

AN INSIGHT INTO THE RADIOGRAPHIC PRACTICE AMONG THE DENTISTS OF
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ABSTRACT

Objectives: One important aspect which is commonly not given prime importance in routine general dental practise is radiography. So the current study was designed to assess the knowledge about various aspects of radiographic practices followed by the private dental practitioners in Karad city, India. **Materials and Methods:** A total of 89 dental practitioners in Karad, India were included in the study. A structured, pre-tested, self-administered questionnaire was used for the study. The questionnaire comprised of 28 questions which included information about Demographic characteristics, Radiation safety standards, ALARA principle and Management of radiographic waste. **Results:** Only 57% of the respondents mentioned that they get their X-ray unite serviced on a regular basis. Majority of the dentists used E speed film (77%). Only 34.5% of the respondents do change the exposure time for different patients. Only 38% of the dentists used lead aprons for their patients regularly and none of them had a thyroid protecting shield. In the present study only 55% of the dentists followed the position distance rule when the protective barrier was absent while taking radiographs. Only 3% of the dentists used film badges for monitoring radiation exposure. The processing solutions were disposed properly by only 3% of the dentists and only 27% of them disposed the film covering and lead foil as hospital waste. **Conclusion:** The present study highlights the necessity to improve the knowledge of general dentists about radiation safety and dose reduction methods which could be possible using various educational approaches to disseminate vital information.

KEYWORDS: Radiation protection, X rays, Dentist.**INTRODUCTION**

Ever since the discovery of X-rays in the year 1895, radiographic examination is one of the principal diagnostic methods used in all fields of medical services and contributes to the promotion of the health, both individually and nationally. Intra oral radiography is a very commonly used imaging modality in dentistry and has become an integral part in day to day dental practise.^[1,2,3] Though the amount of radiation exposure encountered in dentistry is minimal, it can still bring about stochastic effects, that is, an all-or-none phenomenon.^[4] So, the prevailing approach is to keep the exposure to ionizing radiation as minimal as practically possible, which is known as, as low as reasonably achievable (ALARA).^[5,6]

There are various guidelines in dentistry for the protection of patients, dental health professionals, and the environment from the harmful effects of ionizing radiation.^[7,8] However, in order to combat radiation-induced hazards, dental practitioners must adhere to these radiation protection guidelines.

The three basic ways of protecting a patient from radiation exposure in dental practise are: By appropriate selection criteria for patients and equipment, methods of dose limitation and quality assurance procedures.^[9] Even though the dose of radiation exposure in dental practice is relatively low, we should consider the cumulative effect of repeated exposures.

Updated guidelines on the use of x-rays for dental exposures were released by the American Dental Association (ADA), in collaboration with the US Food and Drug Administration, in the year 2012. These guidelines are not merely intended to serve as standards of care but also to serve as an adjunct to the dentist's professional judgment of how to best use diagnostic imaging for each patient.^[10,11]

Despite the guidelines, few surveys conducted on practicing dentists have shown fairly little acceptance of these dose reduction techniques among dental practitioners.^[12,13,14] Continuous advances in dental radiography equipment have resulted in dose reduction

without quality impairment. Studies have shown that many dentists do not appreciate this advancement in technology and still end up in overexposing their patients.^[15]

Understanding the lacunae among the dental practitioners in the implementation of radio-protective measures in dental practice is essential to develop intervention strategies to tailor fit the needs of specific groups. However, there is a want of comprehensive investigations into the various issues related to radiation protection, both globally as well as in the Indian setting. Therefore, the present study was aimed at assessing the knowledge, attitudes and radiographic practices of dentists for the dentate adult patient in and around Karad city.

MATERIALS AND METHODS

The present study was conducted among dental practitioners in and around the city of Karad, Maharashtra, India after obtaining due ethical clearance from the Institutional Review Board, of Krishna Institute of Medical Sciences Deemed University, Karad. The survey was performed on 89 dental practitioners who were using ionizing radiation in their practise. The purpose of the study was explained to the dental practitioners and their consent was subsequently obtained.

Procedure

A cross-sectional questionnaire design was employed and a structured, pre-tested, self administered questionnaire comprising of 28 items was used in the present study (table 1). The questionnaire was distributed by visiting each dental clinic and Dentists were assured about the anonymous processing of the questionnaire. The questionnaire comprised of 28 questions which included information about their Demographic characteristics, Radiation safety standards, ALARA principle and Management of radiographic waste.

Statistical analysis

The resulting data was coded and statistical analysis was evaluated using SPSS (Statistical package for social sciences) software Version 17.0; Chicago, IL, USA. Mean was calculated for demographic variables and percentages were calculated for the responses given by dentists. Data was evaluated according to the frequency distribution.

