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Prevalence and Pattern of Third Molar Impaction

A retrospective study of radiographs in Oman

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معدل انتشار و نمط الأضراس الثالثة المنحشرة

دراسة استعادية للصور الشعاعية من عمان

سميرة مبارك العنقودية، سالم مسلم السديري، أحمد الحوسني، عبدالله المنيري

ABSTRACT: ***Objectives:*** The aim of this retrospective study was to investigate the prevalence and pattern of third molar impaction in patients between 19–26 years old attending Sultan Qaboos University Hospital (SQUH) in Muscat, Oman. ***Methods:*** The study reviewed 1,000 orthopantomograms (OPGs) of patients attending the Oral Health Department of SQUH between October 2010 and April 2011. Patients were evaluated to determine the prevalence of third molar impaction, angulation, level of eruption and associated pathological conditions. ***Results:*** Of the study population, 543 (54.3%) OPGs showed at least one impacted third molar. The total number of impacted molars was 1,128. The most common number of impacted third molars was two (41%). The most common angulation of impaction in the mandible was the mesioangular (35%) and the most common level of impaction in the mandible was level A. Of the 388 bilateral occurrences of impacted third molars, 377 were in the mandible. There was no significant difference in the frequency of impaction between the right and left sides of both jaws. Pathological conditions associated with impacted lower third molars were found in 18%, of which 14% were associated with a radiographic radiolucency of more than 2.5 mm, and 4% of impacted lower third molars were associated with dental caries. ***Conclusion:*** This study found that more than half of Omani adult patients ranging in age from 19–26 years had at least one impacted third molar.

Keywords: Third Molar; Impacted Teeth; Mandible; Prevalence; Oman.

الملخص: الهدف: الهدف من هذه الدراسة الاستعادية هو بحث معدل انتشار ونمط الأضرس الثالثة المنحشرة عند المرضى من الفئة العمرية 26–19 عاما المراجعين لمستشفى جامعة السلطان قابوس بمسقط، عمان. **الطريقة:** تم فحص 1,000 صورة إشعاعية للمرضى المراجعين لعيادة صحة الفم و الأسنان من أكتوبر 2010 إلى أبريل 2011. وقد تم تقييم المرضى لمعرفة معدل انتشار الأضراس الثالثة المنحشرة، نسبة التزوي، مستوى الظهور والآفات المرضية المصاحبة. **النتائج:** من عينة الدراسة، تبين أن عدد 543 (54.3%) من صور الأشعة أظهرت وجود على الأقل أحد الأضراس الثالثة منحشرة. جملة عدد الأضراس الثالثة المنحشرة كانت 1,128. كان عدد اثنان (41%) من الأضراس الثالثة المنحشرة هو الأكثر شيوعا. كان التزوي الوسطي أكثر حالات التزوي شيوعا في الفك السفلي (35%) ومستوى الظهور A هو الأكثر شيوعا. من أصل 388 حالة ثنائية الانحشار، وجد هناك 377 حالة في الفك السفلي. لم يوجد أي فارق معتد في تردد الانحشار بين الجهتين اليمنى واليسرى لكلى الفكين. المشاكل المرضية المصاحبة للأضراس المنحشرة شكلت 18%، منها 14% كانت مصاحبة لتغيرات إشعاعية واضحة و 4% من الأضراس الثالثة السفلية المنحشرة كانت مصابة بالتسوس السني. **الخلاصة:** أوضحت هذه الدراسة أن أكثر من نصف المرضى العمانيين البالغين من الفئة العمرية 26–19 عاما لديهم على الأقل واحد من الأضراس الثالثة منحشرة.

مفتاح الكلمات: الأضراس الثالثة؛ الأسنان المنحشرة؛ الفك السفلي؛ معدل الانتشار؛ عمان.

Advances in Knowledge

- *This study supports the available literature worldwide on the high prevalence of third molar impaction.*
- *To the best of the authors' knowledge, the present study is the first of its kind to show the prevalence of third molar impaction in Oman.*

Application to Patient Care

- *This study identifies the future need for health education targeted at patients with impacted third molars, particularly regarding possible complications, and the possible treatments and surgical interventions for this condition.*
- *The study also highlights the need for careful evaluation during routine dental examinations to identify third molar impaction and encourage specialist referral in cases requiring further management.*

Teeth become impacted when they fail to erupt or develop in their proper functional location; of all teeth, mandibular third molars are the most frequently impacted.[1] The cause of third molar impaction is due to inadequate space in the mandible; this may cause pericoronitis, dental caries and the development of cystic lesions.[2,3] The angle of impaction can be measured using Winter's

