

DETERMINATION OF SKIN AND BONE DOSE IN L.O.J. TECHNIQUE
ACCORDING TO SEX AND AGE

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INTRODUCTION:

The increased use of ionizing radiation during the past several decades suggests the importance of using all possible means to protect individuals from the deleterious effects of man-made ionizing radiation such as x-rays.

The purpose of the following study is to determine the skin and bone dose during extra-oral radiodiagnosis and to obtain the most convenient method of measuring absorbed dose in the aspect of oral radiology. Also an attempt is made to find a suitable method to reduce the absorbed dose during extra-oral techniques.

MATERIALS AND METHODS

MATERIALS:

1) The x-ray machine which was used in this study was a phillips XA machine (ORAL.IX) Type 11227, 50 KVp Voltage, operating at 7 mA. with a beam having an H.V.L.

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of 2 mm. Al, inherent filtration equal to 2mm. AL.

2) Extra-oral Film: Screen films and cassettes with speed intensifying screens (Kodak Manufacture).

3) Kodak radiation monitoring film - type I.

Methods:

1) Calibration of the Dental x-ray machine was carried out by Ionization Dosimeter (Baldwin Farmer). The values obtained from the calibration are linear relative to dose in density.

2) Film processing: Film processing was according to manufacture specifications.

a) Development: The films were placed for 5 min. in Kodak-19 developer at 20°C (68⁰F.), with intermittent agitation.

b) Rinsing: After developing, the films were rinsed for 10 seconds in a solution of Kodak-Indicator stop bath, at 18⁰C (64⁰F.).

c) Fixing: The developed films were left in a solution made of Kodak FX-40 for 10 min. to fix them permanently.

d) Washing: The films were washed for 15 minutes in running water.

e) Drying: The films were dried by circulating dry air from an electrical dryer.

f) Safe light: A Kodak safe light, No.6B was used.

g) Film evaluation: As the density of films were too dark for evaluation, the fast emulsion layer had to be removed from half of the area of each film to allow measurements to be made from the shiny emulsion(4). Extreme care was necessary when removing the emulsion layer. Density measurements were taken after the films were dried with a radiological densitometer.

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 Procedures for Measuring Absorbed Dose in Patients
 Using Film Badge Dosimetry:

1) Technique: Lateral oblique jaw radiographs were employed for all patients.(3)

2) Monitoring film position: Two monitoring films were positioned, one on the side of the face exactly at right angle to the central ray, the second placed on the center of the cassette, parallel with the other. Time of exposure was 0.25 seconds. Focus - to - film distance was 15 inches.

3) After exposure, the monitoring films and the radiograms were processed simultaneously under standardized conditions.

4) The density of the monitoring films were measured precisely by a densitometer.

5) For a given density, the exposure dose was obtained from the calibration curve.

6) The absorbed dose was calculated from the following equation:

$$D_a = D_e \cdot K \cdot N \cdot f \cdot (1,2)$$

There D_a and D_e are the absorbed and exposure dose respectively, $K = \frac{760}{p} \times \frac{273 + t}{273 + t'}$, in this condition t' ($^{\circ}C$), and 760 (mm Hg) are respectively the adjusted temperature and pressure of the ionization chamber, t and p are the room temperature ($^{\circ}C$) and pressure (mm Hg) during calibration of the x-ray unit. N , is the correction factor supplied by the standardization laboratory for the ionization chamber at the H.V.L. being used, and "f" is the conversion factor (from roentgens to rads).

RESULTS:

The results of this investigation are summarised in tables I and II. A total of 46 patients (27 males and 20 females).

During the examinations a total of 142 films were exposed.

Table I expresses the results in terms of age and the number of monitoring film used for each age range and demonstrate the skin and bone dose for each group. The results obtained from table I are summarized in table II.

TABLE II

		No.	Age Range (yr)	P.P.F.M.	P.E.P.	
Total No. of Patients 46		3	15-20	100%		
		No. of	3	21-30	90%	
		female	4	31-40	50%	
		Patients	6	41-50	50%	50%
		19	3	51-60	33%	
		-	61-70	-		
		7	15-20	57%		
		No. Of	10	21-30	80%	
		male	-	31-40	-	
		Patients	5	41-50	80%	
		27	3	51-60	66.7%	
		2	61-70		100%	

KEY:

- a) No., number of patients in each age range
- b) P.P.F.M, Percentage of Patients with filling materials.
- c) P.E.P., Percentage of edentulous Patients.

