Cases Administrated of CBCT by Dentists of Kerman: A Questionnaire Study

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ABSTRACT

Introduction: Cone beam computed tomography (CBCT) is a new method that is able to provide three-dimensional images in radiology and is useful for dentomaxillofacial imaging. This study aimed to investigate the cases administrated CBCT by dentists of Kerman (2015 year).

Methods: This cross-sectional study was conducted on dentists in Kerman. The data were gathered using standard research questionnaires containing 20 questions about the CBCT prescription and 10-question on diagnostic value of CBCT with intraoral radiographs and other information regarding the participants (age, sex, job, participate in the retraining of radiology, retraining courses, radiation protection). Data was analyzed by T test, regression and SPSS 18.

Results: Among 182 participants, 107 (52.26%) were male and the rest were female with an average age of 37.16±8.93 years. The mean score of the questions of CBCT was 75.75±3.43, and the diagnostic value of the study was 16.17±2.15. The value of questions was statistically significant between general practitioners and specialists (P=0.01). There was no difference between men and women in the administration of CBCT. The difference between male and female dentists for diagnostic value of CBCT and other X-ray was statistically significant (P=0.029). Between continuing medical education courses, retraining radiology, radiation protection programs, CBCT and diagnostic value with other radiological statistically significant correlation was observed.

Conclusion: The results of this study showed that knowledge of dentists in the administration of CBCT and its diagnostic value with other X-rays was satisfactory.

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1. Introduction

Dedicated cone beam computed tomography (CBCT) scanners for the oral and maxillofacial region were pioneered in late 1990s independently by Arai et al. [1] in Japan and Mozzo et al. [2] in Italy. Therefore, CBCT is a new technology that has been recently useful for dento-maxillofacial imaging [3].

When compared with conventional CT scanners, CBCT unit cost less and require less space. They have rapid scan time and they reduce the radiation doses [3, 4, 5]. Also, the beams rays are confined to head and neck only. Lower dosage of X-rays and the ability to take different images from a certain structure and also the possibility of reconstructing sagittal and coronal views, all make CBCT a convenient technology [6-8].

Common indications for CBCT in dentistry include assessment of the jaws for placement of implants, examination of teeth and facial structures for orthodontic treatment

planning, evaluation of TMJ for osseous degenerative changes, evaluation of mandibular third molar root proximity to mandibular canal prior to extraction, evaluation of teeth and bone for cysts and tumors [5, 6]. The disadvantages of CBCT are low resolution of its soft tissue and scattering beams from tooth tissue [9]. Usual indications of CBCT in dentistry are implantation, orthodontic treatments, assessment of temporomandibular joint, relationship of third mandibular molar with inferior alveolar nerve block and presence of tumors and cysts [10].

Researchers have investigated the use of digital radiological imaging in various countries. In 2000, it was estimated that 5% of dental practitioners in North America used digital radiography in their practice [11]. In studies conducted in Norway, the usage rate was estimated to be 11-14% [12, 13] and in the Netherlands it was estimated as 12% [14]. Considering the significance of CBCT in dental treatments, it seems that assessment of dentists' awareness for indications of this system is important. Therefore, the aim of this study is to investigate the cases in which the CBCT was administrated by dentists of Kerman.

Table 1. Demographic data of the dentists.

Characteristics	Number	Percent
Gender		
Female	107	56.26
Male	75	43.38
Level of education		
Specialist	24	86.8
General dentist	158	13.2
Type of practice		
Private Practice	48	26.2
Clinic	42	23.1
Clinic & Private Practice	92	50.6
Continue education		
Yes	159	87.4
No	23	12.6
Continue education for radiology		
Yes	51	28.1
No	131	71.9
+		
Yes	49	26.9
No	133	73.1

Table 2. The correct response of the study subjects towards CBCT administration.

Question	Number	Percent
Patients with systemic disease	6	3.3
Patients with malignant disease	107	58
Endo-perio lesions	121	66.5
Patients with xerostomia	46	25.3
Maxillofacial fractures	32	17.6
Check the patient's sinuses	1	0.5
Root fractures	146	80.2
Temporomandibular joint pain and limited movement of jaw	98	53.8
Trauma to the face	59	32.4
Before and after maxillofacial surgery	33	18.1
The Relationship between impacted tooth with normal structures	144	79.1
Salivary gland stones	6	3.3
Area search implants	162	89
Check the type of fixture	115	63.2
Check diameter implant fixture	131	72
Check the length of the implant fixture	130	71.4
Before and after orthodontic treatment	2	1.1
Assessment of growth and development after 6 years	3	1.6
Assessment of growth and development before age 6	7	3.8
Dental anomalies	60	32.5

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2. Materials & Methods

This cross-sectional descriptive study was performed on 182 dentists in Kerman. First a questionnaire was designed according to previous studies [15-17]. The questionnaire comprised of: a demographic part [age, sex, years of employment, educational degree], as well as general questions and questions regarding the CBCT technology. Validity of the questionnaire was evaluated by 10 specialists in Kerman. They were asked to express their opinions on each question by the words: totally appropriate, appropriate, no idea, inappropriate and totally inappropriate.

