Knowledge, attitude, and practice among dental practitioners about cone-beam computed tomography and its applications in dentistry – A cross-sectional study

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ABSTRACT

Introduction: Cone-beam computed tomography (CBCT) is a radiographic imaging method that allows accurate, three-dimensional imaging of hard tissue structures. CBCT is the most significant among the diagnostic imaging modalities that have emerged recently. The imaging produced in CBCT is capable of providing higher diagnostic quality, with shorter scanning times. Aim and Objective: This study aims to assess the knowledge, attitude, and practice on dental practitioners about CBCT and its applications. Materials and Methods: A questionnaire was prepared to assess knowledge, attitude, and practice on CBCT and its applications in dentistry. The questionnaire was distributed to 100 dental practitioners who included both general dentists and specialty dentists. The results were collected and statistics was tabulated using Chi-square test. Results: About 56% of dental practitioners felt that CBCT was necessary in their workplace and 69% rely on radiologist for interpreting the images. 87% prefer CBCT over CT to study maxillofacial region. They prefer CBCT for implant placement (44%), maxillofacial trauma (39%), and locating accessory canals (20%). Conclusion: From this study, we come to know that the dental practitioners have adequate knowledge about CBCT and its applications in dentistry and more practice is recommended.

KEY WORDS: Attitude, Cone-beam computed tomography, Dental practitioners, Survey

INTRODUCTION

Cone-beam computed tomography (CBCT) is a radiographic imaging method that allows accurate, three-dimensional (3D) imaging of hard tissue structures. CBCT is the most significant among the diagnostic imaging modalities that have emerged recently. The imaging produced in CBCT is capable of providing higher diagnostic quality, with shorter scanning times. Furthermore, the radiation exposure is very less when compared to conventional CT, CBCT is 10 times lesser than from conventional CT scans in maxillofacial region. On comparison with CT, CBCT has high accuracy and sensitivity and can capture the maxilla and mandible in a single rotation of the X-ray source. CBCT is the most significant among the medical diagnostic imaging modalities that have emerged recently. CBCT has gained increased acceptance as a 3D imaging modality offering an alternative to CT, especially in the maxillofacial area. CBCT has many applications in oral and maxillofacial surgery, the most important application is to investigate the exact 3D location of pathologies of jaw such as inflammatory bone lesions and benign or malignant tumors, to investigate the location of supernumerary teeth, to assess impacted teeth, to evaluate bone grafts, and to assess their in relation to vital structures. CBCT also has many other important applications such as evaluating the morphology of defect, cleft size, volume of graft material necessary for repair, arch segment positioning, quality of bone graft over a period of time, evaluation of dental age, and overall facial growth in cleft lip and palate cases. Contrast-enhanced CBCT images have been used in treatment adaptation for tumor visualization and have led to improved treatment outcome in case of radiotherapy treatment. CBCT plays an important role in investigating and diagnosing apical lesions, few research studies have
shown that contrast-enhanced CBCT images can be used for differentiating between apical granulomas and apical cysts by measuring the density of lesion.\textsuperscript{[10]} It also helps in differentiating the lesions of endodontic and non-endodontic origin, vertical fractures, accessory canals are diagnosed with CBCT.\textsuperscript{[11]} Since CBCT has greater accuracy with measurements at lower radiation doses, it has become a preferred option in implant dentistry.\textsuperscript{[12]} One of the important features of CBCT is virtual implant planning, this helps clinicians to predict and visualize the end result before beginning the treatment.\textsuperscript{[13]} CBCT has an improved visualization of the depth, height, and morphology of the defects and also allows analysis of buccal and lingual surfaces.\textsuperscript{[14]} The important factor in the field of forensic science is estimation of dental age, CBCT helps in performing non-invasive method of dental age assessment.\textsuperscript{[15]} Despite these advantages, implicating it in clinical practice may vary so our study aimed to assess knowledge, attitude, and practice among dental practitioners about CBCT and its applications in dentistry.

**MATERIALS AND METHODS**

The study was conducted by conducting a survey on CBCT to assess the knowledge, attitude, and practice among dental practitioners. A questionnaire containing 10 questions assessing knowledge, attitude, and practice about CBCT and its applications was prepared. The questionnaire was distributed to 100 dental practitioners who included both general and specialty dentist working in a private dental hospital, Chennai. The results were statistically analyzed with Chi-square test using SPSS (5.0) and the results were tabulated.