RESULTS

Demographic profile

Among the 89 respondents, 61 were male and 27 were female dentists. 61% of the respondents were below 35 years and 39% were above 35 years of age. Of the 89 respondents, 74% identified themselves as non-specialist and 26% as specialist.

Radiographic equipment

A total of 77 respondents use X ray units in their clinics out of which 68% were aged >10years. Only 57% of the respondents mentioned that they get their X-ray unite serviced on a regular basis.

Radiographic technique

On an average, 17 radiographs were taken by the respondents per week. The most preferred type of radiograph was periapical view (81.5%) followed by panoramic view (15%) and bitewing view (3.5%). On comparison of the technique for periapical radiography, 79% of the respondents used the bisecting angle technique. Around 77% of the respondents used a radiographic film and only 23% of them used digital receptors.

E speed film was used by 77% of the dentists, 19% used D speed and 4% used F speed film. Almost 59% of the dentists used the correct exposure time, but only 34.5% of them do change the exposure time for different patients.

A total of 87% of the dentists used manual processing units and 91% of them do not check the temperature of their processing solutions. Majority of the dentists (73%) change the processing solution after 6-7 weeks.

Protective measures from radiation

According to 33% of dentists, thyroid was considered most important organ against radiation protection and 58% considered gonads as important organ to be protected against radiation protection. Only 38% of the dentists used lead aprons for their patients regularly and none of them had a thyroid protecting shield. In the present study only 55% of the dentists followed the position distance rule when the protective barrier was absent while taking radiographs.

Only 3% of the dentists used film badges for monitoring radiation exposure.

Disposal of radiographic waste

The processing solutions were disposed properly by only 3% of the dentists and 27% of them disposed the film covering and lead foil as hospital waste.

DISCUSSION

The present survey provides a valuable insight on practices followed in dental radiology and highlights the lack of knowledge regarding various aspects of dental radiography and radiation protection amongst the dental practitioners of this region. As the questionnaires were personally delivered by the author in hand and then followed-up for responses a 100% response rate was achieved.

Today there are many equipment and techniques available in dental radiography that can result in patient dose reduction. However, many studies show that

dentists are not always loyal to the ALARA principles.^[14-17] In order to ensure the optimum exposure conditions, quality assurance of the radiographic system should be performed. One of the basic steps of quality assurance is maintenance, and regular checkups of the X-ray machine. In our study, 57% of the dental practitioners performed regular check-ups of their X-ray machines. The results of the present study are consistent with Math *et al* and Jacobs *et al.*^[12,18]

Use of standard and accurate techniques reduces the number of retakes and indirectly reduces unnecessary exposure. In our study majority of respondents used bisecting angle technique rather than paralleling technique which is similar to findings in Belgium, Turkey and Uganda.^[18-20] However these findings are contrary to reports mentioned by Geist *et al* and Tugnait *et al.*^[21,22]

The paralleling technique has diagnostic advantages over bisecting technique. These are mainly, geometrically accurate image with minimal distortion and reproducible radiographs. In periapical radiography paralleling technique should be regarded as the technique of choice.^[4]

Advances in film manufacturing technology have resulted in the development of faster films.

Replacement of D-speed film with E-speed film reduces radiation dose by 50%. F-speed reduces 20% dose than E-speed. Researchers have shown that imaging quality is not impaired by using faster films. In our study majority of them (77%) preferred E speed film which is similar to studies done by Syriopoulous *et al* and Geist *et al.*^[15,21]

Our present study showed only 23% of dentists used digital receptors. Cost factor and small active area of the some receptors may be the hindrances in opting for digital receptors. We should encourage use of digital intraoral radiography as it significantly reduces patient dose in comparison with conventional films.^[4]

Selecting an appropriate exposure time is also very important in minimizing radiation exposure. In our study we found that only 34.5% of the dentists changed the exposure time for different patient types. In our opinion, factors like not changing the processing solutions on a regular basis, compensatory over exposure, factory pre setting of some X ray timers that are based on slower film speeds might influence a dentist's choice of changing the exposure times.

Table 1: Questionnaire.

Name of the Dentist:

1. Gender: Male Female
2. Age:

The present study also shows that there is necessity of increasing the awareness about the position and distance rule among the dentists. This study showed that there is a definite lack of knowledge about disposing the radiographic waste which leads to environmental pollution. Dentists can be persuaded to recycle silver and lead through selling used fixer solutions and lead foils to the local vendors and scrap metal dealers.