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classification system, with reference to the angle formed between the intersected longitudinal axes of the second and third molars.[4] The Pell and Gregory classification system is one of the common methods used to assess the level of third molar impaction where the impacted third molars are assessed in relation to the neighbouring second molars.[5]

The prevalence of third molar impaction ranges from 27–68.6%.[6–9] A few studies from the Gulf region have reported the prevalence of impacted third molars to be 32–40.5%.[7,8] The pattern of third molar impaction in an Omani population has not been described in the literature to date; thus, the aim of this retrospective radiographic study was to investigate the prevalence and pattern of third molar impaction, angulation, level of eruption and associated pathological conditions among dental patients treated in the Oral Health Department in Sultan Qaboos University Hospital (SQUH) in Muscat, Oman.

Methods

This retrospective study was conducted from October 2010 to April 2011 and reviewed 1,000 orthopantomograms (OPGs) of patients who presented to the outpatient Dental Centre and were treated at the Oral Health Department at SQUH, Muscat, Oman, between 2006–2010. Only patients 19–26 years old were selected for the study as third molar eruption usually begins at this age. The data were collected retrospectively from clinical notes and OPGs.

For the purposes of this study, OPG X-rays were selected randomly which meant that not all patients included in the study had attended the Clinic for the management of impacted wisdom teeth. Therefore, patients with any of the following conditions were excluded: any pathosis or trauma to the jaws that might have disrupted the dentition alignment; third molars presenting with incomplete root formation; absent adjacent second molars, and/or the presence of congenital diseases or facial syndromes.

Two pairs of examiners viewed the OPGs using SIDEXIS XG software, Version 2005 (Sirona Dental Systems GmbH, Bensheim, Germany). The presence, location, depth and angle of impaction of third molars were noted.

For this study, impaction, and angulation and level of impaction were defined as follows. The third molar was considered impacted when it was not fully erupted to the assumed normal functional position in the occlusal plane. The angulation of impaction of the mandibular third molar was determined by the angle formed between the intersected longitudinal axes of the second and third molars. This angle was measured using tools available in the SIDEXIS software (Sirona Dental Systems GmbH). The angulation of the impacted third molar was recorded using Winter's classification with reference to the angle formed between the intersected longitudinal axes of the second and third molars.[4] The angulation of impaction was measured using Quek *et al.*'s classification system: mesioangular impaction at 11° to 79°; vertical impaction at 10° to −10°; distoangular impaction at −11° to −79°, and horizontal impaction at 80° to 100°.[9] Uncommon angulations such as buccolingual, mesioinverted, distoinverted and distohorizontal angulations were classified as 'other'. Maxillary third molars were recorded as impacted when the lowest portion of the crown of an impacted maxillary third molar was below the occlusal plane of the second molar.[10]

The level of impaction was determined using the Pell and Gregory classification as follows.[5] Position A was recorded if the highest portion of the impacted mandibular third molar was on a level with or above the occlusal plane, whereas position B was recorded if the highest portion of the impacted mandibular third molar was below the occlusal plane but above the cervical line of the second mandibular molar. Position C was recorded if the highest portion of the impacted mandibular third molar was below the cervical line of the second mandibular molar.[5]

The pathological condition of the impacted mandibular third molar was determined from the patient's OPG based on the existence of lesions in which the widest area of the distal aspect of the mandibular third molar was >2.5 mm and the presence of caries in the impacted third molar.[11]

All assessments were done by a single examiner to measure the angulation of impaction. Findings were recorded when both examiners agreed. From the pilot study, interexaminer and intraexaminer reproducibility was found to be 85%.

Data were analysed using the Statistical Package for the Social Sciences (SPSS), Version 19.00 (IBM, Corp., Chicago, Illinois, USA). The patient's age, gender, number of impacted third molars, classification of impaction, level of impaction and pathological conditions associated with impacted mandibular third molars were displayed by frequency and percentage. The Pearson's Chi-squared test was used to test the association between different variables.

Ethical approval was obtained from the Medical Research & Ethics Committee of the College of Medicine & Health Sciences at Sultan Qaboos University, (MREC #385). All data, including patient identification and X-rays, were kept confidential.

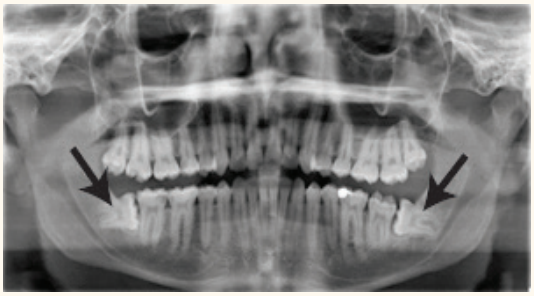

Figure 1: An orthopantomogram showing an impacted third molar.

