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Retrospective Evaluation of Impacted Positions of Permanent Teeth with Cone-Beam Computed Tomography

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Abstract

Objective: The aim of this study is to determine the localization of the impacted permanent teeth according to the Winter classification with cone-beam computed tomography and to evaluate the incidence among sexes.

Methods: Cone-beam computed tomography images were obtained from 471 patients whose request was impacted teeth were examined. The positions and localizations of the impacted permanent central, premolar, canine, and first, second, and third molar teeth were evaluated according to age and gender using the Winter classification.

Results: The distribution of the impacted tooth groups in this study was 62.2% third molar, 31.6% canine, 3.8% premolar, 0.4% incisor, and 0.2% first molar teeth. The study group's most common teeth were impacted in the vertical position at 40.1%. The impacted third molar teeth were found to be impacted most frequently in the vertical position. In contrast, the impacted canines were most frequently impacted in the mesioangular position with a rate of 51.0%.

Conclusion: It is necessary to know the position of the impacted teeth to determine the appropriate method of treatment for impacted teeth and to prevent complications during or after treatment. Cone-beam computed tomography appears to have a clinical contribution to the evaluation of impacted tooth positions and localizations.

Keywords: Cone-beam computed tomography, impacted canine, impacted third molar

INTRODUCTION

The term impacted tooth is used for teeth that are not placed in the arch in accordance with the eruption time. There are many factors that cause teeth to be impacted. Among these factors, local factors such as persistent deciduous teeth, pressure from adjacent teeth, long-standing inflammation in the surrounding mucosa, and jaw stenosis can be counted. Systemic factors include rickets, anemia, congenital syphilis, tuberculosis, endocrine disorders, and syndromes.[1,2] The mandibular third molars remain impacted due to differences in jaw and facial development, attrition of the teeth, the degree of use of chewing muscles, and space restriction in the jaw arch.[3] The main factor is the insufficient distance between the mandibular second molar tooth and the ramus.[4]

If we compare the third molar teeth among themselves, they differ in morphology, localization, and anatomical structure of the roots.[4] In all races, mandibular third molar teeth are the last to take their location in the arch.[4] In addition, in studies conducted with different races, no significant difference was found between the genders regarding the impacted third molar teeth.[5,6] Impacted third molar teeth may be clinically asymptomatic. In some cases, pericoronitis can cause pathologies such as pain, swelling, decay in the adjacent tooth or tooth root resorption, and odontogenic cysts.[7] These teeth can also

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cause neuralgia-like pains, focal infection, temporomandibular joint disorders, and cheek biting.[8,9]

It is very important to know the problems that may be caused by impacted teeth in terms of determining the treatment method to be applied. The impacted teeth may need to be surgically removed prophylactically or regularly followed up radiologically and clinically.[10,11] If it is decided to extract an impacted tooth, the most important step before the operation is radiological evaluation. In this way, complications that may arise during the surgical operation can be predicted and measures can be taken for this situation. In radiological evaluation, in addition to 2-dimensional imaging methods such as panoramic, occlusal, and periapical radiography, cone-beam computed tomography (CBCT), which is a 3-dimensional imaging method, is used when more detailed examination is required. With CBCT, the relationship of an embedded tooth with neighboring teeth and anatomical structures can be evaluated in detail.[12,13] Cone-beam computed tomography is the gold standard imaging method for the evaluation of impacted teeth.[14] The CBCT has advantages such as low cost and patient radiation dose compared to computed tomography and faster data acquisition.[15] The aim of this study is to retrospectively evaluate the positions of impacted teeth with CBCT according to Winter classification. Determining the localization, position, and prevalence of the impacted teeth before the operation will prevent possible complications.

METHODS

The study was approved by the Eskisehir Osmangazi University Faculty of Medicine Clinical Research Ethics Committee (approval number: 316, September 24, 2019). Within the scope of this retrospective study, the reasons for the request of 2516 patients who received CBCT in our clinic for various indications between March 2016 and December 2017 were evaluated. Images of 471 patients with impacted teeth between 18- and 82-year-old were obtained using the same CBCT device (Promax 3D Mid; Planmeca, Helsinki, Finland) in the study. Imaging parameters: tube voltage 94 kVp, X-ray tube current 14 mA, 360° rotation, scan time 27 seconds, and voxel size 0.400 mm. Images of patients whose reason for CBCT request was impacted teeth were included in the study. Radiographic images with poor image quality, craniofacial syndrome, cleft lip and palate, and radiographic images of patients with craniofacial bone diseases and orthognathic surgery were not included in the study. In this study, the area where the teeth were impacted and their impacted position were evaluated by CBCT. The positions of the impacted molar, canine, and premolar teeth according to Winter classification[16] (Figure 1) (class 1) vertical, (class 2) horizontal, (class 3) mesioangular, (class 4) distoangular, and (class 5) bucco-lingual are grouped. In addition, canine and premolar teeth according to the position of the teeth in the arch is classified as palatinal, labial, both palatinal and labial, and total edentulous. All scans were examined by the same operator with 3 years of experience. Statistical analysis of the data was made using the Statistical Package for the Social Sciences statistics computer program. The existence of a linear relationship between variables was evaluated with Pearson's and Spearman's correlation tests according to the distribution characteristic of the variable. The statistical significance level was accepted as $P < .05$ in the analyses.

