

Prevalence and Pattern of Maxillary Wisdom Tooth Impaction and Angulation in Relation to the Maxillary Sinus among Yemeni Students

Prevalência e padrão de impactação e angulação do dente do siso maxilar em relação ao seio maxilar entre estudantes iemenitas

Prevalencia y patrón de impactación y angulación de la muela del juicio maxilar en relación con el seno maxilar entre estudiantes yemeníes

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Faisal Abulohom

ORCID: <https://orcid.org/0000-0002-9074-4171>
Ibb University, Yemen
E-mail: fzshwgr@gmail.com

Hesham Mohammed Al-Sharani

ORCID: <https://orcid.org/0000-0002-9576-2408>
Ibb University, Yemen
Harbin Medical University, China
E-mail: hishamm2010@live.com

Zakarya Al-Muaalemi

ORCID: <https://orcid.org/0000-0003-1729-1193>
Jiblah University for Medical and Health Sciences, Yemen
E-mail: dent.zak2010@gmail.com

Abdalhaq Hussin Alhasani

ORCID: <https://orcid.org/0000-0002-5230-188X>
Ibb University, Yemen
E-mail: alhasani1970@hotmail.com

Nassr Abdalwhab Al-Huthbany

ORCID: <https://orcid.org/0000-0001-5379-6741>
Ibb University, Yemen
E-mail: nassralhut@gmail.com

Mubarak Ahmed Mashrah

ORCID: <https://orcid.org/0000-0003-4372-0465>
Stomatology Hospital, China
Guangzhou Medical University, China
E-mail: Mubarak198226@gmail.com

Ekaterina Diachkova

ORCID: <https://orcid.org/0000-0003-4388-8911>
Sechenov University, Russia
E-mail: dyachkova_e_yu_1@staff.sechenov.ru

Tenglong Hu

ORCID: <https://orcid.org/0000-0003-1484-6210>
Harbin Medical University, China
E-mail: flylong_26@sina.com

Abstract

The goal of this study was to determine the prevalence of maxillary third molar impaction and angulation, as well as its relationship to the maxillary sinus, in a group of Yemeni students. Panoramic x-rays were used to assess 200 students, 102 men and 98 females, in this retrospective investigation. Chi-square tests were used to assess age, gender, maxillary sinus approximation to maxillary third molar roots, depth of impaction, and angulation. A total of 327 maxillary third molars were examined; the most congenitally missing maxillary third molar was on the right side, and females (10.25%) had more maxillary third molars engaged in the maxillary sinus than males (8.0%) (4.9%). Type A (52.9%) was the most common according to Pell and Gregory's classification, although vertical angulations of the maxillary third molar were seen more frequently (85.32%). Congenitally missing maxillary third molars are more common in females, and position A was the most common among the maxillary third molars on a vertical level.

Keywords: Maxillary third molar; Impaction; Angulation; Maxillary sinus; Health teaching.

Resumo

O objetivo deste estudo foi determinar a prevalência de impacção e angulação de terceiros molares superiores, bem como sua relação com o seio maxilar, em um grupo de estudantes iemenitas. Radiografias panorâmicas foram usadas para avaliar 200 alunos, 102 homens e 98 mulheres, nesta investigação retrospectiva. Testes de qui-quadrado foram usados para avaliar idade, sexo, aproximação do seio maxilar às raízes dos terceiros molares superiores, profundidade de impacção e angulação. Um total de 327 terceiros molares superiores foram examinados; o terceiro molar superior mais ausente congenitamente foi do lado direito, e as mulheres (10,25%) tiveram mais terceiros molares superiores engajados no seio maxilar do que os homens (8,0%) (4,9%). O tipo A (52,9%) foi o mais comum segundo a classificação de Pell e Gregory, embora as angulações verticais do terceiro molar superior tenham sido observadas com maior frequência (85,32%). Terceiros molares superiores congenitamente ausentes são mais comuns no sexo feminino, e a posição A foi a mais comum entre os terceiros molares superiores em nível vertical.

Palavras-chave: Terceiro molar maxilar; Impactação; Angulação; Seio maxilar; Ensino em saúde.