Results

Of the 1,000 patients, there were 435 male and 565 female patients. A total of 215 (40%) of the male patients and 328 (60%) of the female patients showed at least one impacted third molar on their OPG, yielding a male to female ratio of 2:3. A total of 1,128 impacted third molars were found [Figure 1].

Table 1 presents the distribution of subjects according to the total number of impacted third molars. A total of 64 (12%) patients had all four third molars impacted, 81 (15%) had three third molars impacted and 226 (41%) had two third molars impacted, while 172 (32%) had only one third molar impacted. The total number of impacted third molars in an individual was significantly different between males and females (P <0.01). Females were 1.73 times more likely to have three or more impacted teeth than males (95% confidence interval [CI]: 1.13–2.65; P <0.001).

Table 2 shows the distribution of impacted third molars by gender and arch (either upper or lower jaw, otherwise known as the maxilla and mandible). The prevalence of impacted mandibular third molars (n = 817) was significantly greater than that of impacted maxillary third molars (n = 311) which was statistically significant (48.7% *versus* 19.0%; P <0.01). The mandible accounted for 72.4% (n = 817) and the maxilla accounted for 27.6% (n = 311) of the impacted third molars. Impacted third molars were 4.1 times more likely to occur in the mandible than in the maxilla (95% CI: 3.5–4.76; P <0.001). In the maxilla, females (n = 218, 30.7%) had more impacted third molar teeth than males (n = 93, 22.1%) which was statistically significant (P <0.001). In the mandible, there was no statistically significant difference between gender and lower-third molar impaction. In addition, there was no statistically significant difference between the right and left impacted third molars within each arch; therefore, these data were pooled.

Table 3 shows the occurrence of the different angulations of impaction in the mandible. Overall, mesioangular impaction was the most frequent (n = 282, 35%), followed by distoangular (n = 267, 33%), vertical (n = 247, 30%) and finally both horizontal and other types of impaction (n = 22, 2%). The distribution of the different angulations of impaction was significantly different between genders (P <0.01). Mesioangular impaction (n = 147, 45%) was the most common form of impaction among males and distoangular impaction (n = 200, 41%) the most common among females. Of the 1,128 teeth, 474 (58%) were positioned with the highest portion of the impacted mandibular third molar on a level with or

Table 1: Distribution of subjects by total number of impacted third molars (N = 543)

Total number of impacted third molars	Female	Male	Total	%
1	98	74	172	32
2	129	97	226	41
3	56	25	81	15
4	45	19	64	12
Totals, n (%)	**328 (60)**	**215 (40)**	**543 (100)**	**100**

Table 2: Distribution of fully erupted and impacted third molars by arch and gender

	Maxilla	Mandible	Total
Fully erupted			
Female	724	465	1,189
Male	606	394	1,000
Totals	**1,330**	**859**	**2,189**
Impacted			
Female	218	491	709
Male	93	326	419
Totals	**311**	**817**	**1,128**

Table 3: Distribution of the angulation of impaction in the mandibular third molars (N = 817)

Angulation	Impacted mandibular third molars n (%)		Total n (%)
	Females	Males	
Mesioangular	135 (27)	147 (45)	282 (35)
Vertical	148 (30)	99 (30)	247 (30)
Distoangular	200 (41)	67 (21)	267 (33)
Horizontal	4 (1)	7 (2)	11 (1)
Other	4 (1)	6 (2)	10 (1)
Totals	**491 (100)**	**326 (100)**	**817 (100)**

Table 4: Distribution of pathology associated with impacted mandibular third molars

Angulation	Radiolucency >2.5 mm n (%)	Caries n (%)
Mesioangular	50 (43)	19 (58)
Distoangular	48 (42)	5 (15)
Vertical	12 (10)	7 (21)
Horizontal	4 (3)	1 (3)
Other	2 (2)	1 (3)
Total	**116 (100)**	**33 (100)**

above the occlusal plane (level A). Level C eruption occurred least frequently compared to other levels (1%). There was no significant difference between the right and left sides when considering impacted mandibular third molars (P = 0.085).

Of the 543 radiographs with impacted third molars, 388 (71%) showed bilateral impacted third molars. A total of 377 OPGs showed a bilateral impaction of third molars in the mandible, of which 60% had the same angulation of mandibular third molar impaction. Bilateral impaction in the maxilla occurred in 75 OPGs in 64 OPGs all four third molars were impacted.

