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Cone Beam Computed Tomography (CBCT) and Digital Radiographies Requested and Related Factors by Iranian General Dentists

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ABSTRACT

Introduction: Digital radiography and CBCT is increasingly used as a new imaging technology in dental practice. This study aimed at studying the knowledge and attitude of general dentists on Cone Beam Computed Tomography (CBCT) and digital radiographies in 57th congress of Iranian Dental Association in Tehran.
Materials and Methods: This cross-sectional study conducted on 384 dentists, who were selected through randomized simple convenience sampling method. Data was collected by a questionnaire consisting of demographic data and 20 questions about digital radiography and CBCT which took approximately 10 minutes for completion. Data analyzed in SPSS 21 software by using T and ANOVA tests and descriptive statistics was calculated in terms of frequencies and percentages. 0.05 was considered at significant level.
Results: From 322 participants of the present study 55.9% were men. The most frequent reason for using digital radiography was it does not need processing. The most participants also believed CBCT had lower radiation dose compared to medical CT. 86.3% of the participants of the survey were aware of CBCT. Seventy two and four percent of participants also reported that adequate teaching was not imparted regarding CBCT in educational institutions. Dental implants treatments were the most frequent reason for prescription of CBCT.
Conclusion: CBCT has an important role in the diagnosis of oral and maxillofacial pathologies with reduction in radiation dose. Based on the result of the present study dental implant was the most frequent reason for CBCT prescription. The most important reason for the use of digital radiography was minimum need for development and fixation. A regular continuing education program for dental students and dentists is recommended.

Key words: CBCT, Knowledge, Attitude, Dentists, Digital radiography, Prescription, General dentist

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INTRODUCTION

Several methods of digital radiography in dentistry are currently used as a substitute for radiographic film. Recent advances and the continued expansion of the sensor technology have made possible higher-resolution images [1,2]. In oral and maxillofacial radiology, 3D imaging quickly replaces two-dimensional radiographs [3].

Cone beam tomography (CBCT) is a recent useful imaging technique in dental, oral and maxillofacial images. Compared with CT images, CBCT contain of a lower cost, less space, shorter scan time, limitation to head and neck area and reducing radiation dose, which makes it more suitable for use in dentistry [4,5]. The most common cases of CBCT in dentistry include dentition analysis for dental implants, examination of teeth and facial structures for orthodontic treatment, examination of temporomandibular joint (TMJ) for degenerative changes, pre-surgical assessment of proximity of mandibular third molar roots to mandibular canal, assessment of teeth and bones for infection, cysts and tumors [6]. Jansen showed that CBCT could be used for a wide range of diagnostic steps to treatment such as dental extraction, implant, endodontics, orthodontics, temporomandibular joint disorder (TMD), and airway obstruction cases. However, general dentists can also

use (CBCT) to evaluate the hard tissue before and after placement of the implant [7]. In a study by Dölekoğlu et al. in Turkey, conducted to assess the use of digital radiography and CBCT in dentists in Turkey showed that 95 out of 383 people did not prescribe digital radiography due to costs. 55.9% of dentists and 79.1% of faculty member dentists were knowledgeable about CBCT [8]. Yalcinkaya et al. showed that 76.6% of Turkish endodontists used digital imaging methods, and those with over 40 years of age had significantly less awareness about CBCT than young people [9]. The greatest use of CBCT was by surgeons and periodontologists in Norway for the treatment plan [10]. Professional guidelines expressed for the use of CBCT in several organizations, including the American Academy of Oral and Maxillofacial Radiology (AAOMR), International Congress of Oral Implantologists (ICOI) and American Association of Endodontists. These recommendations set out the basic principles for considerations in CBCT images selecting for patient care. One of the important issues is that prescribing radiographic images, such as CBCT, should be performed after complete clinical examinations, and prescribing it for diagnosis in the patient, especially in children and adolescents should be more valuable than ionizing radiation. In addition, CBCT can be complement or replacement for conventional dentistry radiographs only when conventional radiographs do not provide the required information to clinician [11-15]. New methods of radiography and CBCT in many cases are helpful in dental treatments. The purpose of this study was to determine the causes of use and prescription of digital radiography and CBCT by general dentists participating in 57th congress of Iranian Dental Association in 2012.

