

# Comparison of Eruption Level of Third Maxillary Molars in Cone Beam Computed Tomography and Panoramic Images in Patients Referred to the School of Dentistry of Tabriz University of Medical Sciences in 2017-2020

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### ABSTRACT

**Introduction:** Surgical extraction of third maxillary molar can have serious complications. By identifying the factors influencing the success of maxillary third molars surgery, accidents during surgery as well as postoperative complications can be prevented. Considering that knowledge of eruption level type of maxillary third molars is one of the most important factors in the success of tooth extraction surgery. The aim of this study is to examine and compare the type of eruption level in CBCT ( ) cone beam computed tomography and Panoramic radiographs in the population of patients referred to the Department of Oral and Maxillofacial Radiology, Tabriz School of Dentistry.

**Materials and Method:** This study is a descriptive-analytical cross-sectional study on 395 patients who referred to Tabriz School of Dentistry between 2017 and 2020 and had both CBCT images and panoramic radiographs records. The eruption levels of the maxillary third molars relative to the occlusal plane of the adjacent molars in CBCT and panoramic radiographs were examined and compared by a radiologist based on the Pell & Gregory system. Descriptive statistics and chi-square test were used to report and analyze the data.

**Results:** In this study, on both sides of the maxilla, the most common eruption levels of the third molars in both panoramic and CBCT images were: level A, level B, and level C, respectively. Levels B and C on the left were more common, while on CBCT images levels A and B on the right and surface C on the left were more common. Also, comparison of Eruption Level A, B, C in CBCT and panoramic images showed that the eruption level of the third molar on both sides of the maxilla were significantly different ( $P < 0.05$ ).

**Conclusion:** It is recommended that CBCT images replace panoramic radiographs or be used in conjunction with panoramic radiographs as a reassuring method.

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### Introduction

The most common impacted teeth are maxillary and mandibular third molars, followed by maxillary canines and mandibular premolars [1]. Despite racial differences in eruption sequence, third molars are the last teeth to grow in most breeds [2]. Impacted teeth must be surgically removed from the oral cavity due to

various problematic complications. The presence of the third molars reduces the amount of bone in the distal second molars adjacent to it, and sometimes, in addition to periodontal problems, pressure from the third molars on the root of the adjacent tooth and causes root resorption. Also, benign cysts and tumors can form around them, so that these cysts gradually grow and cause destruction, weakening, and even bone fractures. In addition, they can cause pain of unknown cause and spread to the head and neck area [1]. However, timely removal of the third molar makes

healing more possible and prevents these problems; On the other hand, extraction of the third molar may lead to complications such as intraosseous defects in the distal molar and periodontal problems for the teeth adjacent to the surgical site. The difficulty of surgically extracting third molars depends specifically on the position of the tooth [3].

Among molars, it is more difficult to extract third maxillary molars that are deeper than the CEJ of the second maxillary molars [4]. Surgical removal of the third maxillary molar, which is in contact with the root of the adjacent second molar, is also difficult [5] and can be moved into the buccal space, the trigeminal space, or the lateral pharyngeal space. In addition, it is more likely to move into the maxillary sinus in the deep maxillary third molars [6]. Displacement of the maxillary third molars occurs due to inadequate clinical examination and radiography, inadequate surgical technique, insufficient vision, and excessive force exerted while extracting [7], among which, lack of clinical examination and adequate radiographs are important factors. Which lead to the displacement of the third molar. Accuracy of radiography is essential in locating the tooth before extracting and locating the displaced tooth [8]. Preoperative evaluation of the maxillary third molar should also include morphological details of the tooth and its relationship to the surrounding structures and tissues [8]. Before performing third molar extraction surgery, radiographic examinations to determine the eruption level of these teeth play a very important role in guiding the surgical path for different types of third molars with different eruption levels [2]. Panoramic radiography is the most common technique used to view impacted teeth is due to the difficulty of accurately assessing the position of the roots and their relationship to the maxillary sinus and the angle of the third molar, cone beam computed tomography (CBCT) has the ability to provide more accurate information about the position of the third molar [9,10]. In recent years, the technique of CBCT has become an alternative and very important diagnostic tool in dentistry. The use of CBCT radiography along with panoramic radiography can provide complete information to the dentist about suspected cases affecting the displacement of the third maxillary molars and prevent complications after surgery of this tooth [11,12]. Due to the fact that determining the eruption level of maxillary third molars has a very important role in guiding the surgical path for different types of third molars with different eruption levels, so far not enough studies have been done in this field. On the other hand, considering that the knowledge of the type of eruption level of the tooth is related to the prevention of accidents during extraction of the third maxillary molars and its postoperative complications, so we decided to examine and compare the type of eruption level in CBCT and Panoramic radiographs in the population of patients referred to the Department of Oral and Maxillofacial Radiology, School of Dentistry, Tabriz University of Medical Sciences.