The pathological changes associated with the impacted lower mandibular third molars, either the presence of caries in the impacted lower third molar and/or a radiolucency of more than 2.5 mm in the distal aspect, are presented in Table 4. Only 18% of the total impacted mandibular third molars were affected by at least one of the two pathological changes. Around 116 (14%) impacted mandibular lower third molars were associated with a radiolucency of more than 2.5 mm and most of the radiolucencies were associated with mesioangular and distoangular impactions. Only 33 (4%) impacted lower third molars were associated with caries, which were most common in mesioangular impacted lower third molars (n = 19, 58% of total caries).

Discussion

This is the first study to evaluate the prevalence of third molar impaction in Oman. A total of 543 OPGs with 1,128 impacted upper and lower third molars were analysed. It was found that 54.3% of patients attending the Oral Health Department of SQUH had at least one impacted third molar, indicating how common impaction is and the need to explore the possible aetiological factors of this condition. This will help determine whether this is an emerging problem or due to influences of the population's ethnic background. The aetiology of third molar impaction has never been investigated in an Omani population and there is a need to conduct future studies to assess the causes of this condition more extensively.

The prevalence found from this study was lower than that observed by Quek *et al.* who reported a frequency of 68.6% in Singaporean Chinese.[9] On the other hand, studies by Hassan,[8] Hattab *et al.*,[2] and Reddy *et al.*,[6] reported lower frequencies in studies done on Saudi Arabians (40.5%), Jordanian students (47.4%) and Indians (27%), respectively. In the current study, the most common number of impacted third molars per patient was two (41%), which is in agreement with the findings of Quek *et al.*[9] but not with those of Hassan,[8] who reported that one was the most common number of impacted third molars per OPG. In contrast, Ma'aita reported that 40% of Jordanian patients had all four third molars impacted.[3] The most common numbers of impacted third molars in the present study by order of frequency were two (226, 41%), one (172, 32%), three (81, 15%) and four (64, 12%). This is in agreement with Quek *et al.*'s study.[9]

Radiological examination of the OPGs revealed that mesioangular impaction was the most common type of angulation (35%). This is in agreement with many other studies where the frequency of mesioangular impaction ranged from 33.4–62%.[3,8,9,12–15] However, the current study's results differ from studies published by Reddy *et al.*[6] and Haider *et al.*[7] which found that vertical impaction was the most common type of third molar impaction. This could be due to the fact that a different method of classifying angulation was used in the current study. Another study classified angulation according to visual impressions based on Winter's classification method.[4] In the current study, vertical impaction was observed in 30%, which is less than the findings of Byahatti *et al.* (38%)[12] and Sandhu *et al.* (42%) in Libyan and Asian-Indian populations, respectively.[16]

An analysis of the level of impaction showed that level A was the most common level of impaction (58%). This disagrees with the results of other research which reported that level B was the most common level of impaction.[8,9,16]

The present study showed that bilateral third molar impaction was more common than unilateral impaction. Bilateral impaction occurred in 388 (71%) of the 543 radiographs examined, which is higher than that reported by Quek *et al.* (63%); however, this result is still in agreement with their conclusion that the majority of bilateral impacted third molars occur in the mandible.[9] The prevalence of maxillary third molar impaction in the current study was 15%, which was higher than the 10% reported by Reddy and Prasad in

a study done on an urban population in South India.[6]

Pathological changes associated with impacted third molars were found in 14% in the current study, which is higher than the 10% reported by Polat *et al*. in a Turkish population.[11] However, Celikoglu *et al*.[17] reported that most pathological changes were associated with horizontally impacted third molars, in contrast with this retrospective study which found most changes in cases of mesioangular and vertical impaction. The prevalence of dental caries in impacted lower third molars was 4% in the current study, which is similar to that reported by Polat *et al*. (5%)[11] in a Turkish population and Ma'aita in a sample of Jordanian adults (8%).[3] However, this prevalence of dental caries was significantly lower than those reported in Kenyan (46%)[15] and Jordanian populations (13.6%).[18] This difference may be attributable to the wide age range in these respective study populations.

Conclusion

This is the first retrospective radiographic study investigating the prevalence of third molar impaction in young Omani patients aged 19–26 years old. The high prevalence found, with more than half of these Omani adult patients having at least one impacted third molar, underlines the need to increase awareness among dental professionals. Further studies should also be conducted to determine how many patients with impacted third molars are symptomatic or actively seek treatment. Further studies are also needed to assess the pattern of third molar impaction in other regions of Oman.

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