

Original article

Prevalence and Angulation Pattern of Mandibular Third Molar Impaction in a Libyan Sub-population: A Retrospective Radiographic Study

Mervet El-Zuki^{*}, Farha Alamami¹, Haneen Albillah¹, Alaa Ayman¹, Maha Elfeitore¹

Faculty of Dentistry, Libyan International Medical University (LIMU), Benghazi, Libya

^{*}Corresponding author: mervet.a.elzuki@limu.edu.ly

Abstract

Impacted teeth are those that fail to erupt into their proper functional location beyond the chronological time usually expected. Etiology may be multifactorial, usually due to adjacent teeth, dense overlying bone or soft tissue, size of the mandible or maxilla, with the resultant lack of space in the jaw, aberrant path of the eruption, abnormal positioning of the tooth bud, differential root growth between the mesial and distal roots, or pathological lesions. Amongst all, mandibular third molar impaction is an important clinical issue, as impacted teeth may predispose to periodontal disease, such as Pericoronitis, Periodontitis, cystic lesions and neoplasms, root resorption, causing determined effects on the adjacent tooth and resulting in pain, discomfort, and loss of function. Impacted third molars can be diagnosed based on clinical as well as radiographic examination. Intraoral and panoramic radiographs are usually used to assess the impacted molar, helping to evaluate the pattern of impaction, aiding in accurate treatment planning and management. Different classifications have been introduced, of which Winter's, Pell's, and Gregory's Classifications are claimed to be the most common ones. To radiographically evaluate the prevalence and angulation pattern of mandibular third molar impaction in terms of age, gender, and side in a sample of Libyan patients, using panoramic images. It is a retrospective, cross-sectional (2021-2022) study that utilized the radiographic records; Panoramic images of 1000 patients, aged between 20 and 50 years old, attending the Dental Center in the Faculty of Dentistry at the Libyan International Medical University (LIMU), Benghazi- Libya. Based on Winters' Classification, the method of defining the angle of impaction by estimating the angle between the longitudinal long axis of the second and third molars to decide the type of impaction: Mesioangular, distoangular, vertical, horizontal, or others. Among the original sample (1000 images), only 783 images were included; 130 (16.6%) displayed impaction of mandibular third molars, including 70 (53.85%) males ($P>0.13$) and 60 (46.1%) females ($P>0.06$). The most frequent age group was 22 years (16%); out of which 11 (50%) were males and 10 (45 %) were females. The most common angulation pattern of impaction was the mesioangular position (53.8%). In the assigned sample, the mesioangular impaction is the most common angulation pattern, followed by the vertical and horizontal patterns. Males had an increased predilection for third molar impaction than females. The prevalence of mandibular third molar impaction was higher on the left side and most frequent in the 22-year-old age group.

Keywords: Impaction; Third molar; Radiographic; Retrospective; Mandibular, Libya.

Introduction

An impacted tooth is a tooth that fails to erupt to its normal functioning position in the dental arch within the expected time [1,2]. Third molars are the most frequently impacted teeth [1,3], generally erupting between 18 and 24 years old [4,5]. However, variations exist in the age of eruption. Etiology of impaction may be multifactorial; usually due to insufficient skeletal growth, macrodontia, adjacent teeth, dense overlying bone or soft tissue, pathological lesions, local factors, and systemic conditions. Mandibular impacted third molars are often associated with pericoronitis, periodontitis, dental caries, pain, crowding, and root resorption [1]. Therefore, dental management and intervention are usually required [1,6].

Diagnosis of impacted third molars can be determined by both intraoral, periapical, and panoramic radiographic examination. Moreover, radiographic examination can be utilized to evaluate the type of impaction, to detect anatomical obstacles preventing the impacted tooth from eruption, and most importantly, to assess its relation to the inferior alveolar canal [1-11]. Accordingly, a proper diagnosis can be obtained for proper dental management, and in this context, several methods were utilized to classify third molar impaction [1].

