IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 3 Ser.8 (March. 2021), PP 59-62
www.iosrjournals.org

Evaluation of the Use of Radiographic Images and Cone-Beam Computed Tomography in the Surgery of Impacted Teeth

Ali Mortazavi[1], Sedigheh Razi[2], Shahin Ebrat[*3]
1- Department of Oral and Maxillofacial Surgery, Faculty *of* Dentistry, *Tabriz University of Medical Sciences, Tabriz, Iran.*
2- Department of Oral and Maxillofacial *Radiology, Tabriz University of Medical Sciences, Tabriz, Iran.*
3- Student of Dentistry, Tabriz University of Medical Sciences, Tabriz, Iran. [*]

Abstract
Introduction: *An appropriate radiography is a requirement for extraction of the impacted teeth. Different sections of CBCT imaging have great importance and application in surgery of the impacted teeth and reducing the postoperative complications. The aim of this study is determining the type of radiographic image and the selected imaging section for extracting the impacted tooth and the selected imaging cross-sections by the surgeon.*
Materials and methods: *This descriptive-analytical study includes 86 surgeries on the impacted teeth performed by maxillofacial surgeons during March-August 2020 in Tabriz Faculty of Dentistry. The patients had undergone the CBCT radiography and one plain radiography (panoramic, periapical, etc.). The questionnaire was distributed among the maxillofacial surgeons. It included the questions on the application of P.A and panoramic radiographic stereotypes and different CBCT imaging sections. The surgeons completed the questionnaire according to the applicability of the relevant images and their connection to the adjacent vital structures. The results were reported as frequency. SPSS 16 was used to analyze the data.*
Results: *In this study, 86 different surgeries were performed on the impacted teeth by the maxillofacial surgeons. %100 of surgeons used the panoramic images for the impacted tooth surgery and more than %95 of surgeons introduced the panoramic images as the most widely-used image and suggested its prescription. %44.83 of surgeons used the cross-sectional CBCT and %68.97suggested this section for application and %71.26introduced it as the most practical section. Periapical images and parasagittal and axial imaging sections were the least-used ones among the various CBCT imaging sections.*
Conclusion: *Based on this study, the most widely-used images in the impacted dental surgeries were the panoramic images. CBCT is recommended to be prescribed, if the root and other anatomical variations are close to the critical and sensitive structures. Among the various aforementioned imaging sections, the most widely-used section was CBCT cross-sectional sections.*
Keywords: *Impacted Tooth, Panoramic, CBCT*

Date of Submission: 03-03-2021 Date of Acceptance: 17-03-2021

I. Introduction

There are several complications associated with extracting impacted teeth. The most common of these are alveolitis, infection, and numbness of the inferior alveolar nerve (2,1). However, it is observed that in case of extraction of the latent third molar, the most common permanent complication after surgery is lower alveolar nerve anesthesia (3-5). Having a proper radiograph is essential for the extraction of impacted teeth. Panoramic radiography gives the surgeon an accurate picture of the anatomy of the target area and is also the radio graph of choice for impacted wisdom tooth surgery. Periodical radiography can be acceptable if it shows us all parts of the impacted tooth and its connection to vital structures. The use of CBCT imaging is indicated if the roots of the impacted teeth are too close or overlap with adjacent vital structures such as the inferior alveolar canal. The path of the lower alveolar nerve canal can be seen through the ram us and mandibular trunk (6). CBCT imaging is accurate diagnostic imaging that is capable of producing accurate images with a resolution of less than a millimeter, which allows the examination of maxillofacial structures at a lower dose and cost than CT (Computed Tomography). Limitations of this imaging include image noise and poor soft tissue contrast. CBCT imaging is often used to remove impacted teeth when the information needed for diagnosis and treatment cannot be obtained from other radio graphic images (2, 1). In the study of Jung et al. (2014), it was found that the highest visibility of the lower alveolar canal is in the molars and the degree of visibility of the neural canal can be related to the Methodist position of the neural canal (7). Alexander et al. Concluded that regardless of the different models of dental occlusion and the location of the inferior alveolar canal, the sharpness and visibility

of the neural canal are excellent in most cross-sectional images and CBCT imaging is the best diagnostic tool to track the position of the inferior alveolar canal (8). In the study of Matzen et al. (2014) it was concluded that in the majority of cases of extraction of impacted wisdom teeth, panoramic and periodical radiography is sufficient and used only when there is a sign of close contact between the tooth and the mandibular canal. It is indicated by CBCT imaging (9). CBCT imaging technique is more accurate than panoramic radiography to determine the exact position of impacted teeth and its relationship to vital structures. According to the studies that have mostly done the difference between panoramic radio graphs and CBCT in the field of relationship of impacted teeth with vital structures, no specific study has been done on the type of CBCT imaging sections and the use of each section. Also, surgeons' satisfaction with the applicability of CBCT images in the radiology department has not been evaluated. The aim of this study was to evaluate the type of radiography selected for latent extractions and the effect of different CBCT imaging sections in this process.

