



RESEARCH ARTICLE

KNOWLEDGE AND ATTITUDE TOWARDS DIGITAL RADIOGRAPHY AMONG DENTISTS

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ARTICLE INFO

Article History:

Received 20th October, 2019

Received in revised form

19th November, 2019

Accepted 15th December, 2019

Published online 30th January, 2020

Keywords:

Postpartum Hemorrhage, NASG,

Hypovolemic Shock,

Maternal Mortality.

ABSTRACT

Background: Digital imaging modalities which are recently developed offer better options by significantly reducing the dosage of radiation exposed and at the same time offer better quality with user- friendly options. Such things must be made known to the dentists which will in turn benefit the patient as well. **Objective:** The aim of this study was to determine the knowledge and attitude towards digital radiography among dentists. **Materials and Methods:** A systematic random survey of practicing dentists in Chennai using a questionnaire with questions pertaining to individual details, knowledge level and approach toward digital radiography was done. A total of 50 dentists were included in the survey. **Results:** In this study, it was found that majority of the dental practitioners prefer digital imaging modalities in their practice. However, detailed knowledge regarding the digital imaging remains unknown to some. **Conclusion:** Proper precautions need to be taken by the dentists during radiation exposure, which has to be made known to them, and also the various advances in the digital imaging modalities, which provide better options for the dentist as well as the patient.

INTRODUCTION

The selection of an ideal diagnostic technique is an essential step in the treatment of a disease. An ideal diagnostic tool will provide the essential information, while minimizing the cost and adverse effects to the patient. Radiographs are valuable tools in diagnosis and treatment prognosis in various fields of dentistry. The discovery of X rays was done by Wilhelm Conrad Roentgen in the year 1895. The first original roentogram was taken by Dr. Otto Walkoff in January 1896 from a portion of a glass imaging plate for an exposure time of 25 minutes in his own mouth. Ever since, imaging in dentistry has seen a major progress and is applied in various fields of dentistry (Naseem Shah, 2014). As a result of rapid developments in the field of dental imaging and technology, the use of digital imaging has found to be increased over the past years. Both intra oral radiographs and extra oral radiographs are being used to help in diagnosis and treatment in various fields in dentistry. Two dimensional and Three dimensional radiographs are used in diagnosis and treatment panning.

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Dimensional radiographs provide excellent insight into the internal structure of the teeth and the supporting structures and hence can be used in the diagnosis of dental caries, periodontal and periapical lesions and osseous defects as well. Intra oral radiographs give a picture of the tooth and the internal components, the periodontal structures and the surrounding alveolar bones. Extra oral radiographs which include the lateral cephalometric radiograph shows the structural relationship between the bones, the maxillary and the mandibular jaw bones, and the airways spaces. Conventional imaging modalities which require a detailed processing have been developed in such a way to minimize the processing time and to fasten the image reception process. Attempts have been made in dental imaging to develop techniques that provide optimal information, while minimizing harm to the exposed patient (Jacobs, 2004). Most practitioners favor the use of digital radiographic techniques which have many advantages, which include time effectiveness, use of low radiation dosage, elimination of requirement of chemicals and development processes, and have storage capacity and easier ways to communicate with other dentists also (Bhawana et al., 2016). There are also disadvantages with the use of digital imaging, such as high cost for installment and maintenance, and in some cases, even the radiation dose. Imaging modalities such as Computed Tomography (CT) and Cone Beam Computed Tomography (CBCT) have been developed with the aim of reducing radiation exposure of the patient and limit the exposure to the head and neck region. CBCT works on the

principle that by focusing a cone shaped X-ray beam on a two-dimensional (2D) detector that rotates 360° or less around the patient's head to produce a series of 2D images which is then studied. CBCT was introduced with the benefit of having a lesser cost factor, require lesser installation space and have a rapid scan time and limited area of exposure only to the head and neck. Drawbacks of CBCT include beam hardening and scatter from dental materials and poor soft tissue contrast (Kamburoglu et al., 2011). Although it could be assumed that the radiation dose levels in dental practice are relatively low and not harmful to health, the cumulative effect of repeated exposures must be considered. It is necessary to determine the level of knowledge of dental practitioners, quality care, radiation protection and whether they are being used efficiently in oral and maxillofacial radiology.

