Third molar impaction in a cross section of adult orthodontic patients.

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ABSTRACT

Introduction: Third molars (M3) show the greatest variability of the human dentition. Impacted third molars have been implicated in oral infections, neoplastic conditions and late onset dental crowding.

Aims and Objectives: To assess the prevalence of third molar impaction among a sample of adult orthodontic patients in relation to their antero-posterior and vertical craniofacial skeletal patterns.

Design: A descriptive cross-sectional study.

Methods: Orthopantomograms and lateral cephalograms of 62 adult orthodontic patients were assessed. Presence and type of M3 impaction according to Winter's and the Pell and Gregory's classifications were documented and the relationships of these data to the vertical and antero-posterior cranio-facial skeletal patterns were assessed. All analyses were performed using the SPSS package, version 22. Level of significance was set at $p<0.05$.

Results: Median age was 23.5years. Disto-angular impaction was commonest in the maxilla while mesio-angular and horizontal impactions were limited solely to the mandible ($p<0.001$). There was a significant relationship between Winter's classification of M3 impaction and the antero-posterior skeletal pattern ($p=0.007$). Pell & Gregory class 3 impactions were found almost entirely among patients with class II malocclusion, ($p<0.001$).

Conclusion: M3 impaction is prevalent among the sample, the ore more severe impactions occurring in skeletal pattern II subjects.

Keywords: Impaction, Cephalometry, Third Molar, Skeletal Pattern

INTRODUCTION

The third molars (M3s), also called the "wisdom teeth" are the most variable of the teeth in man in terms of development and eruption.[1,2] M3s may fail to appear because they are congenitally absent (agenesis) or fail to erupt because there is an obstruction in their path (impaction). Many factors have been implicated in these conditions. A meta-analysis has reported that M3 impaction occurs in 24.4% of the world population with no gender difference..[3] A more locally based study observed an M3 impaction prevalence of 10.7% among urban Nigerians as against 1.1% in the rural area.[4] The disparity in prevalence may conceivably be attributed to the low utilization of dental health services among rural dwellers in Nigeria.[5] Impacted third molars have been implicated in the aetiology of oral infections, in neoplastic conditions as well as in the late onset of dental crowding[6,7,8] and as a result, prophylactic extraction of M3s is often requested by many dental practitioners, including orthodontists.

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Acronyms

M3: third molar tooth

OPGs: Orthopanthomograms

Reduced retro-molar space distal to the second molars has been reported as the single most important factor in the aetiology of M3 impaction, the availability of this space being dependent on growth of the jaw.[9,10]and the facial type categorized by the facial axis angle.

RESULTS

The overall rate of mandibular third molar impaction was 58.76 per cent. Those with a facial axis angle >93 (brachyfacials However, M3 impaction has been observed in instances of both adequate and indeed excessive retro-molar space.[9] This connotes that there are other factors involved in the impaction processes. These may include late calcification of the teeth, the position of mandibular M3s relative to the external oblique ridge, the inclination of the M3, length of the mandible and the skeletal pattern of the individual.[9,11]

A recent meta-analysis has asserted that mandibular impactions are more commonly seen in the general population,[3] although other studies had indicated that maxillary M3 impactions were the more frequent.[1,10] With regards to the skeletal pattern, M3 impaction has been reported to be less common in individuals with class III malocclusion,[9] but more frequent among people with retrognathic mandibles. as in Class II skeletal patterns,[10]and the facial type categorized by the facial axis angle.\n\nRESULTS: The overall rate of mandibular third molar impaction was 58.76 per cent. Those with a facial axis angle >93 (brachyfacials[,13] as well as in individuals with a tendency to deep bite occlusalrelationships.[12,13] Mesio-angular M3 impaction, as described by Winter's classification, is the presentation most often encountered in all three skeletal types,[3,14] though another study reported a greater frequency of vertical impaction.[15] Sogra et al., 2014, reported that the application of Winter's classification did not result in the demonstration of any significant relation between type of impaction and skeletal pattern but the Pell and Gregory classification did reveal more severe impactions were related to seen in Classes I and II malocclusions.[15]

This study assessed the prevalence of third molar impactions among adult orthodontic patients in a Nigerian tertiary care dental clinic and the relationship of the types of impaction with the antero-posterior and vertical cranio-facial skeletal patterns of the participants.

