

# Knowledge of Iranian Dentists about Cone-Beam Computed Tomography: A Questionary Study

## Original Article

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## **Abstract**

### **Introduction:**

Cone-beam computed tomography (CBCT), is a relatively new imaging technique in dental and maxillofacial fields, with versatile abilities and applications. If the advantage of CBCT is well understood and established; the technique will be properly applied in dental planning and treatment along with tremendous benefits to the patients. This study was designed to evaluate the knowledge of Iranian dentists about CBCT.

### **Materials and methods:**

A researcher-made questionnaire, including 18 questions was used to assess the knowledge of Iranian dentists participating in an international anniversary conference. Data were extracted and analyzed using SPSS software version 18.0 (SPSS Inc., Chicago, IL, USA). The student t-test and Spearman correlation coefficient were used to compare the relationship between knowledge scores and independent variables. The significance level was set at 0.05.

### **Results:**

The mean score of knowledge about CBCT achieved by general practitioners was 7.45 and that of specialists was 8.73, which can be categorized as average. There was no significant difference in knowledge about CBCT between male and female dentists ( $p = 0.33$ ) and also there was no relation to age ( $p = 0.54$ ) and years of experience of dentists ( $p = 0.88$ ) in this regard. The knowledge about CBCT was higher in specialist dentists ( $p = 0.002$ ).

### **Conclusion:**

The knowledge of Iranian general dentists about CBCT is not at ideal level. Educational and post-educational training programs should be considered to improve this knowledge.

**Key words:** •Knowledge •Cone-Beam Computed Tomography •Dentist.

## Introduction

Imaging is an important diagnostic adjunct to the clinical assessment of dental patients. Radiographic imaging forms an important part in diagnosis and treatment of dental pathologies, especially if complicated situations are encountered and advanced treatments are needed, such as implantation surgeries and temporomandibular joint (TMD) treating. Advanced treatments usually necessitate advanced imaging. Simple linear tomography is available in most panoramic machines, but low image quality and complicated procedure had prevented this technique to become a popular projection.<sup>(1)</sup>

Cone-beam computed tomography (CBCT) is an imaging modality that has recently become available for dentomaxillofacial imaging. When compared with conventional CT scanners, CBCT units cost less and require less space, have rapid scan time, limit the beam to the head and neck, reduce radiation doses, and have interactive display modes that offer maxillofacial imaging and multi-planar reformation, making them more suitable for use in dental practices.<sup>(2)</sup>

The three-dimensional data of dental structures and related anatomy that is free of superimpositions helps the dentists to diagnose sophisticated cases more reliably and plan more beneficial treatments. The knowledge about advantages and applications of this method will create tendency in dental staff for employing CBCT imaging according to the exact needs. However since the technology is relatively new, more time may be needed to achieve a suitable and proper role for this technic in dental imaging strategies. Evaluation of dental knowledge has a long history among researchers. Many studies have been performed to evaluate the attitude of dentists toward CBCT applications around the world. Regarding the clear advantages of CBCT, this study is designed to assess the dentists' awareness of the capability and indications of CBCT in Iran.

## Materials and Methods

The study was conducted as a cross-sectional descriptive survey of Iranian dental practitioners, attending an international dentistry congress in Tehran on 17th of May 2016.

The questionnaire approach was chosen to evaluate dentists' knowledge, benefits, and perceptions of CBCT. A modified questionnaire was extracted from similar ones and sent to five professors of Shiraz University including four oral and maxillofacial radiologists and one oral surgeon, for corrections and evaluation of validity. The reliability of the revised questionnaire was confirmed through a pilot study conducted on 20 randomly selected dentists.

The questionnaire consisted of two parts:<sup>(1)</sup> Demographic data, including age, gender, place, and year of graduation; and <sup>(2)</sup> knowledge assessment containing 18 multiple-choice questions about CBCT advantages, disadvantages, benefits, and indications for prescription in dental clinics. The questionnaire was given to 385 dentists randomly. Since dentists entered the study intentionally, there was no ethical limitation for this research. Incomplete and unreturned questionnaires were excluded.

Data were extracted and analyzed using SPSS software version 18.0 (SPSS Inc., Chicago, IL, USA). The student t-test and Spearman correlation coefficient were used to compare the relationship between knowledge scores and independent variables. The significance level was set at 0.05.