MATERIALS AND METHODS

The present study is a descriptive cross-sectional study that was conducted to determine the causes of use and prescription of digital radiography and CBCT by general dentists participating in 57th congress of Iranian Dental Association in Tehran, Iran in 2012. Data were collected by a questionnaire consist of demographic data (including gender, age, years of study, workplace) and three questions about the working life of the radiography equipment, the presence of a panoramic device and the use of digital radiography at the workplace. In case of not using radiographic devices, reason was mentioned. If the responder used digital radiography, they asked questions about the cause of use, the type of prescribed radiographs, participant opinion on digital images, the problem with using digital sensors and film holders, the type of used sensor and in the case of not using digital radiography, they responded to the CBCT awareness questionnaire. If they had not heard anything, they would not answer the next questions. If the answer was yes, they would answer the next 8 questions included information sources, training courses, prescribing background, CBCT differences with CT, prescribing In the future, necessity and efficiency of teaching at the college of education, and willing to hold CBCT courses. This questionnaire was confirmed by using similar texts and articles of researchers. The validity of the questionnaire was 0.83 measured by Cronbach's alpha coefficient. The reliability of the questionnaire was confirmed through test-re-test with the Cronbach's alpha coefficient, on two occasion's response in 0.85. Sample size was determined based on the sample size formula, taking z=1.96, d=0.05 and p=0.5 and no. of 384 people. One senior dentist who was trained and was able to answer the possible questions collected the data. In this way, the student attended in congress center at resting hours and delivered the questionnaire to the general dentists who wished to participate after explaining the design and purpose of doing it, and received the completed questionnaire at the same session. The approximate time of completing the questionnaire was 10 minutes. This method continued to reach the sample size. Data analyzed after collecting, using SPSS 21 software, frequency distribution tables and statistical T tests to determine gender difference and regression analysis to examine the means and chi-square test to analyze the qualitative variables. The significance level was considered 0.05. The Ethics Committee of Kerman University of Medical Sciences with the code IR.KMU.REC.1396.1357 approved proposals for this research project.

FINDINGS

Out of 384 distributed questionnaires, 352 questionnaires were returned completed (response rate 91.66%). Data analysis was performed on 322 questionnaires due to misleading and non-responsiveness to all required items in 32 questionnaires. In this study, 180 were men (55.9%) and 142 (44.1%) were female. In terms of work, 118 (36.6%) worked only at the office. Longevity of the radiographic device of 34.5% people was between 1 and 5 years old. 255 people (79.2%) had no panoramic radiography at their workplace (Table 1).

Table 1: Frequency distribution of individuals according to demographic variables

Number	Percent	Variable	
180	55.9	Man	Sex
142	44.1	Female	
118	36.6	Office	Workplace
61	18.8	Clinic	
81	25.2	Clinic and clinic	
17	5.3	University	
45	14	Office and university	
111	34.5	5-1 years	Device age
119	36.9	6-10 years	
53	16.5	15-11 years	
19	5.9	20-16 years	
20	6.2	20 years	
255	79.2	Yes	Having a panoramic radiograph at work
67	20.8	No	
134	41.6	Yes	Use digital imaging method
188	58.4	No	

86.3% subjects had heard about CBCT. The largest source of information was seminars (26.6%). 168 subjects (52.2%) had CBCT training courses and 150

subjects (46.6%) had prescribed CBCT for their patients (Table 2). The most commonly prescribed CBCT in the future was implant (30.1%). The most important cause of non-use of digital radiographs was the lack of original equipment (14.9%) and then equipment expensiveness (10.2%).

