Published online: 2019-09-25

Investigation of third molar impaction in Turkish orthodontic patients: Prevalence, depth and angular positions

Ahu Topkara[1], Zafer Sari[2]

Correspondence: Dr. Ahu Topkara
Email: ahutopkara@gmail.com

[1]Department of Orthodontics, Faculty of Dentistry, Istanbul Aydın University, Istanbul, Turkiye,
[2]Department of Orthodontics, Faculty of Dentistry, Akdeniz University, Antalya, Turkiye

ABSTRACT

Objective: We aimed to investigate the prevalence, distribution, angular position, and depth of third molar impaction in a Turkish orthodontic patient population. **Materials and Methods:** We retrospectively reviewed the panoramic radiographs, intraoral photographs, and dental casts of 207 patients (62 men and 145 women; age 20-39 years) who had undergone orthodontic treatment at a university department of orthodontics for impacted third molars (ITMs). A comprehensive chart review of all subjects was conducted. Patient and treatment-related data were recorded in a digital database for comparative analysis. **Results:** The prevalence of ITMs was 54.1%, and no statistically significant gender differences were evident (61.3% in men and 51.0% in women; $P = 0.23$). The frequency of maxillary ITMs was 49.3% (148 of 300 teeth) while that of mandibular ITMs was 50.7% (152 of 300 teeth). The most frequently observed angulations of impaction were mesioangular for the mandible (65.1%), and distoangular for the maxilla (64.2%). Of all the ITMs analysed, 61% were partially buried in bone and 39% were completely buried. **Conclusions:** Third molar impaction was evident in 54.1% of a group of Turkish orthodontic patients aged 20-39 years, and there was no statistically significant gender bias. Mesioangular and distoangular inclinations were the most common in the mandible and the maxilla, respectively.

Key words: Angular position, depth, impaction, prevalence, third molars

INTRODUCTION

Third molar impaction is the most commonly observed tooth impaction in modern communities, as the third molars are the last teeth to erupt.[1-3] Inadequate retromolar space and the direction of eruption may be contributing factors.[4] Third molars have been reported to account for 18-32% of impactions.[5]

While most studies have reported no gender differences in Caucasians, some studies have reported that impaction is more prevalent in women than in men.

The purpose of this study was to investigate the prevalence, distribution, position, and depth of impacted third molars (ITMs) in Turkish orthodontic patients from a single academic institution.

MATERIALS AND METHODS

We retrospectively reviewed the panoramic radiographs, intraoral photographs, and dental casts of 207 patients (62 men and 145 women; age, 20-39 years; mean age, 22.7 ± 3.29 years) who had undergone orthodontic treatment. Patients with conditions such as cleidocranial dysplasia, and Down's syndrome were excluded from the study. If an ITM was present, its angle and depth of impaction were recorded.

How to cite this article: Topkara A, Sari Z. Investigation of third molar impaction in Turkish orthodontic patients: Prevalence, depth and angular positions. Eur J Dent 2013;7:94-8.

DOI: 10.4103/1305-7456.119084

If the third molar was not fully erupted to its normal functional position or the eruption process was not complete with regard to angular position or lack of space, then it was deemed as impacted. The angulation of impaction was measured with reference to the angle formed between the intersected longitudinal axes of the second and third molars. The impaction was classified on the basis of Winter's classification.[6] The following classification system was adopted: 0°-10°, vertical; 11°-79°, mesioangular or distoangular; 80°-100°, horizontal, and the remaining cases were classified as cases of inverted or buccolingual impaction. The level of impaction was considered in relation to alveolar bone and the cementoenamel junction of the ITM: Level A, not buried in bone; level B, partially buried in bone (if any part of the cementoenamel junction was lower than the bone level, the tooth was considered to be partially buried in bone); and level C, completely buried in bone.

All records were examined carefully by a single orthodontist. Clinical and radiographic data were cumulatively entered in a custom-designed computer database. Statistical analysis was performed using NCSS (Number Cruncher Statistical System) 2007 statistical software (Utah, USA). The data are presented as means, proportions, and *P* values. Groups were compared using Pearson's Chi-square test and Fisher's exact test. Results were considered significant if $P < 0.05$.

RESULTS

In our orthodontic patient population, ITMs were evident in 112 patients (54.1%). Prevalence of ITM was not found to be significantly different between men and women (61.3%, $n = 38$ vs. 51.0%, $n = 74$, respectively), ($P = 0.23$). ITM data based on gender and anatomical distribution are summarized in Table 1. The proportion of ITMs was approximately equally represented in the maxilla and the mandible for both genders. Of the 300 ITMs, 49.3% were in the maxilla and 50.7% were in the mandible. There was no significant difference between the distribution of maxillary and mandibular ITMs in men and women ($P = 0.97$). In addition, there was no significant difference in the frequency of third molar impaction between the right and left sides within each arch ($P > 0.05$). The distribution of ITMs on the right and left sides was equal (50%) in the mandible. In the maxilla, the distribution was 51.35% for the right side and 48.65% for the left side.