Winter's Classification is one method of defining the angle of impaction by estimating the angle between the longitudinal long axis of the second and third molars to decide the type of impaction [2]. This study aims to investigate the prevalence and angulation pattern of mandibular third molar impaction in terms of age, gender, and side in a sample of Libyan patients attending the LIMU Dental Center, by using their panoramic images.

Methods

Study Population

1000 panoramic images, intended for several clinical reasons, were retrieved from the Radiology Unit archives in the LIMU Dental Center, Faculty of Dentistry at LIMU-Benghazi, Libya, within the period from 2021 to 2022; Ethical Clearance with the Certificate Reference No. DEN-2023-00035.

Impaction

To consider a third molar as an impacted tooth, it should not have a functional occlusion while the root formation is completed. Angulation of impaction: Based on Winter's Classification, the angle of impaction was defined as the angle between the longitudinal long axis of the second and third molars [2] (Figure 1). Inclusion criteria included panoramic images of Libyan patients within the age group of 20–50 years, and the presence of a second molar adjacent to the impacted mandibular third molar. Exclusion criteria included images of poor quality, totally edentulous patients, and patients during orthodontic treatment, the presence of any pathological lesions in the molar area, evidence of trauma, or any pathology in the mandible that affects the alignment of dentition.

Data collection

Demographic information regarding the age and gender of patients was collected in a checklist. Panoramic images were evaluated by a trained dentist under standard conditions. All panoramic images were taken by a Digital Panoramic System: Vatech · Rayence · Vatech MCIS · Ewoosoft · Woorien · Vatech eng. Address 13, Samsung 1-ro 2-gil, Hwaseong-si, Gyeonggi-do, 18449, Korea. VATECH. The Software (EasyDent V4 Viewer – English Copyright © 2002-2012 by VATECH Version 4.1.5.10). Selected exposure settings composed of two sets of combinations: 60 kVp, 4 mA, 18 s, and 66 kVp, 8 mA, 18 s. Panoramic images were processed and evaluated using a workstation computer unit (HP LP2475W LCD TFT Monitor, China). The PC workstation used Windows® 7 Professional 32-bit with XP Mode operating system (Microsoft Corporation, Redmond, WA, USA). Images were interpreted under the same standard conditions: dimly lit room, the same workstation computer unit, and the same display monitor.

Reliability and Repeatability

For the 783 images, the inter-observer agreement repeatability was (0.59) for 60 images. Regarding the “intra-observer” reliability: For the first observer the observation reliability (0.62) for the 20 images. For the second observer, observation reliability (0.67) for the randomly selected 25 images.

Statistical analysis

The prevalence of impacted third molars in relation to age, gender, and type of impaction was evaluated and expressed as frequency and percentage. All measurements are presented as mean (M) and standard deviation (SD) values, and the threshold for statistical significance was set at ($P < 0.05$). In addition, to analyze the data, a Chi-square test was performed, using the statistical package for social sciences software, version 24 (IBM, SPSS, Chicago, IL, USA).

Results

A total of 1000 panoramic images were evaluated, out of which 217 were excluded, and 783 were included. 130 (16.6%) of the images showed unilateral and bilateral impaction of mandibular third molars, including 70 males (53.85%); ($P > 0.13$) and 60 (46.1%) females; ($P > 0.06$). The mean age was 22 (16%), including 11 (50%) males and 10 (45%) females, and the difference in the mean age was insignificant, with a decrease in prevalence of impacted mandibular teeth as age increased. According to the side, amongst the 130 images with mandibular third molar impaction, the frequency of impactions was 100 (76.9%) ($P < 0.96$) on the left side and 65 (50%) ($P < 0.48$) on the right.

As regarding the angulation type distribution of the mandibular third molar impaction in both males and females, and based on a Chi-square test, the prevalence of the mesioangular angulation was higher than the other types ($P > 0.13$), constituting the most common angulation type 70 (53.8%); 47 (67%) on the left side and 23 (32%) on right, followed by the vertical type 47 (36.1%); 25 (53.1%) on the left side and 22 (46.8%) on the right, and then the horizontal type 45 (34.6%); 26 (57.7%) on the left, 19 (42.2%) on the right (Table 1).