Resumen

El objetivo de este estudio fue determinar la prevalencia de la impactación y angulación del tercer molar maxilar, así como su relación con el seno maxilar, en un grupo de estudiantes yemeníes. Se utilizaron radiografías panorámicas para evaluar a 200 estudiantes, 102 hombres y 98 mujeres, en esta investigación retrospectiva. Se utilizaron pruebas de chi-cuadrado para evaluar la edad, el sexo, la aproximación del seno maxilar a las raíces del tercer molar superior, la profundidad de la impactación y la angulación. Se examinaron un total de 327 terceros molares maxilares; el tercer molar superior faltante congénitamente estaba en el lado derecho, y las mujeres (10,25 %) tenían más terceros molares superiores encajados en el seno maxilar que los hombres (8,0 %) (4,9 %). El tipo A (52,9%) fue el más común según la clasificación de Pell y Gregory, aunque las angulaciones verticales del tercer molar superior se observaron con mayor frecuencia (85,32%). Los terceros molares maxilares que faltan congénitamente son más comunes en las mujeres, y la posición A fue la más común entre los terceros molares maxilares en un nivel vertical.

Palabras clave: Tercer molar maxilar; Impactación; Angulación; Seno maxilar; Enseñanza en la salud.

1. Introduction

Third molars are the most often teeth congenitally missing. (Alling, C. C., et al., 1993) If present, they are usually the last tooth to erupt in human dentition, and thus, it is subjected to impactions which are considered a pathological condition which return to the cause by the end of adolescence, the jaw has almost reached the adult size, but it happens that sometimes it is not large enough to support the development of the last erupted wisdom teeth, when this occurs, these teeth fail to erupt and stay embedded in the bone and erupt where there is less resistance. This condition takes place more in females than males due to the smaller female's jaws. Therefore, the prevalence of impacted third molars is between 16.7% - 68.6%. (Alsadat-Hashemipour, Tet al., 2012; Hugoson & Kugelberg 1988; Mead 1930; Quek et al. 2003)

Maxillary third molars have a higher degree of impaction than the mandibular third molars leading to many clinical complications like facial pain, periodontitis, carious lesions, adjacent roots resorption, cysts, tumors, teeth crowding, malocclusion, and even sinusitis if inflamed tooth. (Brauer 2009; Demirtas & Harorli 2016; Lysell & Rohlin 1988; Nakayama et al. 2009)

When maxillary third molars are extracted, it also leads to many postsurgical implications such as maxillary tuberosity fracture, maxillary sinus perforation, or maybe displacement of teeth or roots to the maxillary sinus. (Bouquet et al. 2004; Demirtas & Harorli 2016; Patel & Down 1994; Primo et al. 2014)

The classification of maxillary third molars impaction allows surgeons to communicate easier with other colleagues, and enhance the management of post-surgical problems. Many studies are evaluating the relationships between the inferior border of the maxillary sinus and roots of maxillary third molars by panoramic radiograph. Several investigations have shown the relationship between the roots of mandibular third molars and mandibular canal using panoramic radiograph; However, few studies on the type of impaction of the third molars angulation and position. (Bouquet et al. 2004; Jung, et al., 2012; Katakam 2012; Obayashi et al. 2009; Şekerci & Şişman 2013)

Panoramic radiography is widely used in dentistry because it is fast, inexpensive, and provides a low radiation dose and bilateral view of the jaws compared to other advanced diagnostic tools. So, it is often used in assessing the impaction

position of the impacted third molars. Panoramic radiography can be an appropriate technique for assessing impacted third molars, linear dimensions, and proximity to the maxillary sinus. Orthopantomography is normally used to estimate the association between the impacted upper third molar and the maxillary sinus. (Carvalho & do Egito Vasconcelos 2011; Lim, et al., 2012; Nasser et al. 2018)

There are few studies discussed about the types of impaction of the upper third molar and the correlation between the third molar and the floor of the maxillary sinus. (Jung, et al., 2012; Lim, et al., 2012) This study was performed to assess the relationship and position of maxillary third molars to maxillary sinus among Yemeni students by using orthopantomography.

The objectives of this study are to evaluate the incidence of mandibular third molar impaction for Yemeni students by using panoramic X-ray in which the null hypothesis was tested that there was no difference in the pattern of mandibular third molar impaction and angulation in comparison with other studies around the world.

2. Methodology

The current study was a retrospective analysis of college students, performed between 2018-2019 in the departments of Oral Radiology and Oral and maxillofacial surgery, Faculty of Dentistry, Ibb University, Yemen. The study protocol was approved by the ethical and legal affairs of Ibb University with the agreement of students. All the necessary data were recorded in a case sheet that was obtained through clinical examination and x-ray findings.