## Results

Out of 385 questionnaires, which were distributed among dentists, 327 were completely answered, which were entered into the study. The participants consisted of 42 specialists (12.8%) and 285 general practitioners (87.2%), including 186 males (56.9%) and 141 females (43.1%). The age of participants ranged from 24–72 years (mean  $38.4 \pm 10.47$ ) and the duration of occupation ranged from 1–45 years (mean  $11.05 \pm 9.51$ ). The grading scales for evaluating the level of knowledge were 0–14. Average level of knowledge was  $7.61 \pm 2.56$ , lowest mark was 0 and highest mark was 14, with the median score of 8.00 (Table 1). The analysis showed that the respondents were being informed about CBCT through varied methods, including university courses by 23 participants; internet and personal studies by 54 participants; learning by seminars by 118 participants, and 132 participants learned about this technique through other methods.

**Table 1:** Demographic information of the participants

Level of education	M	F	age of participants	Duration of occupation
General physician	285	163	122	Between 24-72
Specialist	42	23	19	Between 1-45
Number of participants			327	

M: Male, F: Female

The statistical analysis did not show any significant correlation between the level of the knowledge and gender ( $p = 0.33$ ), age ( $p = 0.54$ ), duration of the occupation ( $p = 0.88$ ), and the training of CBCT ( $p = 0.82$ ). A significant relationship was seen between the level of the education (general or specialist [ $p = 0.002$ ]), interest of the dentists in training CBCT ( $p = 0.009$ ) and utilization of this technique ( $p = 0.000$ ) (Table 2).

The questionnaire and numbers of correct and incorrect answers for each question are enclosed.

**Table 2:** Comparison of the knowledge scores of the dentists with different variables

Variables	Mean	Standard Deviation	p-value	
Gender	Male	7.73	2.55	0.33
	Female	7.46	2.57	
Duration of the occupation	7.61	2.52	0.88	
Training of CBCT	7.68	2.35	0.82	
Level of the education	Specialist	8.73	2.23	0.002*
	General	7.45	2.56	
Interest of the dentists in training with CBCT	7.78	2.54	0.009*	
Utilization of this technique	8.18	2.26	0.000*	

Student's t-test and Spearman correlation coefficient test

## Discussion

Improvements in computer sciences and detector technologies resulted in CBCT imaging being accessible to dental staff for more reliable diagnosis and treatment planning in many fields of dentistry such as oral surgery, endodontics and orthodontics.<sup>(3,4)</sup>

Chau et al., compared typical patient radiation doses delivered in implant imaging with spiral CT, conventional spiral tomography and CBCT. They reported that CBCT delivers the lowest

radiation doses to the organs, whereas spiral multi-slice CT delivers the highest.<sup>(5)</sup>

The highest attainable score for knowledge was 14 in this research, while the mean scores were 7.45 for general dentists and 8.73 for specialists, which are classified as weak to moderate. Similarly Kamburog et al. reported that the level of knowledge of Turkish dental students regarding CBCT indications was poor.<sup>(6)</sup>

Balabaskaran and Srinivasan claimed that 18% of dentists are not aware of indications of CBCT in dentomaxillofacial region.<sup>(7)</sup>

Reddy et al., found that most general dentists are not aware of the CBCT method, and most cases of CBCT were prescribed for dental implant planning (23.6%), followed by cyst and tumor evaluation (8.1%).<sup>(8)</sup>

Our results did not show a significant difference between gender and level of awareness. On the other hand, specialists demonstrated a higher level of knowledge about CBCT. Torabi also stated that there is a significant difference between specialist and general dentists, in prescription of CBCT. The difference may be due to the characteristics of the specialist's job. For example, a maxillofacial surgeon is evidently more involved in various modalities of three-dimensional imaging compared with a general dentist. But if the advantages of CBCT are clear over other methods of imaging, it should not be limited to specialty branches and comprehensive training must return the real and logic role of this modality.<sup>(9)</sup>

Tofangchiha et al., reported that 4% of the Qazvin dentists had very low level of knowledge regarding CBCT indications, with 16% having low, 50% medium, 14% good, and 11% having very good knowledge. They also found a significant reverse relationship between the level of knowledge and age and the years of employment. Specialists were showed to be more knowledgeable about CBCT, and gender had no effect on this knowledge.<sup>(10)</sup> Mehdi Zadeh et al.,<sup>(11)</sup> found that there is a significant difference between the years of graduation and the adequate radiographic orders by increasing the time after graduation and consequently, it may diminished the level of the knowledge. The three-dimensional data of dental structures and related anatomy free of superimpositions helped the dentists to diagnose

sophisticated cases more reliably and plan more beneficial treatments. This is in agreement with ours in most instances.

