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Pattern of Mandibular Third Molar Impaction in Patients from Twin Cities of Pakistan

Kinza Ayub[1], Mohsin Afzal[2], Maryam Sattar[3], Lateefa Khan[3], Aqsa Malik[3], Ayiza Afzaal[3]

[1]Senior Registrar Oral and maxillofacial surgery HBS Dental College, Islamabad, Pakistan
[2]Associate Professor Oral surgery, Islamic International Dental College and hospital Islamabad, Pakistan
[3]House officer Islamic International Dental College Islamabad, Pakistan

Abstract

When a tooth fails to erupt within its expected time window, it is called as impaction. Impaction of tooth can be due to multiple local and generalized reasons. Generalized factors are associated with multiple systematic disorders and syndromes including cleidocranial dysostosis, Down's syndrome, amelogenesis imperfecta, osteopetrosis and achondroplasia. Local factors involved in the failure of eruption include lack of space, supernumerary teeth, odontogenic cysts and tumors, odontoma, ankylosis, existence of alveolar cleft and idiopathic factors such as primary failure of eruption. Mechanical obstruction are most frequently associated with the failure of eruption of permanent teeth. Most common impacted tooth is mandibular third molar which makes 98% of all types of impacted teeth1 followed be maxillary third molar, maxillary canine and mandibular second premolars. Mandibular third molars removal is performed due to multiple reasons including pain, swelling and other complications during and after eruption. Its extraction requires proper planning according to the angulation and position to avoid post-operative complication. The goal of the present study is to estimate patterns of mandibular impaction in patients from twin cities of Pakistan. So that surgeons can plan the surgery according to the patterns of impactions. A prospective survey was executed on patients visiting oral surgery section of Islamic International Dental Hospital, Islamabad from April 2018 to Feb 2019. Sample size was of 50 patients. Chosen Classifications were Pell and Gregory and Winters classification. Data examination was done through SPSS 23. The most frequent type of impaction is mesioangular in patients of twin cities. Third molar impaction is a public health concern. The most predominant category of impaction was level B and class 2, mesioangular impaction with a slight male prediction in twin cities of Pakistan. This study can help surgeons plan according to data and avoid complications.

1. Introduction

Surgery for removal of mandibular wisdom tooth is the most frequent surgery performed in domain of Oral and Maxillofacial surgery.

Impacted teeth cause various problems including pain, cheek bite and food impaction. Patients can also present with swelling, pericoronitis and trismus. Nikhil et al. reported decay on distal part of second molar on radiographs in 37.5 % cases due to impacted third molars in mandibular arch (1). It is comprehended that even if partially impacted mesioangular mandibular third molars is asymptomatic but due to its nearness and close contact with cementoenamel junction of the second molar, there is always possibility of developing decay and caries in second molar (2). It has also been concluded that third molars can be linked with various pathological

Corresponding author at: Kinza Ayub
Email address: kinza.a.sheikh@gmail.com

conditions including cysts and benign tumors which can transform to carcinomas (3).

Impaction can be removed with elevators and forceps, or surgical intervention may be required depending upon the angulation, depth and mesiodistal area between second molar and mandibular ramus.

The post op sequelae i.e. swelling, pain and trismus and post op complications like inferior alveolar and lingual nerve damage or mandibular fracture can be avoided by proper planning of impaction on the basis of radiographic examination. Proper planning and determination of sequence of steps on the basis of classification can help in decreasing the operative time and better communication with the patient about what to expect. It also helps the surgeon in determining the required equipment and what to expect during surgery.

Orthopantomograms (OPG) are done to assess the sort of impaction based on its angulation with reference to second molar, depth within ramus, state of neighboring second molars and nearness of third molars to inferior alveolar nerve canal in order to prearrange an appropriate management plan.

There are two major classifications used to categorize impactions. Pell and Gregory and Winter's classification. Winter's classification labels inclination of impacted wisdom tooth with reference to long axis of neighboring second molar tooth. Angulation of wisdom tooth can be categorized as Horizontal (H) Mesioangular (Ma), Vertical (V) and Distoangular (Da) according to winter's classification (4) as shown in figure 1-4.

Figure 1: Horizontal Impaction

Figure 2: Mesioangular Impaction

Figure 3: Vertical Impaction

Figure 4: Distoangular Impaction

Pell and Gregory proposed classification and modified techniques on the basis of classification in removal of third molar in 1933.

They determined level A, B and C on the basis of depth of impaction comparative to neighboring tooth Level A was defined as the impaction when occlusal plane of the impacted wisdom tooth is at similar level as occlusal plane of neighboring tooth. Level B is when occlusal plane of impacted wisdom tooth is in the middle of occlusal plane and cervical line of neighboring tooth. Level C is when occlusal plane of impacted wisdom tooth is below cervical line of neighboring tooth (4).

