Is There a Possible Association between Skeletal Face Types and Third Molar Impaction? A Retrospective Radiographic Study

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Significance of the Study

- This study aimed to investigate the relationship between third molar impaction and different skeletal face types. We observed that mandibular third molar impactions are associated with different facial skeletal types while maxillary third molar impactions are not related to face type.

Keywords

Tooth, impacted · Molar, third · Cephalometry

Abstract

Objective: Third molar impaction is seen much more than impaction of any other tooth as they are the last teeth to erupt. Inadequate retromolar space and the direction of eruption may be contributing factors. The aim of this study was to investigate the relationship between third molar impaction and different skeletal face types. **Subjects and Methods:** Panoramic and lateral cephalometric radiographs of 158 orthodontic patients (aged 19–25 years) were retrieved from the archived records of the Necmettin Erbakan University Faculty of Dentistry, Konya, Turkey. Third molar impaction was classified on the basis of Winter's classification. The skeletal facial type was determined by a measure of the angle created by the lines Ba-Na and Pt-Gn. The mean was 90 ± 2 and this value was regarded as mesofacial. An angle of $>93^\circ$ was regarded as brachyfacial and an angle of $<87^\circ$ as dolichofacial. **Results:** The overall presence of mandibular

and maxillary third molar impactions was 65.2 and 38.6%, respectively. Although there was a statistically significant difference between different skeletal facial types and mandibular third molar impaction ($p < 0.05$), no statistically significant differences were observed between different skeletal facial types and maxillary third molar impaction ($p > 0.05$). Brachyfacials demonstrated a lower prevalence of third molar impaction than dolichofacials. **Conclusions:** Different skeletal face types were associated with mandibular third molar impaction. Brachyfacials, who have a greater horizontal facial growth pattern than dolichofacials, showed a lower prevalence of impacted mandibular third molars.

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Introduction

Third molars are the most frequently impacted teeth [1–6]. The prevalence of their impaction is highly variable and generally reported to be between 16.7 and 73.82% [5]. Impaction is more common in the mandibles than in the

Fig. 1. The cephalometric landmarks used in the study.

Fig. 2. The cephalometric lines and facial axis angle.

maxilla [7], and its prevalence is higher in females [8]. If third molars are not impacted, they erupt between the ages of 17 and 21 years [3].

The decision to extract third molars, commonly known as “wisdom teeth,” should be made based on well-defined criteria. Impacted third molars may be related to pathological processes ranging from dental caries and root resorption to pericoronitis, cysts, and neoplasms. Additionally, they are blamed for mandibular incisor crowding after orthodontic treatment [9].

Inadequate retromolar space was found to be an important etiological factor for mandibular third molar impaction [10, 11]. Lack of retromolar space is due to an insufficient amount of mandibular growth. Additionally, it can be related to the direction or rotation of growth, which determines the type of face (mesofacial, brachyfacial, or dolichofacial) [4]. Facial growth can help predict mandibular third molar eruption [12]. The facial skeleton grows in a forward and downward direction under normal conditions. In a mesofacial growth pattern, there is relative harmony in these two directions. The term “brachyfacial” is used to describe an individual with a short anterior face height and a wide face. “Dolichofacial” is the term used to describe a long anterior face height and a narrow face [3, 6, 12].

Third molar impaction has been found to be related to some dental and skeletal features that are controversial and differing among varying populations [4]. The aim of this study was to investigate the relationship between

third molar impaction and different skeletal face types. The null hypothesis was that there is no relationship between third molar impaction and skeletal face type.

Subjects and Methods

Study Design and Sample

The study sample consisted of archived digital lateral cephalometric and panoramic radiographs of 158 individuals (61 males and 97 females) aged 19–25 years who had visited the Department of Orthodontics, Faculty of Dentistry, Necmettin Erbakan University between 2014 and 2016. Digital lateral cephalometric and panoramic radiographs were obtained using a J. MORITA machine (2D Veraviewepocs®, MFG Corp., Kyoto, Japan) with a tube voltage of 65–90 kV and a tube current of 5–10 mA. Included in this study were the pretreatment records of patients with the presence of third molars that had complete root formation and were either fully erupted or impacted, no history of maxillofacial trauma, no previous orthodontic treatment, no missing or extracted permanent teeth, no maxillofacial involvement with endocrine dysfunction, and nonsyndromic conditions.