Shetty et al., reported that all Indian dentists are aware of CBCT and consider it to be a useful diagnostic tool in dentistry. Most of the dentists (89%) prefer CBCT for implant insertion.<sup>(12)</sup>

The results of the current research did not agree with the results of the study by Shetty.

There was no significant difference in the knowledge of individuals with different years of employment. This was similar to Bardal's study comparing dentists that graduated previously with those that had recently graduated, regarding prescription of intra-oral radiology and panoramic views. Bardal's research showed that there was an opposite relation between years of graduation and the proper imaging technique prescription.<sup>(13)</sup>

Cesur et al.,<sup>(14)</sup> evaluated knowledge of and attitudes toward digital radiography and CBCT among orthodontists in Turkey. Many of them (56.3%) used CBCT during orthodontic diagnosis. The most frequently cited indication for CBCT was determination of impacted teeth and other oral abnormalities, followed by cleft lip and palate; most orthodontists believed that CBCT lectures should be included in the clinical phase of dental education and in the main, all of them indicating a willingness to learn more about CBCT. These data showed that the preference of using CBCT for evaluation of oral and craniofacial anomalies will likely increase commensurately with greater technical competence. Using a self-administered questionnaire, Ezodini et al.,<sup>(15)</sup> conducted a descriptive cross-sectional study including 134 general dentists and dental specialists to assess their level of knowledge pertaining to prescription of radiographs. Their level of knowledge was compared in each section on the basis of gender and educational status. Participants showed a high level of awareness in prescription of panoramic, periapical radiographs and computerized tomography. There was no difference in level of knowledge between genders. The level of knowledge in specialists was higher than general dentists except for using X-ray for patients susceptible to caries. They also found that specialist dentists were more knowledgeable than general dentists in prescribing radiological examinations.

The results of this study showed the relative unfamiliarity of dentists with CBCT imaging techniques in our country. The mean grade achieved by participants was about 60% of the total score. This means that there are many misunderstandings about CBCT sciences including basic principles, versatility, indications, and contraindications. This must be compensated for with new training protocols during and after graduation of dental staff. The fact that a high percentage of general dentists' knowledge is not at suitable levels showed that postgraduate programs should also be improved.

In the present study, the most incorrectly answered question was about the lower visibility of soft tissues in CBCT comparing CT scan. Many dentists thought that soft tissue are more visible in CBCT than CT. This is a basic concept in CBCT, which may lead to inappropriate prescription of the technique, which would be accompanied by unnecessary fees and radiation to the patient.

Fortunately there was a good knowledge about not using CBCT as a screening tool instead of panoramic or bite wing views regardless of relatively lower radiation dose to the patient.

## Conclusion

This research showed that dentists in Iran had an average level of knowledge regarding CBCT. It is recommended that qualifying programs be held for dentists and dental students to increase the knowledge toward CBCT.

## Conflict of Interest

Authors declare no conflicts of interest.

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The final version of the questionnaire and the results based on the collected responses

Question	Correct	Incorrect	Other answers	
Q1 = Are you aware of the mechanism of CBCT images?	128	199		
Q2 = Do you ever use this technique in your practice?			177used	150 not used
Q3 = Do you know if the radiation dose of CBCT is higher or lower than CT scan?	243	88		
Q4 = The soft tissue visibility of CBCT is higher or CT scan?	81	246		
Q5 = Which image do you recommend for 3D view in order to diagnose the fracture of the jaws?	191	136		
Q6 = Can we use this technique for caries detection?	206	121		
Q7 = Is it logical to use this image for diagnosis of peri-apical lesions?	212	115		
Q8 = What is the preference of this method compared with CT?	177	151		
Q9 = How did you become familiar with this technique?			132 the University	54 CD
Q10 = Did you attend any course related to CBCT?			63trained	Not trained 264
Q11 = Are you willing to obtain any updating information regarding CBCT?			269yes	58 no
Q12 = Is it logical to use this image for diagnosis of vertical root fractures?	155	172		
Q13 = Can we use this technique as a routine method for detection of periodontal bone loss?	155	172		
Q14 = Is it reasonable to use this technique in detecting the closure of impacted teeth to mandibular canal?	250	77		
Q15 = Is it reasonable to use this technique in detection of the residual roots in relation to the floor of the maxillary sinus?	228	99		
Q16 = Is it logical to use this image for detection of the condylar position in glenoid fossa?	154	173		
Q17 = Can we use this technique as a routine screening method (such as BW or OPG)?	212	115		
Q18 = Can we use CBCT as a proper method for enhancement of orthodontic treatments?	96	231		