The impacted mandibular third molars are common amongst young adults, as it was found in patients between 21 and 32 years old, 103 (76.2%). The current study also showed that the images belonging to males in the age group between 21 and 30 years presented more frequently with impacted mandibular third molars than those of females.

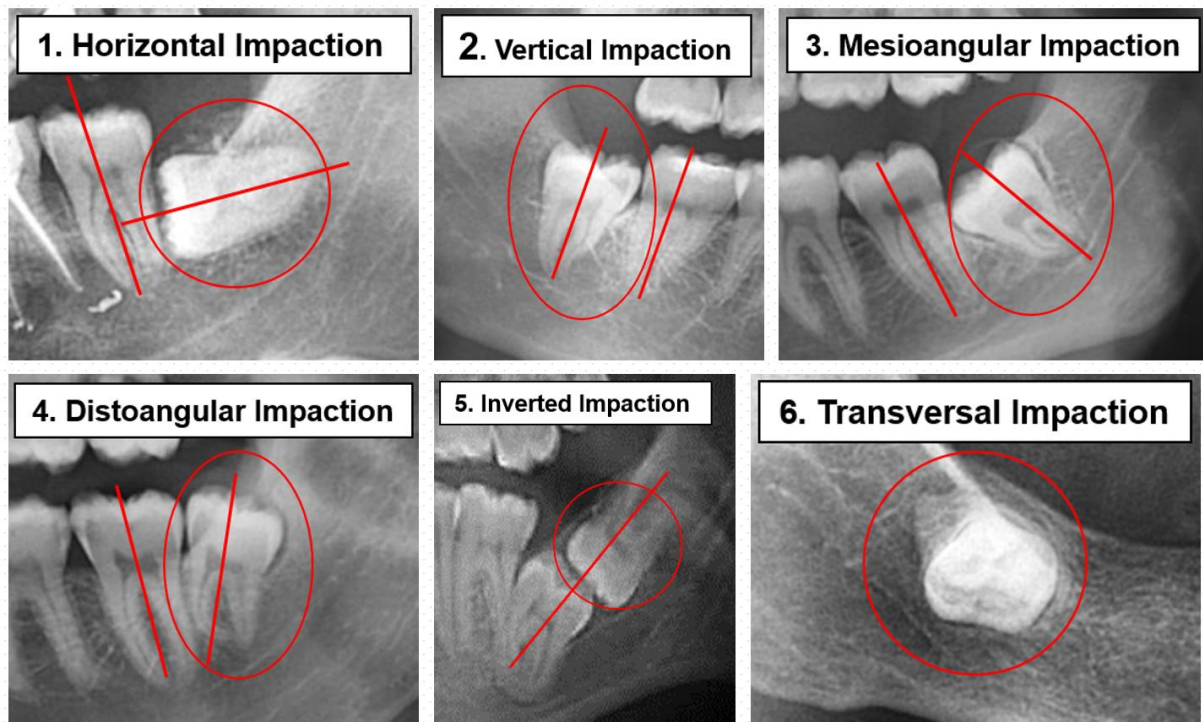


Figure 1: Cropped panoramic images showing the angle of impaction according to Winter's Classification [2]; 1. Horizontal, 2. Vertical, 3. Mesioangular, 4. Distoangular, 5. Inverted, and 6. Transversal impaction or others (the 2nd molar was missing in this cropped image, in regard to the inclusion criteria). However, the image was included for illustrative purposes. All Panoramic images were obtained from the LIMU Dental Center, Faculty of Dentistry, and the angulation measurement lines in the figure were designed by the authors.

Table 1. The frequency of Angulation type of mandibular third molar impaction according to gender, as detected in the sample of 783 panoramic images, where 130 images showed unilateral and bilateral impaction of third molar: with the frequency of 100 (76.9%) on the left and 65 (50%) on the right.