Table 2: Frequency distribution of individuals in response to CBCT information

Number	Percent	Variable	
278	86.3	Yes	Have you heard anything about CBCT?
44	13.7	No	
56	20.1	College of Education	What is the source of your information?
74	26.6	Seminars	
2	0.71	Internet	
13	4.7	Importer or Manufacturer	
65	23.4	Schools and seminars	
23	8.3	College, seminar and the internet	
45	16.2	Other source	
168	52.2	Yes	Have you participated in CBCT introductions?
254	47.9	No	
150	46.4	Yes	Have you ever prescribed CBCT to your patients?
172	53.4	No	

The cause of using digital radiography is shown in Figure 1.

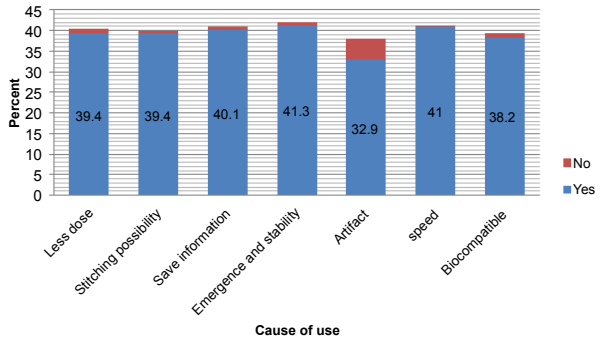

Figure 1: How to answer individuals due to the use of digital radiography

The most common cause of using digital radiography was the lacks of stage of development and fixation. Of the 65 subjects (20.2%) used only periapical radiography and 27 (8.4%) used all types of digital radiography (Figure 2).

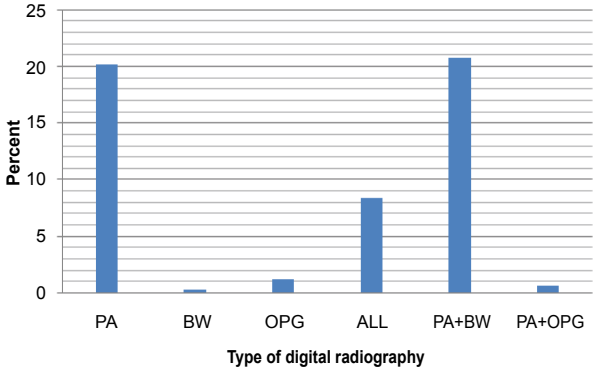

Figure 2: Frequency distribution by type of digital radiography

83 people (25.8%) were satisfied with the quality of digital radiography images and 13.4% were completely satisfied (137 people). In response to the problem of inserting sensors in mouths, 11.2% had difficulty (n. 136). 29.2% of subjects were those who have been forced to not use digital radiography (138 people). 25.2% used children's sensors (133 people). 24.5% used film holders (130 people). 21.4% of people used phosphor plate sensor (125). 26.4% of people decided to buy CCD/CMOS devices (118 people). The responses to CT and CBCT differences are shown in Figure 3.

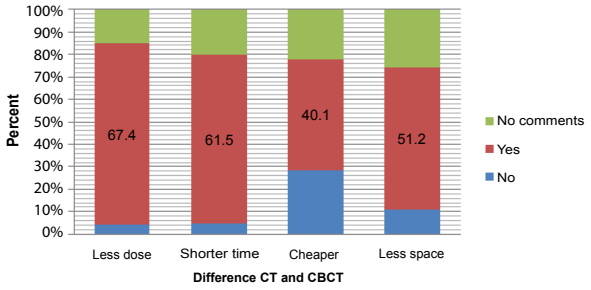

Figure 3: How to respond to differences between CT and CBCT

As seen, less radiation in CBCT was the most significant difference with CT. The way to respond to the need for education, the interest and the adequacy of CBCT training is shown in Figure 4. There was a significant difference in the non-use of digital radiography with gender. In fact, the most common cause was the lack of equipment in women and expensive equipment for men (p=0.018). There was no significant difference between the knowledge score of using digital radiography and gender (p=0.627). Men were significantly more prescribed CBCT than women (p=0.052). There was no significant difference between women and men in terms of answering questions about CBCT (p=0.0179).