After evaluation by the specialists, level of the questions and their comprehensibility was evaluated. Validity of the questionnaire was good. Its overall validity was 79% and the validity co-efficient for each question was between 77-89%. The reliability of the questionnaire was assessed using Cronbach's alpha. Reliability of the questionnaire was assessed by gathering the responses provided by 15 dentists to the same questionnaire within a 15-day interval.

Cronbach's coefficient for the reliability was 0.87, which was suitable for the study. The questionnaire was distributed by a senior student. Confidentiality was guaranteed and subjects were asked to freely express their opinions. Questionnaires were designed un-identified and un-addressed and dentists were ensured that the results of this study will be used only for educational purposes of the dental society and will not be used for evaluating the dentists. T-test, Chi-square and regression test was used to analyze the data using SPSS 18.

3. Results

A total number of 182 questionnaires were completed by specialists and general dentists. 107 male (56.66%) and 75 female (43.38%) subjects with the average age of 37.16±8.93 years participated in this study. Most of the dentists had 1-10 years of professional experience (10.92±7.89 years; range:1-40 years). The demographic characteristics of the dentists are shown in Table 1.

Table 3. The correct response of the study subjects towards diagnostic value of CBCT.

Question	Number	Percent
Root fractures	127	69.8
Detection of height and thickness bonefor implants	165	90.7
Determine the type of implant fixtures	117	64.3
Determine the amount and type of bone loss	96	52.7
Inflammatory periapical lesions	82	45.1
Assessment preoperative of impacted tooth	127	69.8
The Relationship between impacted tooth with normal structures	157	86.3
The situation impacted canines for orthodontic treatment	117	64.8
Dental anomalies	87	47.8
Salivary gland stones	40	22

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Table 2 shows the reasons for using CBCT. Most of the dentists (89%) prefer CBCT due to the implant, 80.2% for root fracture and 79.1 for maxillary sinus.

Table 3 shows the diagnostic value of CBCT. Thus, study shows that thickness of bone height for implant (90.7%) and impacted teeth (86.3%) were the most correct responses.

The mean score for CBCT indications was 75.76±3.41 out of 100 score (74.76±3.41 and 75.85±3.48 for specialist and general dentist, respectively), with no significant differences between specialist and general dentist (P=0.28).

The mean score for diagnostic value of CBCT was 16.17±2.15 out of 20 score (17.02±1.52 and 15.28±2.79 for specialist and general dentist, respectively), with significant differences between specialist and general dentist (P=0.01) (Table 4).

The mean score for CBCT indication for male and female was 75.90±3.28 and 75.53±3.67 respectively, with no

Table 4. Relationship between sex, level of education with mean score of CBCT diagnostic value and administration CBCT.

Variable	Mean	Standard deviation	P value
CBCT diagnosticvalue			
Sex			
Male	75.9	3.28	0.509
Female	75.53	3.67	
Level of education			
Specialist	74.79	3.41	0.218
General dentist	75.85	3.48	
Administration CBCT			
Sex			
Male	15.4	2.91	*0.029
Female	16	2.36	
Level of education			
Specialist	17.6	1.52	*0.014
General dentist	15.28	2.79	

*P<0.05 is significant

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Table 5. Relationship between demographic characteristics with mean score of administration CBCT.

Variable	Beta	P value
Gender	-0.035	0.716
Age	0.05	0.784
Years of professional experience	0.213	0.195
Level of education	-0.115	0.201
Type of practice	-0.008	0.929
Continue education	0.037	0.690
Continue education for radiology	-0.169	0.114
Continue education for Radiation protection	0.184	0.067

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significant differences between this two groups (P=0.05) (Table 4).

ANOVA test showed that there were statistically significant differences between dentists workplace and the mean score for CBCT indications (P=0.02) (Tables 5, 6).

Also, regression analysis showed that there were statistically significant differences between the period of protection from radiation and the mean score for CBCT indications, (P=0.03) (Tables 5, 6).

4. Discussion

Cone beam computed tomography is a medical imaging technique consisting of X-ray computed tomography where the X-rays are divergent, forming a cone [18]. CBCT has become increasingly important in treatment planning and diagnosis in implant dentistry, interventional radiology [IR], among other things. Perhaps because of the increased access to such technology, CBCT scanners have found many of its uses in dentistry, such as in the fields of oral surgery, endodontics and orthodontics [18, 19].

This study was done for assessment of dentists' awareness for indications of cone beam computed tomography. The mean score for CBCT indications was 75.76±3.41 out of 100 score. Kamburog et al. shows that the level of knowledge in dental student about CBCT indications was poor and that these results are similar to findings by many other investigations [20, 21, 22].

Shetty et al. [17] shows that all of dentists were aware of CBCT and considered it to be a useful diagnostic tool in dentistry. Balabaskaran and Srinivasan [23] shows that 18% (n=9) of dentists are not aware of cone beam computed tomography used for dentomaxillofacial region.