METHODOLOGY

Ethical approval was obtained from the Institutional Reviews Committee (Approval number: UI/EC/16/0177). Orthopantomograms (OPGs) and cephalograms of patients seen in the orthodontic clinic were examined. The records of patients who at the time of first clinical evaluation were 17years and above, had not previously undergone orthodontic treatment nor had had third molars extracted, were selected for the study. Demographic variables of age and gender of all subjects were documented. The presence of M3 impaction, affected jaw and side as seen on the OPGs, were recorded. The type of M3 impaction was documented according to Winter's,[16] as well as Pell and Gregory's[17] classifications. The Winter classification is based on the size of the angulation between the long axis of the impacted mandibular M3 and the long axis of the second molar. The Pell and Gregory classification assesses mandibular M3 impaction on the basis of depth relative to the occlusal plane of the second molar tooth (with categories A,B or C) and the mesio-distal width of the tooth relative to the ramus (with categories 1,2or 3). These two schemes are the most widely accepted classification systems for quantifying M3 impaction and form the basis for most other classification schemes, hence their selection for use in this study. A classification of maxillary M3 impaction was described by Archer[18] and corresponds to Winter's system for the mandibular M3 The radiographs were viewed on an X-ray film viewing box independently by both researchers and the result verified with the documented models of the classification. A 90% agreement between the researchers was achieved ($p<0.05$).

The skeletal pattern of the subjects was measured on cephalometric radiographs which had been taken using the Pan-Blue-Oris machine (Blue-X Imaging ASSAGO, ITALY). The heads of the subjects had been held in a cephalostat, with the Frankfort plane parallel to the floor. The cephalograms were traced manually in a darkened room using 0.003″ cellulose acetate tracing sheets and a sharpened 2H pencil. The Steiner's analysis was used to evaluate the skeletal pattern. The following variables were obtained:

SNA angle: Sella turcica-nasion-subspinale (A point) angle: Measures the relative position of the maxilla in relation to the anterior cranial base. It is indicative of prognathic or retrognathic maxilla. (Reference value for the Nigerian population is 85.5± 3.5°).[19]

SNB angle: Sella turcica-nasion-supramentale (B point) angle: Expresses the horizontal position of the mandible in reference to the anterior cranial base. It is indicative of a prognathic or retrognathic mandible. (Reference value for the Nigerian population is 82.3± 3.2°).[19]

ANB angle: A point-nasion-B point angle: Relates the maxilla & mandible to the cranial base. It is indicative of the skeletal pattern. (Reference value for the Nigerian population is 2-4°).[19]

FMA: Frankfurt Mandibular plane angle: Used to assess the degree of vertical discrepancy according to Tweed's analysis. (Reference value for the Nigerian population is 20.8±3.1°).[19]

SNMPA: SN-Mandibular plane angle: Used to assess vertical facial discrepancy according to Steiner's analysis. (Reference value for the Nigerian population is 30.9±6.0°).[20]

Statistical analysis was carried out using the IBM SPSS package, version 22 (Armonk, New York, USA). Measures of central tendency were calculated and the relationships between third molar impaction and the various skeletal parameters were assessed using the Pearson's Chi-square. Findings are presented in Tables. Level of significance was set at $p<0.05$.

RESULTS

Sixty-two patient records were assessed. The median age was 23.5years (IQR: 20 – 28). Twenty-eight (45.2%) subjects were males, 34 (54.8%) were females. There was no significant difference between the mean ages of the two gender groups ($p=0.24$: f-test= 1.40) and hence the data was analyzed jointly. M3 impaction was present in 32 (51.6%) subjects. There was no significant variation in the prevalence of third molar impaction between the gender groups ($p=0.78$).

Fifteen patients (24.2%) had skeletal Class I, 31(50.0%) had skeletal Class II and 16 (25.8%) had skeletal Class III. There was no significant difference in the prevalence of M3 impaction based on antero-posterior skeletal type ($p=0.98$). There was also no significant difference in the prevalence of M3 impaction based on vertical skeletal classification whether the SNMP ($p=0.14$) or FMA ($p=0.45$) was the reference angle for assessment.