A total of 200 students were examined; The age, gender, and the number of impacted third molars were also recorded. The students were excluded if they have any jaw pathology or sinusitis, any previous jaws trauma involving the dentition or third molar extractions, and had incomplete root formation or missing second molars, or incomplete records or poor radiographic quality.

Three professional examiners have checked the radiographs in a dark room with suitable illumination to distinguish the incidence of third molars impaction, depth, relation to the maxillary sinus and second molar, and angulation.

The relationship between maxillary third molars roots apices and the floor of maxillary sinus were evaluated and classified according to the following categories: Far: The space between maxillary third molar root apices and floor of maxillary sinus $> 2\text{mm}$; Close: The space between maxillary third molar root apices and floor of the maxillary sinus is between $(0 - 2)$ mm; Inside: The maxillary third molar root apices are within the floor of the maxillary sinus. (Lim, et al., 2012)

The vertical impaction of maxillary third molars was determined by using Pell and Gregory's classification that assesses the relation of maxillary third molars to maxillary second molars as follows: Type A: The occlusal plane of the second and third molars are with the same level; Type B: The occlusal plane of the third molar are between the cervix and occlusal plane of maxillary second molar; Type C: The occlusal plane of the third molar is apical to the cervix of the maxillary second molar. And Type D was added: The maxillary third molar has overly erupted. (Mohammed Al-Sharani et al. 2021; Yurdabakan, et al., 2018), (Pell & Gregory 1933)

The angulation of maxillary third molars was observed based on Winter's classification as follows: Vertical: The maxillary third molar is parallel to the maxillary second; Horizontal: The maxillary third molar is perpendicular to the maxillary second; Mesio-angular: The maxillary third molar is mesially angulated; Disto-angular: The maxillary third molar is distally angulated; Bucco-lingual: The maxillary third molar is horizontal in buccolingual direction. (Kilic et al. 2010), (Winter, 1926)

The data was collected from the case sheets and inserted through Microsoft Excel 2016, then statically analyzed by IBM SPSS using t-test and χ^2 test, with a P-value considered significant if less than 0.05.

3. Results

In this study, panoramic radiographs of 200 students with 327 maxillary third molars were examined, 102 (51%) males and 98 (49%) females with an average age of 22.34.

The most shown congenitally missing maxillary third molar was on the right side, and it was more frequently in females (10.25%) than males (8.0%). The frequency distribution of maxillary third molar presence was studied based on gender, the results of which are shown in Table 1.

The approximation of maxillary third molars to the maxillary sinus has shown that females are predicted to have teeth within the maxillary sinus more than males in about 4.9% as seen in Table 2. The teeth were close to the sinus in about 60.5%, and this relation was significant.

The relationship between third molar to the second molar according to Pell and Gregory's Classification has recorded a significant association in which type A was the most occurring in about (52.9%) while type C showed the second with (25.38%) as shown in Table 3.

The vertical angulations of maxillary third molars have shown more vertical angulation (85.32%) followed by Disto-angular which represented (13.14%) among our students as observed in Table 4.

Table 1. Frequencies of third molar presence.

| Sex | Number of Third Molars | | | | | P Value |
|--------------|------------------------|----------|-----------|-----------|------------|--------------|
| | Absent | One | Two | Three | Four | |
| Male | 5 | 2 | 10 | 11 | 74 | 0.485 |
| Female | 5 | 3 | 12 | 18 | 60 | |
| Total | 10 | 5 | 22 | 29 | 134 | |
| 200 | | | | | | |

Source: Authors.

Table 2. Relationship of maxillary sinus and upper wisdom tooth

| Maxillary Sinus Approximation | | Absent | | Far | | Close | | Inside | | P Value | |
|-------------------------------|--------|--------|----|-----|----|-------|----|--------|---|--------------|--------------|
| Maxillary Third Molars | | R | L | R | L | R | L | R | L | R | L |
| Sex | Male | 16 | 16 | 30 | 26 | 54 | 59 | 2 | 1 | 0.007 | 0.120 |
| | Female | 24 | 17 | 24 | 27 | 38 | 47 | 12 | 7 | | |

Source: Authors.

Table 3. Pell and Gregory’s Classification assessing the relation of M3 to M2.

| Vertical Impaction | | Type A | | Type B | | Type C | | Type D | | P Value | |
|------------------------|--------|--------|----|--------|----|--------|----|--------|---|---------|-------|
| Maxillary Third Molars | | R | L | R | L | R | L | R | L | R | L |
| Sex | Male | 53 | 54 | 10 | 15 | 18 | 14 | 5 | 3 | 0.040 | 0.070 |
| | Female | 31 | 35 | 16 | 14 | 24 | 27 | 3 | 5 | | |

Source: Authors.