MATERIALS AND METHODS

The present survey was undertaken among practicing dentists in various areas in Chennai. The institutional ethical clearance was obtained prior to the start of the study. A questionnaire with 15 questions was administered to a total of 50 dentists and collected personally. The questionnaire comprised of questions regarding the use and preference of digital imaging modality, knowledge regarding radiation dosage, precautions taken and their attitude towards developments in dental imaging techniques.

A comprehensive questionnaire was prepared based on a study done in Mangalore, India (Shishir Ram Shetty, 2015). All the dentists who undertook this survey were explained in detail about the purpose of this study and were assured about the anonymous processing of the questionnaire. The questionnaire comprised of the following sections of questions such as Demographic details which includes age, sex and work experience; Duration and reason for using digital radiography; Radiation protection which includes the use of protective barriers and knowledge regarding radiation safety and knowledge about recent advances in digital imaging. The results were obtained and the statistical analysis was done and tables were drawn with the analyzed data.

RESULTS

The mean age of the respondents was found to be 35. In this study, it was found that 69.76% of the respondents started using digital radiography in routine practice less than the past 5 years, 27.9% for the past 5 years and 4.6% more than past 10 years. Intra oral radiographic examination us the backbone of imaging for a dental professional. Digital imaging modalities were preferred due to less radiation dose (30.43%), the short time requirement (30.43%) and easy to store data (26.08%) as per this study. The most commonly used radiographic technique was found to be the Intra Oral Peri apical Radiography (84.7%). However, despite the increased usage over the past few years, the knowledge regarding the maximum permissible dosage for digital imaging was not well known. The safe distance from the radiation exposure was known by around 64.4% of the dentists who undertook the survey. Radiation protection during exposure was reportedly taken by 51%, in which lead apron and a protective barrier were commonly employed (30%). 55% stated that they use CBCT for implant placement, 25% in orthodontics and 6% in the evaluation of cysts and tumors.

Table 1. Reason for using digital radiography

Less radiation dose	30.43%
Short time	30.43%
Easy to store	26.08%
No development required	8.69%
Adjustments and measurements can be made	4.34%
Others	2.17%

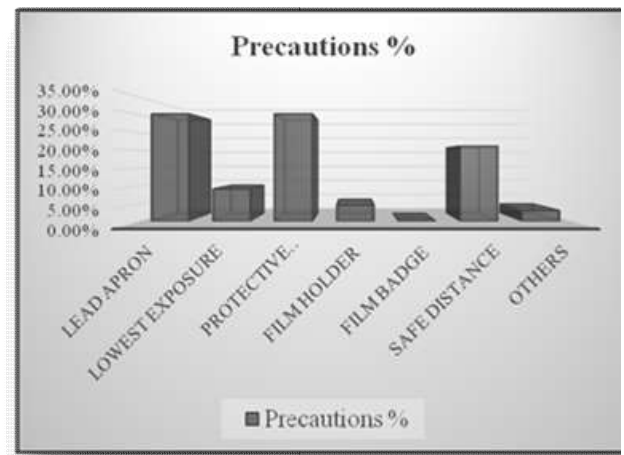
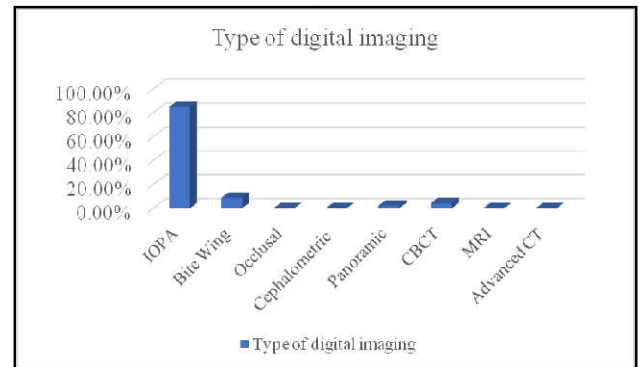