The distribution of patients by number of ITMs is shown in Table 2. The most common type was impaction of all 4 third molars and 2 third molars. There were no significant differences between the distribution of the number of ITMs in male and female patients ($P > 0.05$).

The occurrence of the different angulations of impaction in the mandible is shown in Table 3, and their occurrence in the maxilla is shown in Table 4. The

Table 1: Distribution of ITMs by arch and gender

Gender	Maxillary ITM	Mandibular ITM	Total ITM	*P* value
Female	98	101	199	0.966
Male	50	51	101	
Total	148	152	300	

ITM: Impacted third molar

Table 2: Distribution of patients by total number of ITMs

Number of ITMs	Female	Male	Total	Percentage	*P* values
1	16	6	22	19	0.63
2	20	11	31	28	0.83
3	9	11	20	18	0.05
4	29	10	39	35	0.25
Total	74	38	112	100	
Percentage	66	34	100		

ITM: Impacted third molar

Table 3: Distribution of angulations of mandibular ITMs

	Number of ITMs-(percentage)			
Angulation	Female	Male	Total	*P* values
Horizontal	20 (19.8)	19 (37.3)	39 (25.7)	*0.02
Mesioangular	72 (71.3)	27 (52.9)	99 (65.1)	*0.03
Vertical	6 (5.9)	4 (7.8)	10 (6.6)	0.73
Distoangular	1 (1.0)	0	1 (0.6)	0.99
Buccolingual	2 (2.0)	1 (2.0)	3 (2.0)	0.99
Inverted	0	0	0	0.99
Total	101 (100.0)	51 (100.0)	152 (100.0)	

ITM: Impacted third molar

Table 4: Distribution of angulations of maxillary ITMs

	Number of ITMs-(percentage)			
Angulation	Female	Male	Total	*P* values
Horizontal	6 (6.1)	1 (2.0)	7 (4.7)	0.42
Mesoiangular	6 (6.1)	4 (8.0)	10 (6.8)	0.73
Vertical	23 (23.5)	12 (24.0)	35 (23.6)	0.94
Distoangular	63 (64.3)	32 (64.0)	95 (64.2)	0.97
Buccolingual	0	1 (2.0)	1 (0.7)	0.34
Inverted	0	0	0	0.99
Total	98 (100.0)	50 (100.0)	148 (100.0)	

ITM: Impacted third molar

most common angulations were mesioangular (65.1%) and horizontal (25.7%) in the mandible, while they were distoangular (64.2%) and vertical (23.6%) in the maxilla. The distribution of the mesioangular and horizontal angulations of impaction in the mandible were significantly different between the men and women ($P < 0.05$) [Table 3]. In the mandible, the mesioangular position was more common among women than among men, while this association was vice versa with respect to horizontal position. On the other hand, there was no significant difference in the frequency of different angulation types of impaction between the sexes in the maxilla.

The distribution of impaction levels is shown in Table 5. The most common level of impaction was level B (61%). Level A impaction was observed in only 1 male patient. There were no significant differences between level B and level C impactions in the maxilla ($P = 0.75$), or in the mandible ($P = 0.79$) in men and women. The relative proportion of the different levels of impaction was significantly different between the 2 arches. There was significantly more level C impaction in the maxilla (46%) than in the mandible (32%) ($P = 0.02$). There was no significant relationship between the level of impaction and gender. There was no significant difference between level B and level C impactions in the maxilla or the mandible, in men ($P = 0.45$), or women ($P = 0.21$).

In our patient population, 86 patients presented with bilateral impaction (76.8% of all subjects with ITMs) [Table 6]. The frequencies of maxillary and mandibular bilateral impaction were similar (30.2%, and 24.4%, respectively). Seventy-one percent of the mandibular bilateral impaction cases and 82% of the maxillary bilateral impaction cases presented with the same angle classification and the same level of impaction [Table 7]. Bilateral impaction with the same angulation (82%) was significantly more frequent than bilateral impaction with different angulation (30%) at the same level of impaction in the maxilla ($P = 0.00$). There was no significant relationship between the impaction levels with regard to mandibular bilateral impactions ($P = 0.12$). There was also no significant relationship between the bilateral impaction angulations in the maxilla and the mandible ($P = 0.38$).