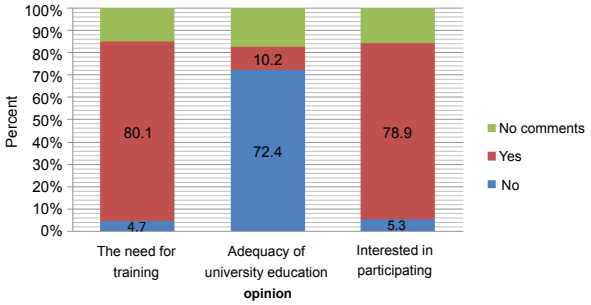

Figure 4: People's opinion on the adequacy, the need for education and the interest in participating in CBCT training courses

DISCUSSION

Radiography always is an essential tool in the diagnostic evaluation of dental patients suspected of dental problems or oro and maxillofacial diseases [16]. Technological advancement, such as digital imaging systems, significantly increase detail access for dentists and reduce the exposure therapy on the patient [17].

In the current research, 58.4% of people did not use digital imaging techniques. In a study by Shetty et al. [18] 16.5% did not use digital radiography. The reason for this difference is that current research has been done on

general dentists, while in Shetty's research there were more specialists.

Yalcinkaya et al. [9] showed that 76.6% of Turkish endodontists used digital imaging methods, and in Dölekoğlu et al. [8] study in Turkey, 67% used digital radiography, which is more in this study. The reason for this difference is the difference in studied population. Results are generally higher in comparison with previous studies in Norway in 2001 [19] and in Turkey in 2005 [20] (14% of dentists used digital radiography), which indicating interest in this type of dental radiography. In this study, the lack of equipment and expensiveness was mentioned as the main cause of non-use. The results are consistent with the study by Shetty et al. [18] in India and Yalcinkaya et al. [9] in Turkey, which highlighted the reasons for non-use as equipment expensiveness. Among digital radiography, periapical radiography was the most common type. The results are consistent with the findings of Dölekoğlu et al. [8] (the most common type of radiography in the Turkish dentists was periapical), and Gijbels et al. [21] in Belgium and Brian et al. [22] in Indiana. Periapical radiography is a good radiograph in cases, when the aim is assessment of root end lesion or diagnosis of dental pulp involvement. The most periapical radiography prescribing is justifiable, considering that, root canal therapy is performed using periapical radiography. The most common reason for performing digital radiography in this study respectively was the lack of a stage of develop and fix, the possibility of storing information and short time, which corresponded with study of Dölekoğlu et al. in Turkey [8]. In Brian et al. study [22] saving time in 87% cases and eliminating process problems was the most common cause. The reason for using digital radiography in the Shetty et al. study [18] in India was a lower dose of radiation, a short time, the possibility of storing information, and the lack of a stage of develop and fix. The benefits of digital radiography is reducing the received dose and the possibility of electronic storage of images without limitations in number of copy and removing the process steps [23,24]. In the present study, 53.4% of the subjects had not prescribed CBCT to their patients yet, which was consistent with the study of Lavanya, which 54.5% of the subjects had not prescribed CBCT for patients yet [25].