Figure 3. Radiation protection methods being practiced by the dentists

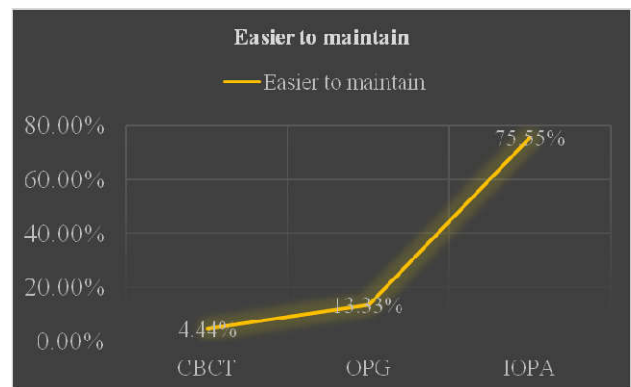


Figure 4. Mode of digital imaging modality is easier to maintain in practice

Periodic checks of the radiography equipment were said to be done by 51% of the respondents. The advantage of CBCT over CT was stated to be because of the low radiation dose (58.8%), continuous image can be obtained (17.6%) and also because of its high accuracy and high resolution. (Table 1) 57.7% say that they are not aware of the recent developments in the field of dental imaging using digital radiographic techniques, and would like to update themselves through the internet (37.14%), journals (28. 2%), conferences (25.7%), and others (8.5%). (Figure 5).

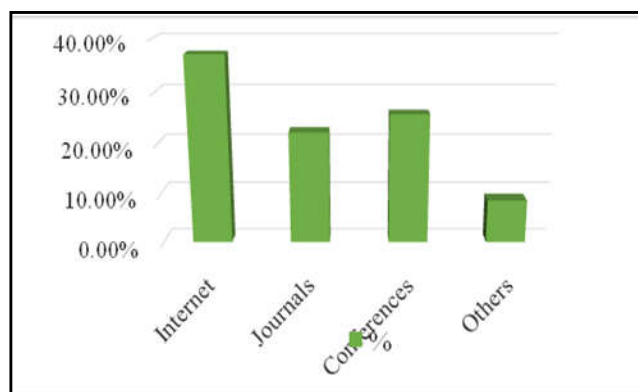


Figure 5. Distribution of dental practitioners willing to enhance knowledge regarding advances in digital imaging techniques through various modalities

DISCUSSION

The data shows that the preference of digital radiography is increasing among dentists over the past years. Among the participants of this study, 69% have started using digital radiography over the past 5 years alone. Wenzel and Moystad in 2001 reported the use of digital radiography in 2001 as 14% of their sample, and compared with the 67% in a 2011 study by Dolekoglu et al. (2015) This shows that the use of digital imaging modalities has probably increased over the years with the advancement in technology. Also, dental practitioners who have recently graduated were found to be more familiar with digital radiographic examination, considering the recent development of digital technology. A similar result was obtained by Karla Rovaris et. al who conducted a survey in Brazil to investigate the use and acceptance of digital radiographic examinations by dental practitioners in Brazil, which also is a developing country like India. (Karla Rovaris, 2016). The various types of intra oral radiographic methods used are: peri apical, occlusal and bitewing radiographs.

The peri apical radiograph provides diagnostic information involving the tooth and peri apical regions. The occlusal radiograph helps to visualize a larger pathology like a cyst which cannot be visualized by any other radiographic method. The bitewing radiographs help to evaluate the interproximal regions of adjacent and opposing teeth simultaneously. In this study it was found that the commonly used digital radiographic methods were IOPA (84%), Bitewing radiograph (8%), OPG (2%) and CBCT (2%) (Figure 2). The extra oral radiographic methods used in dentistry include panoramic radiographs, lateral skull view, Posterior- Anterior View and Lateral Cephalogram. CBCT is another imaging technique which is a recent development and has proven to have better accuracy in determining the extent and location of anatomical structures and defects in the teeth and surrounding structures. Also, digital imaging has profound advantages than conventional imaging modalities. It has been stated that the amount of dose reduction for intra oral digital imaging is about 50%- 60% when an E- speed film is used. Other advantages include short processing time, elimination of a dark room, chemical handling and errors associated with developing the film image. In this study, the reasons for using digital radiography was found to be less radiation dose (30%), short time required for image processing (30%), no development required (8%), measurements and adjustments can be made (4%) and others (2%). (Figure 1).