DISCUSSION

To achieve more reliable results in this study, 20 years was deemed to be the lower age limit on the basis of literature regarding the growth and eruption time of the third molars.[7,8] In addition, due to possible angulation changes of third molars even after 30 years of age, the upper age limit was 39 in our patient population.[9] Although all of the patient records and file information were carefully investigated, it is still possible that some third molars may have been extracted.[10,11]

For determination of the angular position of an ITM, a practical and effective classification system was used. Thus, faulty determinations were averted. This useful system has also been used before by other researchers.[10] In many other studies, the angulation of ITMs was usually determined using visual impression based on Winter's classification.[6]

Due to ethnic variations, differences in diet, and genetic heredity, variations in jaw-tooth sizes and facial growth can occur. Thus, some differences are evident in the prevalence of ITMs in studies of different populations. In addition, differences in diagnostic criteria, sample sizes, and statistical methods may also lead to differences in results. In our study, 54.1% of the subjects had at least 1 impacted third molar. Many other studies have reported much lower frequencies of ITMs.[5] In another Turkish population study, it was concluded that the prevalence of ITMs was 35.9%, and this proportion was lower than was observed in our study.[12] On the other hand, Saglam and Tuzum[13] reported the frequency of lower third molar impaction to be 42.4% and that of upper third molar impaction to be 40.5% in a sample of Turkish patients aged between 16 and 75. There were some methodological differences between these studies with regard to factors such as age limits. Some other prevalence studies have also reported higher ITM frequencies,

Table 5: Distribution of levels of impacted third molars in the maxilla and mandible

Level	Maxilla (%)			Mandible (%)			Maxilla and mandible total (%)
	Female	Male	Total	Female	Male	Total	
A	0	0	0	0	1 (2)	1 (1)	1
B	59 (60)	28 (56)	80 (54)	67 (66)	35 (69)	102 (67)	182 (61)
C	39 (40)	22 (44)	68 (46)	34 (34)	15 (29)	49 (32)	117 (39)
Total	98 (100)	50 (100)	148 (100)	101 (100)	51 (100)	152 (100)	300 (100)

between 65.6% and 76.0%, in American, Chinese, Indian, and Swedish populations.[10,11,14,15]

Like Sandhu and Kaur,[15] Montelius,[16] and Hattab *et al*.[17] we observed no significant gender differences with regard to the frequency of third molar impactions (P = 0.23). However, some other studies, including another investigating a Turkish orthodontic patient population, have reported a significantly greater frequency of ITMs in women ($P < 0.05$).[8,11,12]

In our study, the proportions of impacted mandibular (50.7%) and maxillary (49.3%) third molars were almost equal. In contrast, in most other studies, ITMs were observed more frequently in the mandible than in the maxilla,[10,12,18-20] although some studies have also indicated the opposite.[4,17]

Because of the different classification systems used in different studies, including classification determined solely by visual impression alone, it is difficult to make reliable comparisons of the reported ITM' angulations. In this study, we found that mesioangular impaction of mandibular third molar and distoangular impaction of maxillary third molar were the most common (65.1%, and 64.2%, respectively). Most other researchers have also reported that mesioangular inclination was the most common, in the mandible.[10,12,14,17] However, Hugoson and Kugelberg[11] reported vertical impaction to be the most common (50.0%) in the mandible. In their study, in which they used a different classification system, Celikoglu *et al*.[12] reported that in a Turkish population vertical impaction was the most common in the maxilla (58.9%).

Table 6: Distribution of bilateral impaction by arch

Arches	Bilateral impaction number (percentage)
Maxillary only	26 (30.2)
Mandibular only	21 (24.4)
Both Arches	39 (45.4)
Total	86 (100.0)

In our research, the most common impaction level was level B (61%). This result is similar to Quek *et al*.[10] study result, and they used the same criteria in their study (level B, 80%). Hugoson and Kugelberg[11] have reported that level A- impaction was the most common. However, they included all third molars, impacted or otherwise, in their study. Thus, our result is not directly comparable to that reported by Hugoson and Kugelberg,[11] or other study results. In this study, we only evaluated impacted third molars, and our reference was the amount of crown buried in bone. The frequency of level A impaction was reported as only 5% by Quek *et al*.[10] In our research however, level A was observed in only 1 patient and thus was not analysed statistically. There was significantly more level C impaction in the maxilla (46%) than in the mandible (32%) (P = 0.02) and this result is comparable with that of Quek *et al*.[10]

Bilateral impaction studies are very rare. Dachi and Howel[1] have indicated that the prevalence of unilateral and bilateral impaction of third molars was almost the same. Conversely, Quek *et al*.[10] have reported that bilateral occurrence of third molar impaction was more common than unilateral impactions. Our study also showed that bilateral impaction of ITMs was more frequent. In this study, it was found that maxillary and mandibular proportions of bilateral impaction were similar. However, Quek *et al*.[10] indicated that the majority of bilateral third molar impactions were in the mandible. They also reported that half of the bilateral impactions presented with the same classification of angle and level of impaction in the mandible, while this percentage was 71% in our research.