RESULTS

The patients included in the study were between the ages of 12 and 70 and the mean age was determined as 23.86

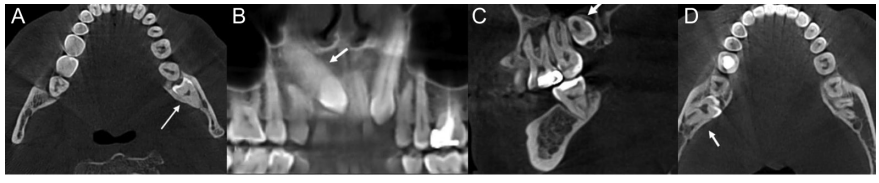

Figure 1. (A) Class 2 molar according to Winter classification. (B) Class 1,5 canine according to Winter classification. (C) Class 1 molar according to Winter classification. (D) Class 5 molar according to Winter classification.

Table 1. Classification of Teeth According to Their Impacted Position

	Position				
Tooth Number	Vertical	Horizontal	Mesioangular	Distoangular	Total
Central incisor	0.0%	100.0%	0.0%	0.0%	100.0%
Canine	23.5%	25.5%	51.0%	0.0%	100.0%
Premolar	61.1%	33.3%	0.0%	5.6%	100.0%
First molar	100.0%	0.0%	0.0%	0.0%	100.0%
Second molar	25.0%	25.0%	37.5%	12.5%	100.0%
Third molar	47.8%	9.9%	33.8%	8.5%	100.0%
Total	40.1%	16.3%	37.8%	5.7%	100.0%

Table 2. Classification of Premolar and Canine Teeth According to Their Positions

Tooth Positions	Incidence (Number of Teeth)	Percent
Palatal	8	4.8
Labial	2	1.2
Palatal and labial	154	92.2
Edentulous jaws	3	1.8
Total	167	100

± 12.11. Of the patients, 66.9% were selected as women and 33.1% were men. It was found that the third molar teeth were the most common, followed by canine teeth. These were followed by premolars, second molars, incisors, and first molars. It was observed that 43.1% of the impacted teeth completed root development and their apices were closed. When the impacted position of the teeth was evaluated (Table 1), it was determined that the impacted third molar teeth remained in the vertical position (47.8%) and the canines in the mesioangular position (51%) ($P < .05$). In contrast, impacted canine teeth were never detected in the distoangular position. When the premolar and canine teeth were evaluated (Table 2), it was determined that 92.2% of the teeth occupied both the palatinal and buccal areas ($P < .05$).

DISCUSSION

Impacted teeth are a common problem with an incidence between 18% and 32%, affecting a large population.[3] There are many classifications for impacted teeth. These classifications were created by evaluating factors such as the level of impacted teeth, their angulations, and their relationship to the anterior border of the ramus.[7] The most common ones are Winter and Pell & Gregory classifications. Parameters evaluated in terms of Pell & Gregory classification are based on maxillary and mandibular third molar teeth and their relationship with the occlusal surface of the adjacent second molar.[7] These classifications have a great role in determining the difficulty of surgical procedures. In addition, these classifications provide a clear and easy understanding of the position of the tooth in communication between physicians. The method used in Winter classification is based on the long-axis inclination of the third molar tooth with the second molar tooth.[17] In our study, we used the Winter classification to evaluate the positions of the teeth.[3] In most of the studies, no significant difference was found between men and women in terms of the incidence of impacted teeth.[18-20] However, few studies have found that impacted teeth are more common in women.[8,21] Tuğsel et al.[19] like many studies in the literature, did not detect a difference between men and women in terms of the incidence of impacted teeth. In our study, it was seen that it was more common in women. Dural et al[8] found the rate of impacting was at least 0.4% in premolars. Supernumerary teeth with 2.6%, canine with 14.2%, and third molar teeth with the highest 36.4% follow them, respectively. Some researchers[22,23] found that the mandibular third molar teeth were mostly embedded in the mesioangular position. On the other hand, some studies have found that these teeth are mostly embedded in the vertical position.[9,12,13,24-29] Scherstén et al[18] found that mandibular third molar teeth were mostly mesioangular and distoangular. There are few studies in the literature regarding the classification of impacted maxillary third molar teeth. Sinus perforation may occur during the surgery of the impacted maxillary third molar teeth. Lim et al[30] found that the impacted maxillary molar teeth were mostly in the vertical position and then in the mesioangular position. In our study, we found that the impacted third molar teeth were embedded in a vertical position of 47.8%, mesioangular 33.8%, distoangular 8.5%, and horizontal position 9.9%. In some of the studies, it has been reported that the most frequently impacted position of impacted canine teeth is the palatal position.[31,32] However, some studies have detected impacted canines mostly in the labial position.[33,34] Wolf and Matilla[35] observed that 9% of them were impacted in the labial position, 16% in the middle position, and 75% in the palatal position in their study by examining 116 impacted maxillary canine teeth. In our study, we observed that premolar and canine teeth were in both palatinal and labial positions at the highest rate. The lowest rate was seen in the group that we classified as labial position.

In conclusion, it was seen that the most frequently impacted tooth was the third molar tooth, with a percentage of 62.2% in this study. Evaluation of the position of the impacted teeth prevents clinical pictures such as pericoronitis, caries and resorption in the adjacent tooth and possible complications that may occur during surgery.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Eskişehir Osmangazi University (Date: September 24, 2019, approval number: 316).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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