A study was done by Mohammed Mahdi et. al to compare the accuracy of conventional and digital radiography in root canal working length determination and the results of the study state that there was no difference observed when using CCD, PSP and conventional imaging techniques (Mohammad Mahdi Yaghoobi Khorasani and Hamed Ebrahimnejad, 2017). The safe distance from the radiation exposure was known by around 64.4% of the dentists who undertook the survey. In a similar study done by Katarzyna et. al to assess the knowledge regarding digital radiography and CBCT, it was found that the radiation awareness among dentists is inadequate (Mine Gecgelen Cesur, 2016). The most commonly preferred imaging modality for the 3D imaging of the head and neck region was stated to be CBCT (47.7%). CBCT processes two dimensional cone- beam projections and provides a 3 Dimensional full volumetric reconstruction so the target area can be assessed in all planes (Adriana Gabriela Creanga, 2015). CBCT has profound uses in dentistry, which includes the localization of supernumerary teeth, detection of cysts and tumors of the jaw, assessment of root canal configurations, detection of root fractures, treatment planning for placement of dental implants, peri- implant bone defects and orthodontic diagnosis (Nicolau Silveria- Neto, ?) Another study done by Keerthana et. al has stated that about 82% were aware of CBCT being used in maxillofacial radiology (Keerthana Balabaskaran, 2013). The Peri apical lesions become visible on radiographs only when 30-60% of mineral bone loss has happened. When such peri apical lesions are covered by a thick cortex or cancellous bone, they could be radiographically undetectable. Two dimensional images restrict the information regarding the size and extent of the peri apical lesion. In such cases, a three dimensional image is essential which is provided by the Cone Beam Computed Tomography which is not considered as the gold standard in endodontics (Tadas Venskutonis, 2014). CBCT is said to give all the information as given by a CT, at just 1/8th of the radiation dose. (Dolekoglu, 2017) However, maintenance and installment of CBCT is not very easy. In this study, it was found that the easiest to manage in a dental office is IOPA- 75%, OPG- 13% and CBCT- 4% (Figure 4).

In this study, 40% had stated that they did not know the maximum permissible dose of radiation for a dentist. This has to be addressed with prime concern because knowledge regarding the permissible dosage is essential to limit and prevent damage to the body cells which are caused by radiation exposure. Some epidemiological studies show that there is no increased risk of cancer among the dentist population, whereas other studies show a higher prevalence of thyroid and breast cancer among female dentists and of melanomas in male dentists (Mounika, 2016). This brings us to a decision that knowledge regarding the safety dosage limit and precautions has to be well known by dentists in order to prevent any systemic complications. In this study, 51% of dentists have stated that they use radiation protection equipments in their daily practice. The most commonly employed method was the use of lead aprons (30%) and a protective barrier wall (30%). (Figure 3) However, a majority of dentists at large are not making use of protective equipments. This has to be treated with concern and knowledge regarding radiation protection must be emphasized. Also, 57% of the participants of this survey have said that they are not updated with the recent advances in the field of digital imaging and would like to enhance their knowledge through the internet- 37%, journals- 22%, conferences- 25% and others- 8% (Figure 5).

Conclusion

Recent developments offer better quality imaging which has to be made known to the dental practitioners. Dentists should prescribe special imaging only when they expect that diagnostic yield will benefit the patient care and improve clinical outcomes significantly. More awareness of the radiation protection and knowledge about the safe dosage and distance has to be made known to the dentists to ensure maximum benefit as well as as low as harm possible.

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