Table 4. Winter’s Classification assessing the angulation of M3.

| Third Molars Angulation | | Vertical | | Horizontal | | Meisio-angular | | Disto-angular | | Bucco-lingual | | P Value | |
|-------------------------|--------|----------|----|------------|---|----------------|---|---------------|----|---------------|---|---------|-------|
| Maxillary Third Molars | | R | L | R | L | R | L | R | L | R | L | R | L |
| Sex | Male | 74 | 75 | 1 | 1 | 1 | 0 | 10 | 10 | 0 | 0 | 0.493 | 0.593 |
| | Female | 63 | 67 | 1 | 0 | 0 | 0 | 10 | 13 | 0 | 1 | | |

Source: Authors.

4. Discussion

When it comes to the surgical procedures in the area of maxillary posterior teeth, it is very important to gather accurate data regarding its relation to the floor of the maxillary sinus for achieving a safe teeth removal, especially upper third molars unless it might result in oroantral communication. (Demirtas & Harorli 2016) (Evlice & Duyan 2021)

In this study, it was aimed to investigate the position of the maxillary third molars and their approximation to the maxillary sinus as well as their different angulations and impaction status using panoramic radiographs which are easy to assess both sides and with affordable price. (Lim, et al., 2012; Shah, et al.,2014)

In the literature, many studies have evaluated the relationship between the maxillary sinus floor and the maxillary posterior teeth. However, few studies tested the relationship of the maxillary third molars with the proximity to the maxillary sinus in regards to angulation and impaction status in a Yemeni student's sample. (Kruger, et al., 2001; Ok et al. 2014)

The current study showed women presented greater impaction of the maxillary third molars which could be explained by the narrower jaws in comparison to men. (Mosquera-Valencia, et al., 2020)

While the rate of complete impaction of maxillary third molars was reported as 14.3% in a study done by Demirtas et al, it was recorded as 25.3% in our study which is in accordance with studies accomplished by Evlice et al. (Demirtas & Harorli 2016; Abulohom, F & Al-Shcarani H 2022, Evlice & Duyan 2021) The high level of impaction is a strong predisposing factor, especially for oroantral communication, because it designates that the tooth is more involved in the bone and therefore its proximity to the maxillary sinus. Due to the excessive amount of bone that should be removed during the removal of the wisdom tooth, the possibility of damaging the sinus is increased. According to Pell and Gregory's classification, the impaction level of the maxillary third molar tooth compared to the adjacent second molar tooth was most frequently observed as class A with 52.9%, and this result was similar to the data of many studies. (Alsadat-Hashemipour, et al., 2012; Demirtas &Harorli 2016; Yurdabakan, et al., 2018)

Our results showed that the vertical angulation of maxillary third molars predominate which agrees with studies Hashemipour et al and others, and conflicted with the research performed by Kruger et al who noticed that the most common angulation among the New Zealand population was mesioangular. (Alsadat-Hashemipour, et al., 2012; Demirtas & Harorli 2016; Kruger, et al., 2001) The contrast in studies may be related to the selected group age, sample sizes, races, and differences in the imaging technique used. A study by Wang et al reported that impacted third molars in mesioangular and horizontal positions increase the risk of root resorption of adjacent second molars. In this study, when the positions of the maxillary third molars were evaluated according to their angulations, the distoangular position with 13.4% while mesioangular and horizontal angulation was very low occurring at about 1.2%. (Yurdabakan, et al., 2018)

In our study, upper third molar roots exhibited about 6.7% to be in the sinus and about 60.5% are closed to the sinus in less than 2 mm which is similar to the study performed by Lim et al. (Lim, et al., 2012) Thus, dentists should be aware of the situation to avoid perforation.

5. Conclusion and Final Considerations

The following conclusions are considered in this study:

1. Panoramic X-rays are a very important tool for initial diagnosis.
2. The gender might affect in maxillary third molar missing congenitally.
3. Most maxillary third molar root apices are closed to the maxillary sinus increasing the risk of sinus perforation. moreover, the proximity of these vital structures should be considered to prevent infectious disease within the sinus. Thus, precautions should be taken before surgery, and CBCT is required to assess the exact relationship of the maxillary sinus and the maxillary third molar root apices during the treatment procedures.
4. The depth of impaction, Class A was shown most frequently in this study. The most common tooth position was vertical angulation.

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