### Materials and Method

This study was a descriptive-analytical cross-sectional study. Samples were selected from the archives of patients referred to the School of Dentistry of Tabriz University of Medical Sciences for the years 2017 to 2020. A total of 395 patients aged 20 to 60 years who referred to the third maxillary molar and had both CBCT and panoramic radiographs simultaneously in their file were included in the study.

### Exclusion Criterias Were

Inexistence of the second maxillary molars, Existence of pathological problems in the posterior maxillary teeth, Existence

of intense metal artifacts in radiographs, third maxillary molars with open apex, Panoramic images have a non-standard head adjustment technique.

The present study entered the implementation stage after the approval of the ethics committee of Tabriz University of Medical Sciences with the code: IR.TBZMED.REC.1399.444 and observing the relevant protocols. CBCT images of patients were prepared by New Tom VGi CT Verona Italy (made in Italy) in the Department of Oral and Maxillofacial Radiology, School of Dentistry, Tabriz University of Medical Sciences. This device has X-ray beam cone, flat panel detector 1920 \* 1536 pixels, 360-degree rotation, 18 seconds scan, maximum 110 kVp and FOV 15 \* 15. The initial and final reconstruction was performed by NNT Viewer version 8 software. The radiation conditions of the device are set automatically. Data obtained from CBCT were entered into the software. The images were displayed in a semi-dark room. Images obtained from patients were displayed on a Liquid Crystal Display (LCD) 19-inch Philips desktop computer (190B) (made in Taiwan) with a resolution of 1208 x 1024 and 32 bits, and the image in cross-sectional section with step = 2mm (distance Sections) and thickness = 2mm (section thickness) were prepared. Panoramic images by the Dental X-Ray system model P-Ray scan (made in South Korea) in conditions of 60/60 Hz, 60-90 kVp, 4-17 mA and Scanner2.0.1 software in the radiology department of the School of Dentistry of Tabriz University of Medical Sciences were prepared. The level of eruption of the maxillary third molars relative to the occlusal plane of the adjacent molars in CBCT and panoramic radiographs was assessed by an observer (radiologist). The assessments were based on the Pell & Gregory system at one of the following three levels [13]: Level A: At this level, the occlusal plan of the third maxillary molar is flush with the adjacent tooth. Level B: At this level, the occlusal plan of the tooth The maxillary third molar is between the occlusal plane of the adjacent tooth and the cervical line of the adjacent tooth. Level C: At this level, the occlusal plane of the third maxillary molar is more apical than the cervical line of the adjacent tooth. The statistical program used was SPSS version 22. Qualitative data were reported in frequency (percentage). Chi-square test was used to compare the findings of the images. In all cases, the results were found to be statistically significant if they had  $P < 0.05$ .

### Results

On both sides of the maxilla, the most common eruption levels of the third molars in panoramic images were: Level A, Level B, and Level C, respectively (Table 1).