It is very essential to implement the recommended radiation practices in community-based practices for the safety of practitioners and patients. The American Dental Association and the American Academy of Oral and Maxillofacial Radiology recommend the use of the fastest image receptors which include F speed film and digital receptors, beam limitation best achieved by rectangular collimation, use of personnel dosimeters and use of lead aprons and thyroid shields when possible.^[10,11]

The recommended use of shielding according to both ADA and NCAC includes thyroid shields and leaded aprons unless they interfere with diagnostic procedures. The support for the use of the thyroid shields is less clear. Siroski A and Taylor KW in 1984 supported the use of thyroid shields while Roth in 2006^[24] concluded that during dental x-ray examinations thyroid shields were not helpful for protecting the patient from unnecessary radiation exposure. A recent study about intra-oral imaging risk reduction with collimation and thyroid shielding reported that round collimation with thyroid shield causes less dose reduction than rectangular collimation alone. In other words it implied that thyroid shield is not required if rectangular collimation is used.^[25]

The use of personal dosimeters to monitor exposure levels is recommended for personnel who acquire radiographs.^[4] The ADA recommends dosimeters for those who may receive an annual dose greater than 1 mSv. Pregnant women acquiring radiographs should use them no matter how minimal the exposure level is. Not all personnel who were identified as acquiring images in this study reported using monitoring devices. Rectangular collimation decreases the radiation dose significantly as compared with a circular collimation. Dentists can decrease the patient exposure by a factor of ten for bitewing and full mouth series by using digital sensors or F-speed film, combined with rectangular collimation.^[10,26] So it is important to raise the awareness among the practising dentists to adhere to the safety guidelines in dental radiography.

3. Year of graduation:

4. University of graduation:

6. Do you work as: General practitioner Specialist

7. Do you work in a dental school as a faculty member? Yes No

8. Do you have an X-ray machine in your office? Yes No

9. What is the age of your X-ray machine?

10. Do you have periodic check up for your X-ray equipment? Yes No

11. How many radiographs do you take in your office weekly?

12. Which type of radiographic examination do you usually prescribe in the initial visit?

Bite wing Selective periapical view Panoramic Full mouth periapical view

13. In your opinion, how important is the role of imaging in dentistry?

Very low Low Moderately High Very high

14. What is the most important organ in radiation protection in dental radiography?

Gonads Bone marrow Thyroid Skin

15. In your opinion, which of the following radiographic techniques delivers more radiation to the patient?

Panoramic Full mouth

16. Can you take any periapical radiographs for a pregnant woman? Yes No

17. Which technique do you use for periapical radiography?

Paralleling technique Bisecting angles technique

18. Do you use film holder while taking radiographs? Yes No

19. Which type of collimator do you use? Round Rectangular

20. Which type of radiographic receptor do you use? Film Digital receptor

21. Which film speed do you use for periapical radiography? D E F

22. How much exposure is required for the periapical view of the following areas?

Maxillary molar ----- s

Mandibular incisor ----- s

23. How do you adjust exposure time in the following conditions?

A. From fat patient to thin patient: Increase Decrease No change

B. From anterior teeth to posterior teeth: Increase Decrease No change

C. From maxilla to mandible: Increase Decrease No change

24. Do you use leaded apron and thyroid shield for patient protection?

Yes, always Yes, occasionally No

25. How do you manage your radiographic waste?

Film lead

Old developer and fixer solutions

26. If there is no barrier between you and patient, in which area do you stand according to the X-ray tube and what is your distance from the patient?

27. Who takes radiograph for the patient in clinic? Dentist Technician

28. How do you process the radiographs? Manually Automatic

CONCLUSION

The results of our study indicate that for minimizing any unnecessary radiation, attempts should be made to improve dentists' knowledge about radiation dose reduction techniques. One of the limitations of an investigation of this nature is the possibility of bias wherein the respondents answer might represent the ideal situations but it is not practised in reality. Continuing educational programs can help to improve the radiation safety for dental patients as well for the operators.

The present study highlights the necessity to improve the knowledge of general dentists about radiation safety and dose reduction methods which could be possible using various educational approaches and publishing studies related to the subject. One more recommendation could be to have quality assurance programs and an audit system to improve the standards of dental radiology. Additional studies are recommended to include the use of Panoramic and CBCT imaging methods and awareness of the same among the dentists.

REFERENCES

1. Langlais RP, Langland OE. Risks from dental radiation in 1995. *J Calif Dent Assoc*, 1995; 23: 33-9.
2. White SC. 1992 assessment of radiation risk from dental radiography. *Dentomaxillofac Radiol*, 1992; 21: 118-26.
3. Gibbs SJ. Biological effects of radiation from dental radiography. *Council on Dental Materials, Instruments and Equipment. J Am Dent Assoc*, 1982; 105: 275-81.
4. White SC, Pharoah MJ. Digital imaging, health physics, guidelines for prescribing dental radiographs. *Principles of radiographic interpretation*. In: Rudolph P, editor. *Oral Radiology, Principles and Interpretation*. 5th ed. St Louis: Mosby, 2000; 225: 57-9, 275, 282.
5. Okano T, Sur J. Radiation dose and protection in dentistry. *Jpn Dent Sci Rev*, 2010; 46: 112-21.
6. Shahab S, Kavosi A, Nazarinia H, Mehralizadeh S, Mohammadpour M, Emami M. Compliance of Iranian dentists with safety standards of oral radiology. *Dentomaxillofac Radiol*, 2012; 41: 159-64.
7. The 2007 recommendations of the International Commission on Radiological Protection. *ICRP publication 103. Ann ICRP*, 2007; 37: 1-332.
8. Miles DA, Langlais RP. National Council on Radiation Protection and Measurement. *NCRP report No. 145: new dental X-ray guidelines: their potential impact on your dental practice. Dent Today*, 2004; 23: 128-34.