Of the 248 third molars expected to be present in this study, six (2.4%) were congenitally missing in 3(4.8%) patients leaving a total of 242 third molars which were further analyzed in this study. The developmental absence of a third molar was recorded in six cases, all females, and affecting the maxillary arch in four instances (66.7%). Of the 242 third molars, 81(33.5%) were impacted. Fifty-two (64.2%) of these were found in the mandible, while 29(35.8%) were in the maxilla. Based on Winter's classification, vertical impaction was the most prevalent, seen presented by 26 (32.1%) third molars. Mesio-angular impaction was observed in 25(30.9%) third molars, disto-angular impaction in 22(27.2%) third molars, while horizontal impaction was the least prevalent and was seen in eight (9.9%) of the third molars. Disto-angular impaction was commonest in the maxilla while mesio-angular and horizontal impactions were limited to the mandible ($p<0.001$), shown in Table 1. There was significant relationship between Winter's classification of M3 impaction and the antero-posterior skeletal Classes ($p=0.007$). There was however no significant relationship between Winter's classification of M3 impaction and the vertical skeletal classification as presented in Table 2.

On the basis of the Pell and Gregory classification, position 'A' and Class '2', lower molar impaction was most prevalent overall. Pell & Gregory category 3 impactions with the mandibular M3s most embedded in the mandibular ramus were seen almost entirely among patients with Class II malocclusion. Pell & Gregory category 2 impactions were more common in Class I malocclusion, a finding which was statistically significant ($p<0.001$). The other relationships between the categories of M3 impaction assessed by applying the Pell and Gregory classification and the Winters system are shown in Table 3.

DISCUSSION

This study observed that less than 5% of our study participants suffered agenesis of one or more third molars. This is similar to a previous finding by Al-Delaimi et al.[21] although other studies have however reported higher prevalences of M3 agenesis among orthodontic patients.[1,2,13,] Where gender predilections have been observed, females are more likely to present with M3 agenesis[1,2] and this was true in this group of orthodontic patients where all cases showing missing third molars were females. With respect to jaw affected by M3 agenesis, our findings also agree with the general report of higher frequency in the maxillary arch.[2,22]

With regards to impaction, this study of our hospital patients found a prevalence similar to those previously reported[10,23] among dental patients, whilst being higher than the prevalence seen in the general population, as has been reported previously.[3,4] Orthodontic patients are more likely to have a higher prevalence of third molar impaction than the general population since space deficiency is an aetiological factor common to both malocclusion and impactions. Contrary to other reports,[9,10] we found no significant differences in the occurrence of M3 impaction in relation to skeletal patterns although the condition appeared to be more prevalent among Class II subjects. Findings from this study also agreed with the meta-analysis that there is no gender predilection for M3 impaction,[3] contrary to the predominance of prevalence in the female gender as has been reported in another study.[24]

Winter's vertical impaction was overall the most common type observed in this study, with a marginal edge over the generally more prevalent mesio-angular impaction category.[3,14,24] The majority of vertical impactions occurred in the maxilla while the mesio-angular impaction was most prevalent in the mandible, an observation similar to other reports among Iranians[23] and a previous Nigerian study.[25]

Analysis of the data found a relationship between Winter's classification and antero-posterior skeletal classification, but not with the vertical skeletal pattern. This implies that the antero-posterior length rather than the vertical height of the jaw plays a more significant role in M3 impaction - as previously reported. The Pell and Gregory classification also found a significant relationship bertween the antero-posterior skeletal pattern and the class 3 impaction in which the M3 is seated deepest in the mandibular ramus, a category seen almost exclusively in skeletal Class II. This is similar to the report by Sogra *et al.*, who found a significant correlation between the Pell and Gregory classification of mandibular M3 impactions and the skeletal pattern.[15] The results of the present study, however, differ from those of Sogra *et al.*, in that while those authors reported a significant correlation between the Pell and Gregory 'ABC' sub-classification and the skeletal classification, our findings show a significant relation with the '123' sub-classification that is restricted mainly to Class II malocclusions. This may be attributed to the fact that skeletal Class II jaws have relatively smaller mandibles which are likely to have more severe space deficiencies than other skeletal jaw types, and hence more severe M3 impactions.

CONCLUSION

In conclusion, M3 impaction has been shown to be prevalent among orthodontic patients in this locality. Although the prevalence of impaction is not significantly higher in any specific Class of malocclusion, more severe impactions were observed in Class II malocclusion subjects presenting in our clinic. The clinical importance of this is that comprehensive orthodontic treatment planning should prudently consider the management of the M3 especially in Class II cases associated with retrognathic mandibles.