CONCLUSIONS

Our study showed that third molar impaction was present in 54.1% of a group of Turkish orthodontic patients aged between 20 and 39 years, with no significant gender differences, and this frequency is the highest, thus far, to be reported in a Turkish population. Mesioangular and distoangular inclinations were the most common in the mandible

Table 7: Distribution of bilateral impaction by angulation and level in the maxilla and mandible

Levels	Bilateral impaction angulations					
	Maxillary (%)			Mandibular (%)		
	Same	Different	Total	Same	Different	Total
Same	45 (82)	3 (30)	48 (74)	34 (71)	5 (42)	39 (65)
Different	10 (18)	7 (70)	17 (26)	14 (29)	7 (58)	21 (35)
Total	55 (100)	10 (100)	65 (100)	48 (100)	12 (100)	60 (100)

and the maxilla, respectively. Of all ITMs, 61% were partially buried in bone and 39% were completely buried.

REFERENCES

1. Dachi SF, Howell FV. A survey of 3,874 routine full-mouth radiographs. II. A study of impacted teeth. Oral Surg Oral Med Oral Pathol 1961;14:1165-9.
2. Bishara SE, Andreasen G. Third molars: A review. Am J Orthod 1983;83:131-7.
3. Grover PS, Lorton L. The incidence of unerupted permanent teeth and related clinical cases. Oral Surg Oral Med Oral Pathol 1985;59:420-5.
4. Bjork A, Jensen E, Palling M. Mandibular growth and third molar impaction. Acta Odontol Scand 1956;14:231-71.
5. Andreasen JO. Epidemiology of third molar impactions. In: Andreasen JO, Petersen JK, Laskin DM, editors. Textbook and Color Atlas of Tooth Impactions. Copenhagen: Munksgaard, 1997. p. 222-3.
6. Winter GB. The Principles of Exodontia as Applied to the Impacted Third Molar. St. Louis: American Medical Book Co.; 1926.
7. Fielding AF, Douglass AF, Whitley RD. Reasons for early removal of impacted third molars. Clin Prev Dent 1981;3:19-23.
8. Hellman M. Our third molar teeth: Their eruption, presence and absence. Dent Cosm 1936;78:750-62.
9. Ventä I, Turtola L, Ylipaavelniemi P. Radiographic follow-up of impacted third molars from age 20-32 years. Int J Oral Maxillofac Surgery 2001;30: 54-7.
10. Quek SL, Tay CK, Tay KH, Toh SL, Lim KC. Pattern of third molar impaction in a Singapore Chinese population: A retrospective radiographic survey. Int J Oral Maxillofac Surg 2003;32:548-52.
11. Hugoson A, Kugelberg CF. The prevalence of third molars in a Swedish population. An epidemiological study. Community Dent Health 1988;5:121-38.
12. Celikoglu M, Miloglu O, Kazanci F. Frequency of agenesis, impaction, angulation, and related pathologic changes of third molar teeth in orthodontic patients. J Oral Maxillofac Surg 2010:68:990-5.
13. Saglam AA, Tuzum MS. Clinical and radiologic investigation of the incidence, complications, and suitable removal times for fully impacted teeth in the Turkish population. Quintessence Int 2003;4:53-9.
14. Morris CR, Jerman AC. Panoramic radiographicsurvey: A study of embedded third molars. J Oral Surg 1971;29:122-5.
15. Sandhu S, Kaur T. Radiographic evaluation of the status of third molars in Asian-Indian students. J Oral Maxillofac Surg 2005;63:640-5.
16. Montelius GA. Impacted teeth: A comparative study of Chinese and Caucasian dentitions. J Dent Res 1932;12:931-8.
17. Hattab FN, Rawashdeh MA, Fahmy MS. Impaction status of third molars in Jordanian students. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1995;79:24-9.
18. Kruger E, Thomson WM, Konthasinghe P. Third molar outcomes from age 18 to 26: Findings from a population-based New Zealand longitudinal study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2001;92:150-5.
19. Shah RM, Boyd MA, Vakil TF. Studies of permanent tooth anomalies in 7,886 Canadian individuals. I: Impacted teeth. Dent J 1978;44:262-4.
20. van der Linden W, Cleaton-Jones P, Lownie M. Diseases and lesions associated with third molars. Review of 1001 cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1995;79:142-5.

Access this article online	
Quick Response Code:	Website: www.eurjdent.com
	Source of Support: Nil. Conflict of Interest: None declared