Evaluation of Images

All cephalometric radiographs were traced and analyzed by the same orthodontist (H.K.) using the Planmeca Romexis® (Helsinki, Finland) Cephalometric Analysis Module. The skeletal facial type was determined by a measure of the angle created by the lines Ba-Na and Pt-Gn (Fig. 1, 2). The mean was $90 \pm 2^\circ$ and this value was regarded as mesofacial. An angle of $>93^\circ$ was regarded as brachyfacial and an angle of $<87^\circ$ as dolichofacial [3].

The cephalometric landmarks used to determine skeletal facial type (Fig. 1, 2) were as follows: Ba – the most inferior posterior point of the occipital bone at the anterior margin of the occipital

Fig. 3. Cropped digital panoramic radiographic examples of Winter's classification.

foramen; Na – the most anterior point of the nasofrontal suture in the midsagittal plane; Pog – the most anterior point on the midsagittal symphysis; Gn – a cephalometric landmark formed by the intersection of the tangent to the most inferior point on the inferior border of the symphysis and the most inferior point of the gonial region and the line connecting Na and Pog; and Pt – located at the lower border of the foramen rotundum, which is observed at the root of the pterygoid plates at the lower border of the body of the sphenoid bone.

Digital panoramic radiographs were used to evaluate the position and angulation of impacted third molars. Maxillary and mandibular third molar impactions were classified according to Winter's classification [13] (mesioangular, horizontal, vertical, distoangular, and buccolingual) (Fig. 3).

Statistical Analysis

The means and standard deviations of all variables were calculated. The χ^2 test was used to determine the relationship between third molar impactions and different skeletal face types. Intraobserver reliability was determined by Cohen's κ analysis and intraexaminer reliability was interpreted as almost perfect (0.81–1.0) according to Landis and Koch [14]. All statistical analyses were performed using IBM SPSS statistics 21.0 (IBM Corp, Armonk, NY, USA). p values <0.05 were considered significant.

Results

Of the 158 patients, 38.6% were male and 61.4% female. The mean age of the study sample was 20.19 ± 1.62 years (20.47 ± 1.75 years for females and 19.74 ± 1.30 years for males). The majority of individuals had a dolichofacial pattern (46.2%). There was no relationship between skeletal face types and sex ($p > 0.05$, $p = 0.52$). The distribution of skeletal facial types according to sex is given in Table 1.

The overall presence of mandibular and maxillary third molar impaction was 65.2 and 38.6%, respectively. Although there was a statistically significant difference between different skeletal face types and mandibular third molar impaction ($p < 0.031$), no statistically signifi-

Table 1. Facial type distribution according to sex

Skeletal face type	Males		Females		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Mesofacial	17	27.8	40	41.2	57	36.1
Dolichofacial	28	45.9	45	46.4	73	46.2
Brachyfacial	16	26.2	12	12.4	28	17.7
Total	61	100.0	97	100.0	158	100.0

cant differences were observed between different skeletal face types and maxillary third molar impaction ($p = 0.833$). Brachyfacials demonstrated a lower prevalence of maxillary and mandibular third molar impaction compared to dolichofacials and mesofacials. The distribution of third molar impaction according to skeletal face type is given in Table 2.

The distribution of third molar impaction angulation is given in Table 3. The most prevalent impaction position was mesioangular in the mandible and distoangular in the maxilla. No statistically significant relationship was found between skeletal facial type and the angular positions of teeth ($p > 0.05$).

Discussion

Third molar prognosis is an important issue for orthodontists in planning successful treatment [4]. Orthodontists should take into consideration the presence or absence of third molars, especially in terms of the possibility of eruption or impaction when distalization is required for first or second molars, the repercussion of the extraction of premolars or other permanent teeth in their positioning, and the timing of the orthodontic treatment [9]. Our results showed that the overall rate of mandibular

