal row of a measured area of nail fold by using a 1 mm scale inserted in the eyepiece of a microscope

one mm on the ocular scale was equal to 7.5 mm of nail fold. The microscope was equipped with a 6 X ocular and a 24 mm Bausch and Lomb objective. The light source was a 250 Watt G. E. projection lamp in a metal housing which also contained a Corning glass heat resistant filter (M. E. Lantern Green, No. 4445). The treatments and observations are tabulated below.

Table I.

Subject	K. V.	Ma	Distance in cm	Portal in cm	Time	r in air	total r (skin)
K. V.	130	20	10	3 x 8	2'41"	161	200
H. D.	130	20	10	3 x 8	2'41"	161	200
S. H.	200	20	30	5 x 5	2'55"	175	200
G. A.	130	20	10	3 x 8	4'2"	242	300
V. G.	130	20	10	3 x 8	4'2"	242	300
A. Br.	130	20	10	3 x 8	4'2"	242	300
R. J.	130	20	10	3 x 8	4'2"	242	300
L. R.	130	20	10	3 x 8	4'2"	242	300
E. H.	130	20	10	3 x 8	5'22"	322	400
C. R.	130	20	10	3 x 8	5'22"	322	400
A. F.	130	20	10	3 x 8	5'22"	322	400
A. Bo.	130	20	10	3 x 8	6'50"	410	500
R. L.	130	20	10	3 x 8	6'50"	410	500
E. B.	130	20	10	3 x 8	8'2"	482	600

Table II.

Results of Observations of Nail Fold Area of Treated Finger

ject	Dose	Pre Treat-ment	Within 15 min. after Treat-ment	DAYS AFTER TREATMENT																						
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
V.	200	24*	24N	24N	24N	24N																				
D.	200	36N	36N	36N	(Patient left the hospital)																					
H.	200	22N	22N		23 d	-	23 d	22 d	20 d																	
A.	300	30N	30N	30 h	30	-	h	N	d	N	he	N	-	he												
G.	300	20N	20N	20 N	20 N	20 N	20 N	N	N																	
Br.	300	N	36N	N	N	N	N	-	N	N	N	N	N	-	-	N	N									
J.	300	N	40N	-	-	-	-	-	-	e h	-	h														
R.	300	30N	30N	30 N	N	N	30 N	N	-	N	N															
H.	400	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N									
R.	400	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N	N	N	-	-	-	N	-	N		
F.	400	N	32N	-	N	-	-	N	-	N	-	N														
Bo.	500	N	N	hd	N	-	-	N	N	N	h	N	-	-	N	N	hd	-	-	-	-	-	-	-	-	-
L.	500	N	N	N	hd	-	-	h	N	N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.	600	24N	N	N	N	N	-	-	N	N	e h	-	-	-	-	N	-	N	-	N	-	-	N	-	-	-	N

: negative; e : erythema; p : pigmentation; h : hyperemia (

In no case was there any detectable change in the nail fold area within 15 minutes after treatment. One patient who received 200 r showed dilated plexus vessels on the second, fourth, fifth and sixth days. There was no macroscopic change at this dose. One patient, at 300 r, showed microscopic changes on the first, fourth, sixth, eighth and eleventh days after treatment and macroscopic erythema on the eighth and eleventh days. Pigmentation of this finger only was apparent on the twenty-fifth day. Another patient at 300 r had hyperemia and erythema on the seventh day and hyperemia on the ninth day after treatment. Among the 3 patients in the 400 r group there were no changes detected on the days of observation. Both patients in the 500 r group had transitory microscopic changes. The only patient who received 600 r had microscopic hyperemia and erythema on one occasion eight days after treatment.

The one subject who was exposed to radium prepared a plaque which contained six 5 mgm tubes, six 10 mgm tubes, and twenty 2 mgm needles. Observations were made of the nail folds of all fingers before and after the exposure. Dilated and irregular vessels were seen both times. There were no detectable differences between the pre-exposure and post-exposure examinations. Another examination was made 56 days later which again showed dilated and irregular vessels. Photographs taken at that time show changes suggestive of those commonly seen among radiologists after years of exposure to radiations.

3) From this brief and incomplete study it appears that radiation exposures of 600 r or less when given as a single dose under the conditions described, produce no constant microscopic or macroscopic reaction. The transitory effects were most often microscopic and consisted of hyperemia of the small terminal vessels and dilatation of vessels in the superficial plexus. There was no change in the number of vessels visible in this area before and after radiation. It is proposed that test doses be given at higher levels. //