In this study, the awareness of individuals about the difference between CBCT and CT was good. Lower dose, shorter time, less space and cheaper prices were respectively CBCT differences with CT. The results are consistent with studies by Dölekoğlu et al. [8] in Turkey. Qirresh et al. [17] also found that, Palestinian dentists saw the first difference between CT and CBCT at a lower dose of CBCT. There was no significant difference in the knowledge of CBCT between men and women dentists in the current study. The results are consistent with the study of Haqnegahdar et al. [26]. The results are inconsistent with Dölekoğlu et al. study [8], which showed men were significantly more aware. The reason for this difference is that in the current study, training was the same. In the current study, the most referral of patients to CBCT is the treatment of dental implants. The results of Dölekoğlu et al. study [8] in Turkey, where 40% of the patients had prescribed implant therapy, also, Qirresh et al. study in Palestine and Kamburoglu in Turkey with the most prescribe of CBCT for implant therapy [27,17] showed that the most commonly CBCT prescribe was implant therapy [29,28]. In this study, men prescribed CBCT significantly more, than women did. This could be because male dentists are more likely to carry out implant treatments than women are, and thus increase CBCT prescribe. In the current study, 72.4% recognize CBCT training at the faculty insufficient. Result was consistent with Kamburoglu et al. study [27] in which, 83.3% of graduates did not know the training of the college sufficient. In addition, with the study by Shetty et al. [18] that the majority of educators know the training by college inadequate, and with Qirresh et al. study [17] in which 56% of educators know the CBCT training inadequate in general dentistry period. The European Association of Oral and Maxillofacial Radiology recommends that all dentists be trained to be able of safely use CBCT in the dentoalveolar area [30]. In the current study, 78.9% of subjects were interested in participating in courses, that were consistent with Kamburoglu et al. study [27], which represented 88.9% of participants were willing to learn. In addition, with the study by Tchaou et al. [31] that 69.2% of people were willing to learn and study, and with Berg et al. study in Switzerland, in which most people were interested in these courses [32]. In this research, the main source of findings were dental seminars, and was consistent with Kamburoglu et al. study [27], in which the main source of 31% participants was seminar. Training on the use of equipment and new imaging techniques is an important part of the patient's protection from radiation [30].

CONCLUSION

The results of this study showed that the most important reason for the use of digital radiography was the lack of need for develop and fix. The most common cause of CBCT prescription was implant therapy. The largest source of information for the participants was dental seminars. 80.1% of the participants considered it necessary to attend CBCT training at colleges. Learning the benefits and limitations of new imaging techniques in student education programs and continuing education is recommended.

CONFLICT OF INTERESTS

Authors have no conflict of interest.