II. Materials And Methods

The present study was performed as a number of all impacted dental surgeries performed in Tabriz Dental School during March-August 2020. The statistical population included 86 different surgeries of impacted teeth. The data collection form was provided to all relevant maxillary surgeons. The patients had CBCT radiography and one of the plain radio graphs (panoramic, periodical, etc.). The questionnaire included questions about the use of different types of P.A. and panoramic radio graphic stereotypes and different CBCT imaging sections. The various sections of CBCT imaging questioned included axial, coronal, parasitical, and cross-sectional. The surgeons filled in the relevant questionnaire according to the applicability of the imaging type for extracting the impacted tooth. The questionnaire included questions about the use of radio graphic images as well as the type of optimal CBCT imaging section in the extraction of impacted teeth and its evaluation with adjacent vital structures. All panoramic images were obtained by P-αRAYSCAN Dental X-ray System (DR Imaging System) and Scanner 2.0.1 software. All images were taken by a technician. The images were prepared by NewtomVGi cone beam (Verona / Italy) in the Department of Oral and Maxillary Radiology, Tabriz Dental School of Medical Sciences. The initial and final reconstruction was by NNT Viewer software version 8. The irradiation conditions of the device were adjusted automatically. The results of the study were reported frequently. SPSS 16 software was used for data analysis.

III. Results

In this study, 86 different impacted dental surgeries were examined, of which the target population included 47.67% women and 52.33% men. The results of Table 1 show that 100% of surgeons used panoramic surgery for impacted teeth. 96.55% mentioned the reason for not using other images as unnecessary images. 96.55% of surgeons suggested prescribing panoramic images to remove impacted teeth. And 96.55% mentioned the most practical images as panoramic images. The results of Table 2 show that 44.83% of surgeons used CBCT cross-sectional section. 40.23% of cross-sectional surgeons rated CBCT as more helpful. 68.97% suggested CBCT cross-sectional section for use and 71.26% introduced CBCT cross-sectional section as the most practical section. Also, 39.08% of surgeons reported paras ital section and 24.14% of axial section as sections that were not needed. In this study, periodical images and axial and paras ital sections of CBCT imaging technique were the least used in the field of impacted dental surgery.

Table no1- Frequency of selected and applied radiography for impacted dental surgery

CBCT	panoramic	P.A		
47	87	5	Number	Which image or images did you use for impacted tooth surgery?
54.02	100	5.75	Percent	
16	84		Number	Which image or images were used the most ?
18.39	96.55		Percent	
3	84		Number	Which of the following is the most useful image used ?
3.45	96.55		Percent	

Table no2 - Frequency of CBCT cross-sectional sections suitable and practical for impacted dental surgery

Cross-sectional	Coronal	Parasacital	Axial		
39	22	12	2	Number	Sections used in imaging CBCT
44.83	25.29	13.79	2.30	Percent	
35	13	5	1	Number	Assistive sections in CBCT imaging

40.23	14.94	5.75	1.15	Percent	
6	4	34	21	Number	Unnecessary CBCT imaging sections
6.90	4.60	39.08	24.14	Percent	
62	19	14	1	Number	If using CBCT, which one was the most useful imaging section?
71.26	21.84	16.09	1.15	Percent	