**RESULTS**

From the results obtained from the study, majority (55%) of dental practitioners who filled this survey were male and the rest were female. Maximum (78%) of the dental practitioners were general practitioners and few of them were specialty dental practitioners. Most (82%) of the dental practitioners felt that CBCT was necessary in a working place for various purposes [Figure 1]. Majority (56%) of them advised CBCT in their routine cases for more details. Maximum (69%) of the dental practitioners rely on radiologist for interpreting the images recorded by CBCT. Most (87%) of the practitioners think that CBCT is more preferred than CT in maxillofacial region. Many (70%) of the practitioners were aware of different sizes of field of view (FOV) used in CBCT in imaging maxillofacial structures. Only some (49%) of the practitioners were aware of guidelines (SEDENTEX CT) for the usage of CBCT. CBCT has several uses which includes for implant placement, to analyze maxillofacial trauma, for locating accessory canals, and to know the extent of pathology. Many practitioners thought that CBCT is used for all the above uses [Figure 2] and especially more preferred for implant placement (44%), analyzing maxillofacial trauma (39%), and locating accessory canals (20%). Almost 94% of dental practitioners were aware of radiation exposure that occurs while taking radiographs. Each radiograph technology has radiation exposure, but it varies, maximum of the practitioners thought that CT has more radiation exposure which is followed by full mouth series, orthopantomograph, intraoral periapical radiograph, and CBCT. Most of the dental practitioners felt that council for doctoral education or workshop should be conducted to enhance knowledge about CBCT.

**DISCUSSION**

The need for CBCT has been extended in fields of diagnosis and treatment planning. The clinical applications of CBCT in fields of dentistry have been increased tremendously. The presence of CBCT has now become necessary in the present diagnostic imaging, and in this study, most number of dental practitioners had CBCT in their working place. The European Academy of Dental and Maxillofacial Radiology has issued guidelines for the use of CBCT technology in Europe.\textsuperscript{[16]} The American Academy of Oral and Maxillofacial Radiology (AAOMR) has stated that dentists who plan to use CBCT in their practices must have proper knowledge of head and neck anatomy as it appears on the images, as well as the ability to recognize normal variants and disease.\textsuperscript{[17]} CBCT scanners used in orofacial imaging were first employed by Arai et al. and Moshiri et al. and since then, CBCT has become a preferred imaging modality for various pathologies of maxillofacial region and treatment needs in dentistry.\textsuperscript{[18-20]}

Li et al. demonstrated the effects of TB on the upper airway morphology in growing individuals with Class II division 1 malocclusion as well as mandibular retrusion and also in comparison with the controls through 3D reconstructive assessment.\textsuperscript{[21]} Studies also reported dimensional variations in the oropharynx followed by any treatment related to mandible.\textsuperscript{[21-23]} Eggensperger et al. found a significant relation between the horizontal variation in hyoid bone position and movement of the mandible in relation to mandibular advancement treatment. Therefore, he proved that the hyoid bone’s horizontal movement is an indicator of the mandibular translocation.\textsuperscript{[24]} Through a longitudinal study, Sheng et al. demonstrated the positioning of the hyoid bone from the mixed dentition period to the young adult stage and found that the hyoid bone moved downward as the age grows.\textsuperscript{[25]} Ahlowalia et al. tested
the accuracy of CBCT for volumetric measurement of simulated periapical lesions and concluded that CBCT is an accurate means of making volumetric measurements of artificially created cavities within bone with the use of appropriate software and training.[26] Sisman et al. demonstrated that since CBCT has low radiation dose and shows fine details and superior features in distinguishing suspicious radiolucent lesions of the mandible, it might be used for diagnosis of SBC.[27] Katz et al. demonstrated that there was a definitive diagnosis of SBC provided, due to the detailed information given by CBCT.[28] Inspire the advantages, there are inherent limitations of CBCT such as poor soft tissue resolution and image artifacts. Hence, dental practitioners should have adequate knowledge regarding usage of CBCT in imaging maxillofacial region to obtain image of diagnostic quality.

CONCLUSION

From this study, we conclude that there is adequate knowledge in attitude regarding CBCT and its applications in dentistry. However, more emphasis should be given for bringing this into practice this can be achieved by continuing dental education programs and hands-on workshops for the dental practitioners.

REFERENCES

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QUESTIONNAIRE
1. Gender
2. Specialty/Qualification
3. Do you have CBCT in your workplace?
4. Do you advise CBCT for diagnostic purposes in your routine cases?
5. Do you rely on radiologist for interpreting the images recorded by CBCT?
6. Do you feel CBCT is more preferred when compared to CT in maxillofacial region?
7. Are you aware of different sizes of FOV used in CBCT in imaging maxillofacial structures?
8. Are you aware of guidelines (SEDENTEX CT) for usage of CBCT?
9. In your opinion CBCT is preferred for
10. Do you have any idea about radiation exposure?
11. Which of the following radiological procedures has high radiation exposure?
12. Do you feel CDE or workshop should be conducted to enhance knowledge of CBCT?