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REFERENCES

1. van der Stelt PF. Better imaging the advantages of digital radiography. J Am Dent Assoc 2008; 139:7-13S.
2. Nair MK, Nair UP. Digital and advanced imaging in endodontics: A review. J Endod 2007; 33:1-6.
3. Dula K, Bornstein, MM, Buser D, et al. SADMFR guidelines for the use of cone-beam computed tomography/digital volume tomography. Swiss Dent J 2014; 124:1170-1183.
4. Scarfe WC, Farman AG, Sukovic P. Clinical applications of cone-beam computed tomography in dental practice. J Can Dent Assoc 2006; 72:75-80.
5. Scarfe WC, Farman AG. What is cone-beam CT and how does it work? Dent Clin North Am 2008; 52:707-730.
6. White SC. Cone beam imaging in dentistry. Health Phys 2008; 95:628-637.
7. Jansen CE. CBCT technology for diagnosis and treatment planning: What general practitioners should consider. Compend Contin Educ Dent 2014; 35:749-753.
8. Dölekoğlu S, Fişekçioğlu E, İlgüy M, et al. The usage of digital radiography and cone beam computed tomography among Turkish dentists. Dentomaxillofac Radiol 2011; 40:379-384.
9. Yalcinkaya SE, Berker YG, Peker S, et al. Knowledge and attitudes of Turkish endodontists towards digital radiology and cone beam computed tomography. Niger J Clin Pract 2014; 17:471-478.
10. Hol C, Hellén-Halme K, Torgersen G, et al. How do dentists use CBCT in dental clinics? A Norwegian nationwide survey. Acta Odontol Scand 2014; 21:1-7.
11. Kincade K. ADA releases guidelines for cone-beam CT use. J Am Dent Assoc 2012; 143:899-902.
12. The use of cone-beam computed tomography in dentistry: An advisory statement from the American dental association council on scientific affairs. J Am Dent Assoc. 2012; 143:899-902.
13. Use of cone-beam computed tomography in endodontics joint position statement of the American association of endodontists and the American academy of oral and maxillofacial radiology. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011; 111:234-237.
14. Tyndall DA, Price JB, Tetradis S, et al. Position statement of the American academy of oral and maxillofacial radiology on selection criteria for the use of radiology in dental implantology with emphasis on cone beam computed tomography. Oral Surg Oral Med Oral Pathol Oral Radiol 2012; 113:817-826.
15. Clinical recommendations regarding use of cone beam computed tomography in orthodontics. Position statement by the American academy of oral and maxillofacial radiology. Oral Surg Oral Med Oral Pathol Oral Radiol 2013; 116:238-257.
16. Faran F, Yashfika AB, Farhana N, et al. Knowledge, attitude and practice regarding computed tomography and cone beam computed tomography among dental students at Dow University of health sciences. Adv Dent & Oral Health 2016; 2:555599.
17. Qirresh E, Rabi H, Rabi T. Current status of awareness, knowledge and attitude of dentists in Palestine towards cone beam computed tomography: A survey. Oral Biol Dent 2016; 4:1.
18. Shetty SR, Castelino RL, Babu SG, et al. Knowledge and attitude of dentists towards cone beam computed tomography in Mangalore–A questionnaire survey. Austin J Radiol 2015; 2:1016.
19. Wenzel A, Møystad A. Decision criteria and characteristics of Norwegian general dental practitioners selecting digital radiography. Dentomaxillofac Radiol 2001; 30:197-202.
20. Ilguy D, Ilguy M, Dincer S, et al. Survey of dental radiological practice in Turkey. Dentomacillofac Radiol 2005; 34:222-227.
21. Gijbels F, Debaveye D, Vanderstappen M, et al. Digital radiographic equipment in the Belgian dental office. Radiat Prot Dosimetry 2005; 117:309-312.
22. Brian JN, Williamson GF. Digital radiography in dentistry: A survey of Indiana dentists Dentomaxillofac Radiol 2007; 36:18-23.
23. Davies C, Grange S, Trevor MM. Radiation protection practices and related continuing professional education in dental radiography: A survey of practitioners in the North-east of England. Radiography 2005; 11:255-261.
24. Versteeg CH, Sanderink GCH, van der Stelt PF. Efficacy of digital intra-oral radiography in clinical dentistry. J Dent 1997; 25:215-224
25. Lavanya R, Babu DB, Waghray S, et al. A questionnaire cross-sectional study on application of CBCT in dental postgraduate students. Pol J Radiol 2016; 81:181-189.
26. Hagh Negahdar A, Ghapanchi J, Saberi E. Knowledge of Iranian dentists about cone-beam computed tomography: A questionary study. J Dentomaxillofac Radiol Pathol Surg 2017; 5:11-16.
27. Kamburoglu K, Kursun S. A comparison of the diagnostic accuracy of CBCT images of different voxel resolusion used to detect simulated small intraoral resolation cavities. Int Endod J 2010; 43:798-807.
28. Chau ACM, Fung K. Comparison of radiation dose for implant imaging using conventional spiral tomography, computed tomography, and cone-beam computed tomography. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2009; 107:559-565.
29. Ludlow JB, Ivanovic M. Comparative dosimetry

of dental CBCT devices and 64-slice CT for oral and maxillofacial radiology. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008; 106:106-114.

30. Brown J, Jacobs R, Levring J, et al. Basic training requirements for the use of dental CBCT by dentists: A position paper prepared by the European academy of dentomaxillofacial radiology. Dentomaxillofac Radiol 2014; 43:20130291.
31. Tchaou M, Bissa H, Pegbessou PE, et al. Knowledge and practices of dentists, oral and maxillofacial surgeons of cone beam computed tomography (CBCT) and the dentascanner in a low income country: Case of Togo. O J Radiol 2017; 7:1-8.
32. Berg B, Gertsch A, Zeilhofer HF, et al. Cone beam computed tomography and radiation dosage: Application frequency and knowledge of dentists in Switzerland. Swiss Dent J 2014; 124:419-433.