Recent advances in cone beam computed tomography in dentistry have identified the importance of providing outcomes related to the appropriate use of this innovative technology to practitioners, educators, and investigators [24].

Table 6. Relationship between demographic characteristics with mean score of CBCT diagnostic value.

Variable	Beta	P value
Gender	-0.201	*0.03
Age	0.248	0.165
Years of professional experience	-0.233	0.166
Level of education	0.138	0.115
Type of practice	0.043	0.623
Continue education	0.607	0.545
Continue education for radiology	1.787	0.076
Continue education for radiation protection	-1.135	0.258

*P<0.05 is significant

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Most of the dentists (89%) prefer CBCT due to the implant that is higher from research by Shetty et al. [17].

Sudhakara Reddy et al. [16] Shows that most of the dentists preferred CBCT referrals for dental implant planning (23.6%), tumors and cyst (8.1%), endodontic treatment (4.3%), orthodontic assessment (3.1%) and impacted tooth (0.6%). Chau et al. compared typical patient radiation doses delivered in implant imaging with spiral CT, conventional spiral tomography and CBCT in their study. They reported that CBCT delivers the lowest radiation dose to the organs, whereas spiral multi slice CT delivers the highest dose [25].

Current research indicated good knowledge of dentists about new imaging techniques [16]. Published researches show that CBCT is important in detection process and plays an important role in the management and outcome assessment [24].

Researches show that CBT is used in the treatment of dental implants, especially in linear measurement, three-dimensional topography of alveolar ridge and proximity to vital anatomical structures and surgical guide design [26[. Also, CBCT is used in implantology in a wide range of assessments prior to treatment, such as anatomical variation, and assessments related to complications after surgery with a focus on the harm to neurovascular structure [27].

In the present study, root fracture was the most common indications of CBCT. Vertical root fractures can be seen in 3.69 to 20% of tooth root canal therapy. Two-dimensional radiographs proved fracture only if it is on the radiation path [28]. Hassan and his colleagues demonstrated a higher accuracy of CBCT than periapical on vertical root fractures [29].

In this study, 69.8% of the dentists know that radiographs CBC have better the diagnostic value about root fracture than periapical. According to the results of this study information of participating in this investigation is high. However, it should be noted that if the diagnosis cannot be reached with conventional radiography, CBCT is an effective aid [30].

The most common reason for prescribing CBCT was relationship between impacted teeth with normal landmarks (sinus/mandibular canal). In many cases, two-dimensional radiographs aren't able to demonstrate real connection impacted teeth with adjacent anatomical (sinus/mandibular canal) that this is important particularly in making decisions about orthodontic treatment of impacted canines.

The results of this study is compatible with Suomalainen et al. Cone-beam CT revealed the number of roots of teeth more reliably than panoramic radiographs. Also CBCT examination was highly reliable in locating the inferior alveolar canal. Suomalainen et al. recommend CBCT examination for preoperative radiographic evaluation of complicated impacted lower third molars [31].

Also, Pecker et al. and Ishak and colleagues shows that CBCT is more useful than panoramic radiography for detecting multiple roots of impacted mandibular third molars [32, 33]. Pertl et al. show that OPG using steel balls as a calibration reference seems reliable in a standard situation [31]. Evidently better assessment of impacted teeth started with panoramic radiography.

45.1% of dentists believe that the diagnostic value of intraoral radiographs is better in the diagnosis of inflammatory lesions than CBCT and panoramic. Although periapical are preferred to panoramic radiographs, but research has shown that the limitations of periapical radiographs may hinder the detection of periapical lesions and more roots need to be assessed, and secondly, more periapical lesions need to be detected with CBCT [34]. Also, Patel et al. shows a 14 times increase in failure rate when teeth with no pre-operative periapical radiolucencies were assessed with CBCT compared with periapical radiographs at 1year [35].

In this study, only 3.2 percent of dentists corrected their answer about CBCT indications in systemic patients. In patients with systemic disease, conventional radiographs are enough except as in cases disputed (impacted teeth near anatomic landmarks, the failure to detect suspicious canal).

In this study, 3.3% dentists were corrected their about suspected cases of salivary stones. Occlusal radiographs, panoramic and sialographic are methods appropriate in the case of salivary gland stones. CBCT is not administrated in assessing the growth and development of teeth before and after 6 years that there is few correct answers about the administration of CBCT in the evaluation before and after orthodontic treatment. This could be due to a very small percentage of dentists in orthodontic field.

The diagnostic value mean of CBCT was 15.2±17.16 of 20, which indicated a good knowledge in this study and there were significant differences between specialists and general dentists (experience, experts and visited patients who have a need to be CBCT). Also, women have been informed about the diagnostic value CBCT.

Cone-beam computed tomography has one of the most important roles for diagnosis in dentistry. This research

showed that dentists in Kerman city had an average level of knowledge regarding CBCT. It is recommended that qualification programs must be held for dentists to increase their awareness toward cone beam computed tomography.

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