**Table 1: All Type of Eruption Levels on Panoramic Images**

Left side of maxilla		Right side of maxilla		
Percent	Frequencies	Percent	Frequencies	
48.8	100	54.2	103	Eruption level A
27.3	56	25.3	48	Eruption level B
23.9	49	20.5	39	Eruption level C

According to Table 1, a comparison of the eruption level frequencies of the third molars between the left and right maxilla in the panoramic images showed that level A on the right was more frequent than on the left, while levels B and C on the left were more frequent than on the right.

On both sides of the maxilla, the most common eruption levels of the third molars in CBCT images were level A, level B, and level C, respectively (Table 2).

**Table 2: All Type of Eruption Levels on CBCT Images**

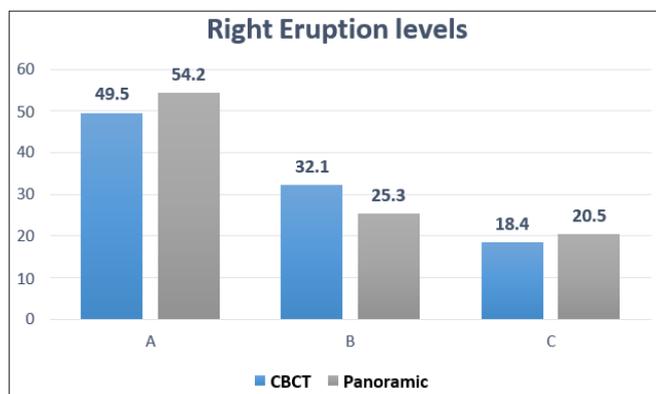
Left side of maxilla		Right side of maxilla		
Percent	Frequencies	Percent	Frequencies	
45.9	94	49.5	94	Eruption level A
30.2	62	32.1	61	Eruption level B
23.9	49	18.4	35	Eruption level C

As shown in table 2 Comparison of Eruption Level A, B, C in the third maxillary molar in CBCT and panoramic images by Chi-square test showed that the eruption level of the third molar on the right side of the maxilla was significantly different ( $P < 0.05$ ), as follows:

Of the 94 cases that showed CBCT images at level A, panoramic images showed 92 at level A and 2 at level B.

Of the 61 cases that showed CBCT images at level B, panoramic images showed 46 at level B, 11 at level A, and 4 at level C.

For level C alone, all 35 cases that showed CBCT images at level C also showed panoramic images at level C (Figure 1).



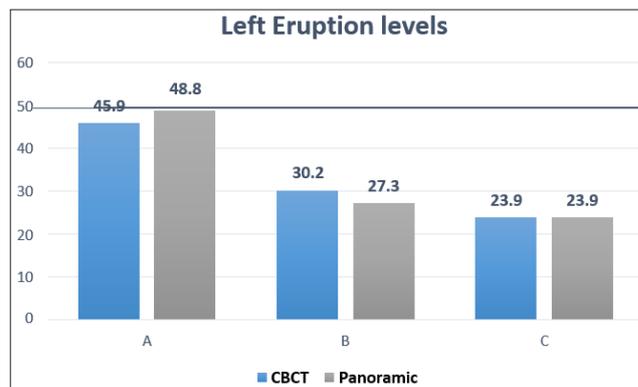
**Figure 1:** Eruption Level Comparison of the Third Molars on the Right Side of the Maxilla between CBCT and Panoramic Images

Comparison of Eruption Level A, B, C in the third maxillary molar in CBCT and panoramic images by Chi-square test showed that the eruption level of the third molar on the left side of the maxilla was also significantly different ( $P < 0.05$ ), as follows:

Of the 94 CBCT images at level A, 90 showed panoramic images at level A and 4 at level B.

Of the 62 cases that showed CBCT images at level B, panoramic images showed 49 at level B, 10 at level A, and 3 at level C.

Out of 49 cases that showed CBCT images at level C, panoramic images showed 46 cases at level C and 3 cases at level B (Figure 2).