9. Horner K. Review article: Radiation protection in dental radiology. *Br J Radiol*, 1994; 67: 1041-9.
10. http://www.ada.org/sections/professionalResources/pdfs/Dental_Radiographic_Examinations_2012.pdf U.S. Food and Drug Administration. Pediatric X-ray Imaging. 2012 <http://www.fda.gov/RadiationEmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/ucm298899.htm>. (accessed August 2012).
11. Shahab S, Kavosi A, Nazarinia H, Mehralizadeh S, Mohammadpour M, Emami M. Compliance of Iranian dentists with safety standards of oral radiology. *Dentomaxillofac Radiol*, 2012; 41: 159-64.
12. Math SY, Murugesappa DG, Annigeri R, Kalra D. Compliance of Indian dentists with oral radiology safety measures. *J Oral Maxillofac Radiol*, 2013; 1: 104-10.
13. Sheikh S, Pallagatti S, Singla I, Gupta R, Aggarwal A, Singh R, et al. Survey of dental radiographical practice in States of Punjab and Haryana in India. *J Invest Clin Dent.*, 2014 Feb; 5(1): 72-7 15.
14. Syriopoulos K, Velders XL, van der Stelt PF, van Ginkel FC, Tsiklakis K. Mail survey of dental radiographic techniques and radiation doses in Greece. *Dentomaxillofac Radiol*, 1998; 27: 321-8.
15. Bohay, R N, S L Kogon, and R G Stephens. A Survey of Radiographic Techniques and Equipment Used by a Sample of General Dental Practitioners. *Oral Surgery, Oral Medicine, and Oral Pathology*, 1994; 78(6): 806-10.
16. Svenson B, Söderfeldt B and Gröndah H G. Analysis of dentists attitudes towards risks in oral radiology. *Dentomaxillofac Radiol*, 1995; 25(3): 151-6.
17. White SC, Pharoah MJ. *Oral radiology principles and interpretation* (6th edn). St Louis, MO: Mosby 2009.
18. Jacobs R, Vanderstappen M, Bogaerts R, Gijbels F. Attitude of the Belgian dentist population towards radiation protection. *Dentomaxillofac Radiol*, 2004; 33: 334-9.
19. Ilgüy D, Ilgüy M, Dinçer S, Bayirli G. Survey of dental radiological practice in Turkey. *Dentomaxillofac Radiol*, 2005; 34: 222-7.
20. Mutyabule TK, Whaites EJ. Survey of radiography and radiation protection in general dental practice in Uganda. *Dentomaxillofac Radiol*, 2002; 31: 164-9.
21. Geist JR, Katz JO. The use of radiation dose-reduction techniques in the practices of dental faculty members. *J Dent Education*, 2002; 66: 697-702.
22. Tugnait A, Clerehugh V, Hirschmann PN. Radiographic equipment and techniques used in general dental practice. A survey of general dental practitioners in England and Wales. *J Dent*, 2003; 31: 197-203.
23. Paula. A. Siroski and Kenneth. W. Taylor. The effectiveness of the thyroid shield in Dental Radiography. *Journal of Oral Surgery*, 1984; 28: 225-226.
24. Roth, Jakob, '[Shielding During Dental X-ray Examinations. Effectiveness of Radiation Protection Measures for Patients During X-ray Examinations]', *Schweizer Monatsschrift für Zahnmedizin = Revue mensuelle suisse d'odonto-stomatologie mensile svizzera di odontologia e stomatologia / SSO*, 2006; 116: 1151-1157.
25. Johnson B, Ludlow JB, Mauriello SM, Platin E. Intraoral radiographic imaging risk reduction with collimation and thyroid shielding. *General Dentistry* in press 6-14-2013.
26. Ludlow, John B., Laura E. Davies-Ludlow and Stuart C. White, 'Patient Risk Related to Common Dental Radiographic Examinations The Impact of 2007 International Commission on Radiological Protection Recommendations Regarding Dose Calculation', *The Journal of the American Dental Association*, 2008; 139: 1237-1243.