References

1. Celikoglu M, Kamak H. Patterns of third-molar agenesis in an orthodontic patient population with different skeletal malocclusions. Angle Orthod. 2012;82(1):165–9.
2. Suja AG, Jerry J, Prasanth SP, Manoj W. Prevalence of third molar agenesis in population with skeletal Cass II pattern. Int J Bioassays. 2015;4(7):4165–70.
3. Carter K, Worthington S. Predictors of third molar impaction: A systematic review and meta-analysis. J Dent Res. 2016;95(3):267–76.
4. Olasoji HO, Odusanya SA. Comparative study of third molar impaction in rural and urban areas of south-western Nigeria. Odontostomatol Trop. 2000;142:25–9.
5. Azodo CC, Amenaghawon OP. Oral hygiene status and practices among rural dwellers. Eur J Gen Dent. 2013;2(1):42–5.
6. Campbell JH. Pathology associated with the third molar. Oral Maxillofac Surg Clin N Am. 2013;25(1):1–10.
7. Gavazzi M, De Angelis D, Blasi S, Pesce P, Lanteri V. Third molars and dental crowding: different opinions of orthodontists and oral surgeons among Italian practitioners. Prog Orthod. 2014;15(1):60.
8. Almpani K, Kolokitha O-E. Role of third molars in orthodontics. World J Clin Cases. 2015;3(2):132–40.
9. Olive RJ, Basford KE. Transverse dento-skeletal relationships and third molar impaction. Angle Orthod. 1981;51(1):41–7.
10. Breik O, Grubor D. The incidence of mandibular third molar impactions in different skeletal face types. Aust Dent J. 2008;53(4):320–4.
11. Jakovljevic A, Lazic E, Soldatovic I, Nedeljkovic N, Andric M. Radiographic assessment of lower third molar eruption in different anteroposterior skeletal patterns and age-related groups. Angle Orthod. 2015;85(4):577–84.
12. Farzanegan F, Goya A. Evaluation of mandibular third molar positions in various vertical skeletal malocclusions. J Dent Mater Tech. 2012;1(2):58–62.
13. Kömerik N, Topal O, Esenlik E, Bolat E. Skeletal facial morphology and third molar agenesis. J Res Pr Dent Pr Dent. 2014;17:1–11.
14. Shokri A, Mahmoudzadeh M, Baharvand M et al. Position of impacted mandibular third molar in different skeletal facial types : First radiographic evaluation in a group of Iranian patients. Imagin Sci Dent. 2014;44:61–5.
15. Sogra Y, Farhad OW, Zahra EN. Pattern of third molar impaction; Correlation with malocclusion and facial growth. Oral Hyiene Dent Manag. 2014;13(4):11–4.
16. Winter GB. Principles of exodontia as applied to the impacted mandibular third molar; a complete treatise on the operative technic with clinical diagnoses and radiographic interpretations. St Louis: American Medical Book company; 1926. 241-279 p.
17. Pell GJ, Gregory GT. Impacted Mandibular Third Molars: Classification and Modified Technique for Removal. Dent Dig. 1933;39(9):330–8.
18. Archer WH. Oral and maxillofacial surgery. 5th ed. Philadelphia: WB Saunders; 1975.
19. Isiekwe MC, Sowemimo GOA. Cephalometric findings in a normal Nigerian population sample and adults with unrepaired clefts. Cleft Palate J. 1984;21(4):323–8.
20. Ifesanya JU. An Update on cephalometrics among Nigerians : Ascertaining prevalent jaw patterns. Br J Med Med Res. 2014;4(16):3092–100.
21. Al-delaimi TN, Abood SW, Khalil AA. The evaluation of impacted third molars using a panoramic radiograph. Al-Anbar Med J. 2010;8(1):26–33.
22. Bhutta N and Sadozai SRK. Association of missing third molars with various skeleteal patterns. Pakistan Oral Dent J. 2013;33(2):307–11.
23. Hashemipour M, Tahmasbi-arashlow M, Fahimi-hanzaei F. Incidence of impacted mandibular and maxillary third molars: a radiographic study in a Southeast Iran population. Med Oral Patol Oral Cir Bucal. 2013;18(1):140–5.
24. Majeed MM, Ahmed I, Uzair M, Atif M. Prevalence of missing, impacted and supernumerary teeth in patients under orthodontic treatment in a teaching hospital of Karachi , Pakistan. Int J Dent Heal Sci. 2014;1(1):39–46.
25. Obiechina AE, Arotiba JT, Fasola AO. Third molar impaction : Evaluation of the symptoms and pattern of impaction of mandibular third molar teeth in Nigerians. Odontostomatol Trop. 2001;143:26–9.