**Figure 2:** Comparison of the Eruption Level of the Third Molars on the Left Side of the Maxilla between CBCT and Panoramic Images

### Discussion

The aim of this study was to compare the eruption level of third maxillary molars in CBCT and panoramic images in patients referred to the School of Dentistry of Tabriz University of Medical Sciences in 2017-2020. The findings of the present study showed that on both sides (right and left) of the maxilla, the most common eruption levels of the third molars in both panoramic and CBCT images were: level A, level B and level C, respectively, in panoramic images, level A on the right and levels B and C on the left were more common. Whereas, in CBCT images, levels A and B on the right and level C on the left were more common. Hashempour et al. based on panoramic radiographic images, showed that level A is the most common level of growth of third maxillary molars [13]. In the study of Al-Dajani et al. which was based on panoramic radiographic images, the findings indicated that the growth level of A was the most common eruption level of growth of the third molars [14].

In the study of Jung et al. Based on CBCT and panoramic images, levels A, C, and B were shown to be the most common growth surfaces of the maxillary third molars, respectively. They also stated that all third molars that did not have enough retromolar space had Eruption level C. The degree of sinus expansion in the buccal side of the roots is greater and there is a relationship between the amount of available retromolar space and the level of growth of the third maxillary molar [14].

Comparison of Eruption Level A, B, C in the third maxillary molar in CBCT and panoramic images in the present study showed that the eruption level of the third molar on the right side of the maxilla was significantly different from all CBCT images in level A. Panoramic images showed 98% at level A and 2% at level B. Also, of all the CBCT images shown at level B, panoramic images showed 75% at level B, 18% at level A, and 7% at level C. For level C alone, 100% of the CBCT images shown at level C showed panoramic images at level C. Also, the comparison of Eruption level A, B, C in the third maxillary molar in CBCT and panoramic images showed that the eruption level of the third molar in the left maxilla was also significantly different from each other, so that among all cases of CBCT images in level A Panoramic images showed 96% at level A and 4% at level B. Also, of all the CBCT images shown at level B, panoramic images showed 79% at level B, 16% at level A, and 5% at level C. Of the 49 cases that showed CBCT images at level C, panoramic images showed 94% at level C and 6% at level B. Studies by Hashempour et al., and Jung et al. showed that the type of radiographic images used to evaluate the third molar can make a difference in reporting the third molar angle [13,14].

Greater proximity between the third and second molar teeth is associated with increased complications of third molar surgery. The close distance between these teeth reduces the space between the distal surface of the second molar and the mesial surface of the third molar and prevents easy access to the third molar [3]. Jabbari et al. also stated in a review study that CBCT has a higher accuracy, sensitivity and spatial resolution and is very suitable for imaging hard tissues, so that CBCT can be the first imaging method. Trusted teeth should be used [12]. Also, Jung et al. stated that sinus extension to the buccal root was the most common pattern of maxillary third molars seen in CBCT images, while panoramic radiography superimposed the roots and floor of the sinuses. Considering the influence and role of other factors in the occlusion of third maxillary molars such as sex, number of roots and morphology of teeth [4,13,14]

### Conclusion

It is recommended that CBCT images replace panoramic radiographs or be used in conjunction with panoramic radiographs as a reassuring method.

According to the obtained results, it can be said that accurate diagnosis of eruption level of maxillary third molars, especially level C molars, plays an important role in performing a low-complication surgery, so it is recommended that CBCT images replace panoramic radiographs or with panoramic radiographs. Be used as a reassuring method.

### Competing Interests

The authors declare no conflict(s) of interest related to the publication of this work.

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### Authors' contributions

HM initiated, conceptualized, and supervised the research work. FF, SK, and ZT contributed to the design of the study. ZT performed data analysis and interpretation of data. ZT and HM and FE wrote the manuscript.

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### Ethics approval

This research was approved by the Research Ethics Committee of the Faculty of Dentistry with the code IR.TBZMED.REC.1399.444.

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