IV. Discussion

The aim of this study was to evaluate the application of radio graphic images and computed tomography imaging sections in cone denture surgery. The results showed that 100% of surgeons used panoramic surgery for impacted teeth. And more than 95% of surgeons suggested prescribing panoramic images and mentioned it as the most practical image used in these surgeries. Moshfeghi et al. Stated that panoramic radiography can be used as the most accessible and reliable method, because due to its negative predictive value, it can be used with 97.3% accuracy if the root canal connects with the lower alveolar canal. Show (10). According to Motatepour Taji et al., There is also a strong relationship between the panoramic diagnostic value in cases of end-root occlusion and interference with the mandibular canal border with CBCT diagnosis in terms of close contact with the canal (11). Bell et al. Also examined the correlation between panoramic radio graphic findings and CBCT findings in assessing the relationship between the latent third molar of the mandible and the mandibular canal and concluded that root canal obstruction and interference with the mandibular canal border seen on radiography They are effective in creating a high risk of communication between the roots of the teeth and the mandibular canal (12). Peker et al. Also compared the findings of panoramic radiography and CBCT in preoperative assessments of mandibular third molars and concluded that close contact between the molar roots was more likely to occur when root canal fusion or interference with the canal border was observed on panoramic radiography. There is a third incisor and a lower dental canal in the CBCT (13). One of the reasons for the widespread use of panoramic can be its ease of use. Nikneshan et al. In the study of prescribing panoramic radiography in Tehran dentists showed that ease of use was the reason for prescribing in 44% of cases and in 57% of cases the reason for prescribing / availability of panoramic radiography (14). The cases mentioned in these studies can be one of the reasons for choosing 100% panoramic images by the studied surgeons. However, there are some studies that show a higher diagnostic power of CBCT compared to panoramic. In a study by Terakado et al., Comparing the diagnostic power of panoramic radiography and CBCT in predicting the relationship between the mandibular third molars and the lower dental canal, the result was that a panoramic radio graph was compared. With CBCT, it is less accurate and has a higher risk of nerve damage (15). Maverna and colleagues believed that CT and CBCT provide information that does not come from conventional radio graphs (16). Tannery et al. Also recommended the use of CBCT for accurate preoperative measurements (17). Kim et al. Concluded that CBCT is as efficient as anatomical incisions in measuring the apex distances of posterior teeth to the mandibular canal (18). Cross-sectional views in CBCT are usually the selective and accurate technique in examining the relationship between teeth and sinuses and are used as a gold standard in many studies (19). In the present study, 44.83% of surgeons used CBCT cross-sectional section. 40.23% rated this section as more helpful. 68.97% of the surgeons suggested this section for use and 71.26% introduced it as the most practical section. Fahimzad stated that observing the canal in the distal mental for amen is more difficult in all methods than in other areas. Due to the less ability of panoramic images to view the canal, especially in the area of premolars and molars, especially in the upper border, CBCT images are used and between CBCT sections, the cross-section method has a better ability than the similar panoramic method in channel display (20). Hekmatian et al. Using ramex 3D CBCT device in comparison with the comparison of the apex distance of posterior maxillary teeth to the floor of the sinus in two cross-sectional and panoramic views in CBCT images concluded that there is a significant difference between cross-sectional and panoramic views There is, and the panoramic view always shows the distance from the tooth apex to the floor of the sinus more than the cross-sectional view (21). The results of the study by Hansen et al. Showed that the use of images with longer sections in CBCT is helpful in determining the more accurate location of the mandible and that observing the alveolar crest is much easier than the mandibular canal (22). Vannier et al. Showed that the difference between CBCT scanners depends on the type of detector and the image processing algorithm, and that the X-ray source, dose, display screen, and image processing software have little effect on image accuracy. In addition, the results of this study showed that new methods of CBCT image reconstruction have several advantages in craniofacial imaging and can reduce surgical problems (23). Mehdizadeh's study also showed that the position of the mandibular canal was different in different views of CBCT imaging and to determine the horizontal and vertical relations of the nerve related to the tooth, only one particular section can be used and for more detailed study, different sections of CBCT are needed. Be (24). The above studies were consistent with the results of the present study and indicated the superiority of CBCT imaging over other routine imaging in cases of overlapping vital structures with impacted teeth. According to this study, panoramic imaging is sufficient for the majority of

impacted dental surgeries and does not require additional imaging. If close contact between vital structures and impacted teeth is observed, the use of CBCT imaging is required. Among the various imaging sections, the cross-sectional section provides the best and most accurate information about the relationship of adjacent structures to each other to maxillary surgeons. And puts the face. One of the limitations of the present study was the lack of review of surgeons' opinions based on work experience and the type of occlusion of the studied teeth.

V. Conclusion

Based on this study, the most widely-used images in the impacted dental surgeries were the panoramic images. CBCT is recommended to be prescribed, if the root and other anatomical variations are close to the critical and sensitive structures. Among the various aforementioned imaging sections, the most widely-used section was CBCT cross-sectional sections.

Reference:

[1]. White SC. Oral Radiology: Principles and Interpretation, 7th ed. Mosby, London. 2014.
[2]. Scarfe WC, Farman AG. What is cone-beam CT and how does it work? Dental Clinics of North America. 2008;52(4):707-730.
[3]. Carmichael F, McGowan D. Incidence of nerve damage following third molar removal: A West of Scotland Oral Surgery Research Group study. British Journal of Oral and Maxillofacial Surgery. 1992;30(2):78-82.
[4]. Bataineh AB. Sensory nerve impairment following mandibular third molar surgery. Journal of oral and maxillofacial surgery. 2001;59(9):1012-1017.
[5]. Jerjes W, Swinson B, Moles D, El-Maaytah M, Banu B, Upile T, et al. Permanent sensory nerve impairment following third molar surgery: a prospective study. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2006;102(4): e1-e7.
[6]. Hupp J, Tucker M, Ellis E (2014). Contemporary Oral and Maxillofacial Surgery, 6th ed. Elsevier, Louis, 159-166.
[7]. Jung Y-H, Cho B-H. Radiographic evaluation of the course and visibility of the mandibular canal. Imaging science in dentistry. 2014;44(4):273-278.
[8]. Alkhader M, Jarab F. Visibility of the mandibular canal on cross-sectional CBCT images at impacted mandibular third molar sites. Biotechnology & Biotechnological Equipment. 2016;30(3):578-584.
[9]. Matzen LH, Wenzel A. Efficacy of CBCT for assessment of impacted mandibular third molars: a review–based on a hierarchical model of evidence. Dentomaxillofacial Radiology. 2015;44(1):20140189.
[10]. Moshfeghi M, Ghaznavi A, Mohseni M, Nikneshan S. The Ability of Panoramic Radiography in Determining the Relationship of Mandibular Third Molar Roots with the Inferior Alveolar Canal. The Journal of Islamic Dental Association of IRAN (JIDA). 2013;25(3):206-210.
[11]. Purtaji B, Salehifard N, Purtaji M. Comparison of panoramic radiography findings with CBCT findings in evaluation of the relation of impacted mandibular third molar tooth and inferior alveolar canal. The Journal of Qazvin University of Medical Sciences. 2017;21(2):50-56.
[12]. Bell G. Use of dental panoramic tomographs to predict the relation between mandibular third molar teeth and the inferior alveolar nerve: Radiological and surgical findings, and clinical outcome. British Journal of Oral and Maxillofacial Surgery. 2004;42(1):21-27.
[13]. Peker I, Sarikir C, Alkurt MT, Zor ZF. Panoramic radiography and cone-beam computed tomography findings in preoperative examination of impacted mandibular third molars. BMC oral health. 2014;14(1):71.
[14]. Nikneshan S, Iranloo F, Sarikhani S, Moshfeghi M. The Consistency of Panoramic Radiography Selection Criteria by Dentists in Tehran with the FDA Guidelines. Journal of Islamic Dental Association of Iran. 2013;25(4):266-271.
[15]. Terakado M, Hashimoto K, Arai Y, Honda M, Sekiwa T, Sato H. Diagnostic imaging with newly developed ortho cubic super-high resolution computed tomography (Ortho-CT). Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2000;89(4):509-518.
[16]. Maverna R, Gracco A. Different diagnostic tools for the localization of impacted maxillary canines: clinical considerations. Progress in orthodontics. 2007;8(1):28-44.
[17]. Dabbaghi A, Razavi M, Shirafcan S, Haghighizadeh M H. Canal position in Cross Sectional Cone Beam Computed Tomography. Jundishapur Science Medical Journal. 2014;13(4):445-455. [In Persian]
[18]. Kim TS, Caruso JM, Christensen H, Torabinejad M. A comparison of cone-beam computed tomography and direct measurement in the examination of the mandibular canal and adjacent structures. Journal of endodontics. 2010;36(7):1191-1194.
[19]. Hashimoto K, Kawashima S, Kameoka S, Akiyama Y, Honjoya T, Ejima K, et al. Comparison of image validity between cone beam computed tomography for dental use and multidetector row helical computed tomography. Dentomaxillofacial Radiology. 2007;36(8):465-71.
[20]. Fahimzad M S. Evaluation of mandible can be seen in panoramic radiography and cross sectional CBCT and CBCT similar to panoramic. [In Persian]
[21]. Hekmatian E, Mehdizadeh M, Iranmanesh P, Mosayebi N. Comparative evaluation of the distance between the apices of posterior maxillary teeth and the maxillary sinus floor in cross-sectional and panoramic views in CBCT. Journal of Isfahan Dental School. 53-2014:145.
[22]. Lofthag-Hansen S, Gröndahl K, Ekestubbe A. Cone-beam CT for preoperative implant planning in the posterior mandible: visibility of anatomic landmarks. Clinical implant dentistry and related research. 2009;11(3):246-255.
[23]. Vannier M. Craniofacial computed tomography scanning: technology, applications and future trends. Orthodontics & Craniofacial Research. 2003; 6:23-30.
[24]. Mehdizadeh M, Ahmadi N, Jamshidi M. Evaluation of the relationship between mandibular third molar and mandibular canal by different algorithms of cone-beam computed tomography. Journal of Isfahan Dental School;90-2014:183 .

Ali Mortazavi, et. al. "Evaluation of the Use of Radiographic Images and Cone-Beam Computed Tomography in the Surgery of Impacted Teeth." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(03), 2021, pp. 59-62.