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TABLE I

Age Range	No of Film	Tube Dose R ± S.D.	Cassette Dose R±S.D.	A.S.D. Rads±S.D.	A.B.D. rads±S.D.	Age Range	No of Film	Tube Dose R±S.D.	Cassette Dose R±S.D.	A.D.S. rads±S.D.	A.B.D. rads ± S.D.
15-20	12	2.062 ± 0.31	0.075	1.64±0.56	7.54±2.69	15-20	20	2.179±0.77	0.075	1.51±0.04	8.87±1.36
21-30	12	2.175 ± 0.09	0.075	1.93±0.73	7.83±4.45	21-30	30	2.379±0.52	0.075	2.01±0.02	9.38±0.47
31-40	12	2.30 ± 1.2	0.075	2.15±0.9	8.11±4.11	31-40	-	-	-	-	-
41-50	20	2.48 ± 0.91	0.075	1.64±0.43	7.66±2.65	41-50	12	2.440±0.42	0.075	2.19±0.47	10.22±1.74
51-60	8	2.560± 0.61	0.075	2.22±0.12	10.35±2.34	51-60	8	2.80 ±0.66	0.075	2.53±0.81	11.48±0.49
61-70	-	-	-	-	-	61-70	8	1.69±0.05	0.70	1.53±0.07	7.24±0.36

- KEY:
- c) No, number of patient in each age range
 - b) A.S.D., Average skin Dose
 - c) A.B.D., Average Bone Dose

DISCUSSION

Monitoring film dosimetry was used in this investigation to obtain the skin and bone dose during extra-oral radiography (L.O.J). Many researchers used this method to investigate the gonad dose(5-8). However until now, this method had never been used in measuring the absorbed dose of jaws and teeth.

In this study the x-radiation photon energy used was 36 Kev. In this energy range photoelectric phenomena of absorption becomes increasingly dominant(1,2). At this energy range, bone which has an effective atomic number about 13.8 will absorb more energy, gram for gram, than soft tissue with effective atomic number about 7.42. Bone and soft tissue have densities of about 1.85 and 1.00 gm/cm³ respectively(1). In other words, energy absorption for unit volume in bone is about 5 times more than for soft tissue(1,2). The differential energy absorption is expressed by the "f" value (the factor for converting exposure dose in roentgens to absorbed dose in rads).

There are different values for skin dose in comparing patients No.17 (female) with patient No.10(female). The same occur when comparing patient No. 20 with patient No. 7(Male). Patients No.17 and 20 were wearing partial dentures made of a mixture of 28.8% chromin(atomic number 28). While patients No.10 and 7 had normal teeth. As previously described the absorption of energy is primarily by the photo-electric process. The photoelectric absorption coefficient per gram varies with the atomic number.

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The effective atomic number in patient No.17 and patient No.20 are more than in patients No.10 and 7, thus it is obvious that the amount of energy absorption in these patients must be more.

Using the same principle, the energy absorption in the patient wearing partial or full dentures (patient No. 7 female), made of an acrylic base, and plastic or ceramic teeth plus a metallic pin, must be higher than in the edentulous patients (males No.26, 27 and females No.5,6, 18,19). The same reasoning applies for the patients with metallic filling materials in comparison with the patient who has no filling materials. In the age ranges 15-20 and 21-30, males and females do not show any significant differences of absorbed dose. One would anticipate an increased absorbed dose in the older group, due to increased density of bone and soft tissues. But the results in these two particular groups differ from the above stated principle. The explanation of this can be due to the increased percentage of metallic filling materials in the younger groups.

The literature dealing with radiation absorbed dose infers that aging increased the density of the hard and soft structures resulting in an increased absorption of radiation by the aging patient. The result of this study that differ from this concept can be explained by the presence or absence of teeth, the presence of prosthetic appliances in some patients and the different percentages of metallic filling materials.

SUMMARY:

The most convenient method for determining bone dose during extra-oral radiography is photographic radiation desimetry. This method was used because, it is cheap, small lightweight and adequately sensitive and it also provides a permanent records(10).

It is evident from this report that a relationship exists between the bone and skin dose, age and sex.

In conclusion reduction of absorbed dose can be accomplished by changing the characters of the x-ray beam, its characters can be changed by reduction of the beam diameter and increasing total filtration to 2.5 mm. of Al.(9)

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ESTABLISHMENT OF INTERNATIONAL FEDERATION OF INFECTION
CONTROL

A world wide effort to bring together representatives in infection control was accomplished at the multidisciplinary International Conference in 1978 at the World Health Organisation, Regional Office-Copenhagen, Denmark. International secretaries representing various infection control organisations have, as a result of this meeting, formed a Planning Committee to develop a strategy for establishing a multidisciplinary International Federation of Infection Control (IFIC).

The aim of IFIC is proposed to be:

To promote international exchange of knowledge, information, ideas and support in the control of hospital-associated infections by:

- (a) gathering and disseminating resource information among the associations, societies and other groups forming the Federation
- (b) regularly arranging international multidisciplinary congresses
- (c) providing individuals, in countries without infection control organisations, with information and assistance for forming such organisations.

Organisations and groups wishing to be placed on a mailing list for future information should send the name and address to:

Mrs. Kirsten Engler

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