Angulation Type	Male	Female	Frequency (%)
Mesioangular	39	31	70 (53.8%)
Distoangular	1	1	2 (2.30%)
Vertical	20	27	47(36.2%)
Horizontal	28	17	45(34.6%)
Inverted	1	0	1(0.76%)
Trans	0	0	0 (0%)
Total	89	76	165

Discussion

Third molar impaction is a common finding in modern societies, usually associated with complications, and can be evaluated radiographically for diagnosis and surgical management [11]. Different populations have different patterns and different frequencies of third molar impactions in the mandible. Given the available literature, this is the second study to evaluate the patterns of impacted third mandibular molars in a Libyan sub-population residing in Benghazi, Libya. The frequency of mandibular third molar impaction (16.6%) was less than that reported in the former study (56%) conducted in 2015 in Benghazi [11]. This inconsistency may be attributed to the sample size discrepancy; the original sample size in the current study is 1000 panoramic images, whereas in the former Libyan study, it was 300 panoramic radiographs. The same statement holds for a study conducted in Oman (54.3%) [8] and in Turkey (57.3%) [3]. Whereas the frequency in Saudi Arabia (12.31%) [10] agreed with the current study, and both were near the frequency in the Eritrean study (26.04%) [9].

In the current study, the most common angulation type of impaction was the mesioangular, followed by the vertical type. This is in accordance with a study conducted in Eritrea regarding the mesioangular angulation [9] and in accordance with a study conducted in Turkey regarding the vertical angulation type 3. It is important to highlight that this study agrees with that conducted in the same University (LIMU) around 10 years ago, by Hatem M. et al. (2015)[11] regarding the fact that the most frequent mandibular third molar impaction types were the mesioangular impaction and the vertical impaction types, respectively [11]. In regard to gender, the present study reported that the frequency of mandibular third molar impaction in males was higher than that in females, which agrees with the results of a previous study in Oman [8] and in Eritrea [9]. Nevertheless, a study conducted in Saudi Arabia reported that the frequency of impacted mandibular third molars was higher in females [10], and the same was reported in

the former Libyan study, where the frequency was higher in females [11]. This was in accordance with the results reported in Jordan [12].

In 2017, a study conducted in Turkey [3] reported no difference between males and females in this respect, which can be due to the different growth patterns between the two genders, as female jaw growth, for the most part, ends by the time the third molar erupts [3]. In the same context, a study in Iran suggested that there is a role of genetics in tooth impaction, explaining the difference in impacted third molar in relation to gender and region [13,14]. In the current study, the mean age of cases with mandibular third molar impaction was about 20-25 years, which is almost the same as the average age as reported for the eruption of mandibular third molar [14]. Regarding side, the present study reported that the left side impaction was the most frequent side, followed by the bilateral impaction. On the contrary, the Omani [8] and the former Libyan [11] studies reported that mandibular third molar impaction was bilateral in most cases, whereas the study conducted in Saudi Arabia [10] reported a little difference between bilateral and unilateral impactions. The prevalence and types of impactions may vary in different racial and ethnic groups. It is, therefore, imperative to understand the pattern of impacts in various communities and population subgroups [11].

Conclusion

In the current study, the assigned sample illustrated that the mesioangular impaction is the most common angulation pattern, followed by the vertical and horizontal patterns, respectively. Males had an increased predilection for mandibular third molar impaction than females. The prevalence of mandibular third molar impaction was higher on the left side and was most frequent in the 22-year-old age group.

Recommendations

In future research, it is recommended to utilize a larger sample size of patients from multiple clinical centers in different districts in Benghazi, or even more in different cities in Libya. Also, it is crucial to consider clinical examination, using other third molar impaction patterns, or classification methods. Lastly, it will be interesting to study the mandibular third molar impaction patterns in orthogonal Cone Beam Computed Tomography scans.

Conflict of Interest: None

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