Table 1: Relationship between Winter's classification of impaction and jaw affected by impaction

Variable	Jaw affected			
	Maxilla	Mandible	Total	
Disto-angular	16(72.7)	6(27.3)	22(100.0)	
Vertical	13(50.0)	13(50.0)	26(100.0)	P<0.001
Mesio-angular	0(0.0)	25(100.0)	25(100.0)	Chi Square 33.7
Horizontal	(0.0)	8(100.0)	8(100.0)	
Total	29(35.8)	52(64.2)	81(100.0)	

Table 2: Relationship between Winter's classification and skeletal classification

Variables	Winter's classification of M3 impaction					
	Disto-angular N(%)	Vertical N(%)	Mesio-angular N(%)	Horizontal N(%)	Total N(%)	
Antero-posterior skeletal pattern						
Class I	5(26.3)	3(15.8)	8(42.1)	3(15.8)	19(100.0)	
Class II	16(35.6)	11(24.4)	13(28.8)	5(11.1)	45(100.0)	P=0.007*
Class III	1(5.9)	12(70.6)	4(23.5)	0(0.0)	17(100.0)	X^2 17.80
Vertical skeletal pattern SNMP						
Normofacial	11(22.9)	17(35.4)	15(31.3)	5(10.4)	48(100.0)	
Brachyfacial	0(0.0)	4(57.1)	3(42.9)	0(0.0)	7(100.0)	P=0.20
Dolichofacial	11(42.3)	5(19.2)	7(26.9)	3(11.5)	26(100.0)	X^2= 8.53
Vertical skeletal pattern FMA						
Normofacial	8(40.0)	3(15.0)	7(35.0)	2(10.0)	20(100.0)	
Brachyfacial	0(0.0)	6(60.0)	4(40.0)	0(0.0)	10(100.0)	P=0.13
Dolichofacial	14(27.5)	17(33.3)	14(27.5)	6(11.8)	51(100.0)	X^2=9.95
Total	22(27.2)	26(32.1)	25(30.9)	8(9.9)	81(100.0)	

* Statistically significant

Table 3: Relationship between Pell & Gregory classification and the skeletal classification number (percent).

Variables	Pell & Gregory classification							
A-P skeletal pattern	1	2	3	Total	A	B	C	Total
Class I	2(14.3)	11(78.6)	1(7.1)	14(100.0)	9(64.3)	2(14.3)	3(21.4)	14(100.0)
Class II	9(33.3)	8(29.6)	10(37.0)	27(100.0)	14(51.9)	5(18.5)	8(29.6)	27(100.0)
Class III	9(81.8)	2(18.2)	0(0.0)	11(100.0)	8(72.7)	3(27.3)	0(0.0)	11(100.0)
Total	20(38.5)	21(40.4)	11(21.2)	52(100.0)	31(59.6)	10(19.2)	11(21.2)	52(100.0)
	*P<0.001	X^2= 21.71			P=0.35	X^2=4.44		
Vertical skeletal pattern SNMP								
Normofacial	11(36.7)	11(36.7)	8(26.6)	30(100.0)	16(53.3)	6(20.0)	8(26.7)	30(100.0)
Brachyfacial	3(60.0)	2(40.0)	0(0.0)	5(100.0)	4(80.0)	1(20.0)	0(0.0)	5(100.0)
Dolichofacial	6(35.3)	8(47.1)	3(17.6)	17(100.0)	11(64.7)	3(17.6)	3(17.6)	17(100.0)
Total	20(38.5)	21(40.4)	11(21.2)	52(100.0)	31(59.6)	10(19.2)	11(21.2)	52(100.0)
	P=0.64	X^2=2.55			P=0.69	X^2=2.24		
Vertical skeletal pattern FMA								
Normofacial	3(25.0)	5(41.7)	4(33.3)	12(100.0)	7(58.3)	3(25.0)	2(16.7)	12(100.0)
Brachyfacial	2(33.3)	2(33.3)	2(33.3)	6(100.0)	3(50.0)	1(16.7)	2(33.3)	6(100.0)
Dolichofacial	15(44.1)	14(41.2)	5(14.7)	34(100.0)	21(61.8)	6(17.6)	7(20.6)	34(100.0)
Total	20(38.5)	21(40.4)	11(21.2)	52(100.0)	31(59.6)	10(19.2)	11(21.2)	52(100.0)
	P=0.57	X^2=2.90			P=0.92	X^2=0.94		

*Statistically significant