Table 2. Distribution of third molar impaction according to skeletal face type

Third molar impaction		Skeletal face type			Total
		mesofacial	dolichofacial	brachyfacial	
Maxilla	absence	36 (37%)	43 (44%)	18 (19%)	97 (100%)
	presence	21 (34%)	30 (49%)	10 (17%)	61 (100%)
Total		57 (36%)	73 (46%)	28 (18%)	158 (100%)
$p > 0.05, p = 0.833$					
Mandible	absence	23 (42%)	18 (33%)	14 (25%)	55 (100%)
	presence	34 (33%)	55 (53%)	14 (14%)	103 (100%)
Total		57 (53%)	73 (46%)	28 (18%)	158 (100%)
$p < 0.05, p = 0.031$					

Table 3. Distribution of third molar impaction angulation according to Winter [13]

Impacted third molar position	18	28	38	48
Mesioangular	28 (18%)	17 (11%)	89 (89%)	98 (62%)
Distoangular	36 (23%)	28 (18%)	2 (2%)	1 (0.5%)
Vertical	7 (4%)	5 (3%)	–	–
Buccolingual	1 (0.6%)	–	1 (1%)	1 (0.5%)
Horizontal	–	–	8 (8%)	6 (4%)
Not impacted	86 (54.4%)	108 (68%)	58 (37%)	52 (33%)
Total	158 (100%)	158 (100%)	158 (100%)	158 (100%)

and maxillary third molar impaction was 65.2 and 38.6%, respectively. This higher rate of impaction may be a result of the study population consisting of orthodontic patients who are more likely to suffer from malocclusion and potential crowding and so are likely to have a higher presence of third molar impaction than a random population sample [3].

Various studies have been conducted to ascertain the etiology of third molar impaction. Many researchers [3, 9, 12, 15–17] have claimed that greater mesial crown inclinations of third molars seem to be indicative of mandibular third molar impaction. Similarly, in this study, mesial inclination of the mandibular third molar and distal inclination of the maxillary third molar were found to be indicative of the tendency for these teeth to be impacted. Mollaoglu et al. [18] reported that individuals with mesioangular tooth inclination had insufficient space in the retromolar region.

Genetic factors and eating habits have also been blamed for impaction [9]. Second molar extraction [19] and premolar extraction for orthodontic treatment [20] decreased

third molar impaction. Late third molar maturation combined with early physical maturation [21], the size, growth amount, and direction of the mandible [10], the remodeling and width of the ramus, the rate of third molar maturation, the inclination of posterior dentition, and the size of dentition relative to the jaws have all been discussed as other implicated factors [4]. Hassan [4] claims that different samples and methods were used in previous studies, which may have led to the different findings.

The current study was designed to ascertain whether skeletal facial growth patterns are related to third molar impaction. The skeletal face types of the subjects were determined using lateral cephalometric radiographs, which provide analysis of craniofacial growth, maxillofacial deformities, and orthodontic problems [22]. Our findings showed that mandibular third molar impaction was 1.5 times more common in dolichofacials than in brachyfacials. This can be attributed to the vertical direction of the condyle, which is present in dolichofacial individuals. These results are consistent with the results of Breik and Grubor [3], who concluded that individuals with a brachyfacial facial growth pattern showed a twice lower incidence of third molar impaction than individuals with a dolichofacial growth pattern. This was explained by the fact that the growth potential is greater in a brachyfacial growth pattern, which allows more remodeling resorption of the anterior border of the ramus.

Capelli [9] claimed that third molar impaction was more likely to occur in vertically growing mandibles. A long, ascending ramus and short mandibular length seem to be indicative of mandibular third molar impaction. The mandibular length was shorter in the dolichofacial facial growth pattern, consistently supporting the hypothesis that dolichofacial individuals have an increased risk of third molar impaction [23].

Conclusion

The null hypothesis that there is no relationship between third molar impaction and skeletal face type was rejected. Patients with a predominantly horizontal growth pattern (brachyfacials) had a lower prevalence of mandibular third molar impaction compared to those with a predominantly vertical growth pattern (dolichofacials). Since third molars can change their position and continue to erupt from their current position, further prospective studies providing greater understanding of third molar impaction should be done to observe possible inclination changes of third molars in this age group.

Statement of Ethics

The study was performed within the stipulations laid out by the Declaration of Helsinki, and approval was obtained from the Ethics Research Committee of Necmettin Erbakan University.

Disclosure Statement

The authors declare that they have no conflict of interest.

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