They also classified impactions in Level I, II and III on the basis of relation of impacted third molar to mandibular ramus and second molar where Class 1 is where adequate space is present between anterior border of ascending ramus and distal aspect of second molar to aid in eruption of third molar. Class 2 is where space existing in the middle of anterior border of ramus and distal aspect of second molar is less than mesiodistal width of crown of third molar. Class 3 is where third molar is totally embedded into bone from ascending ramus because of complete absence of space (5).

Two years after this classification was published, Pell and Gregory published modified techniques for extraction of impacted wisdom teeth on the basis of this classification. They proposed that Class 1 impaction position A has sufficient space for the mesiodistal diameter of crown, and more than half of crown is out of the bone hence it can be removed with reflecting flap and application of elevators.

2

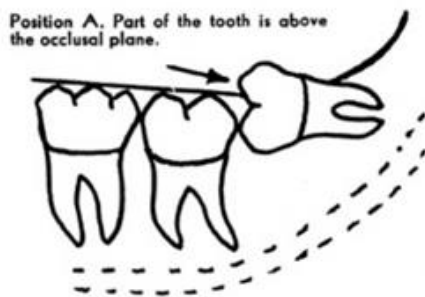**Figure 5:** Class I Level A Mesioangular Impaction

Figure 6: Class I Level A Horizontal Impaction

Class I level B and C impaction do have sufficient space for the crown but due they are below the occlysal level of adjacent tooth and require bone removal buccally and splitting of tooth.
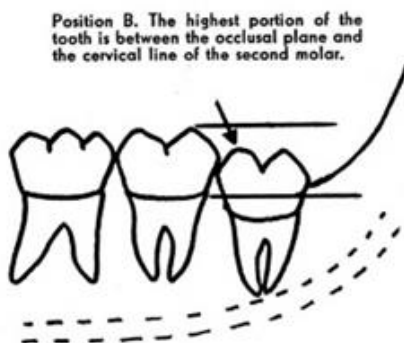

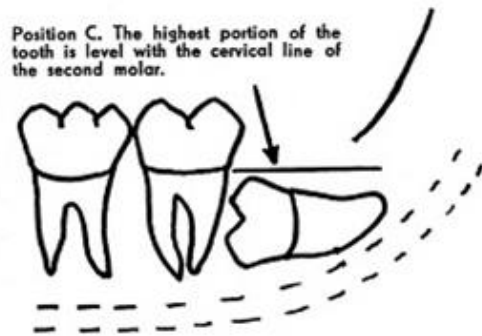**Figure 7:** Class I Level B Vertical Impaction

Figure 8: Class I Level C Horizontal Impaction

Class II has less mesiodistal area between the second molar and ramus of mandible, so it requires bone removal buccally and distally. Position A has the most crown visibility but in position B and C, Crown is below the occlusal level of adjacent tooth and crown needs to be split.
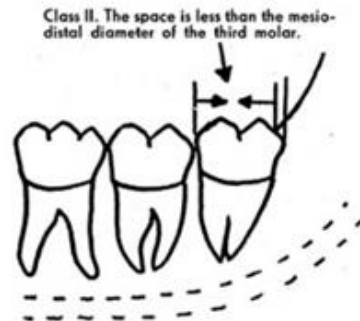

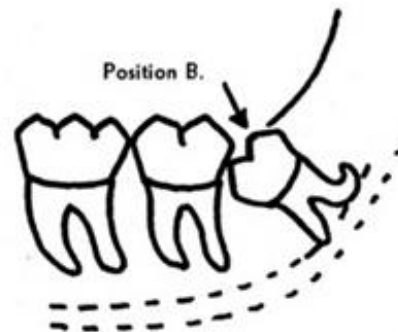**Figure 9:** Class II Level A Vertical Impaction

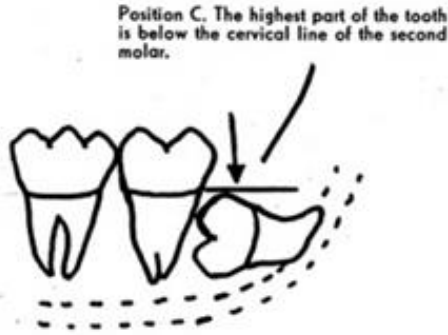**Figure 10:** Class II Level B Mesioangular Impaction

Figure 11: Class II Level C Horizontal Impaction

Class III has no mesiodistal area in between the second molar and ramus of mandible so it requires bone removal occlusally, buccally, and distally. Position A, B and C require bone removal and crown needs to be split.
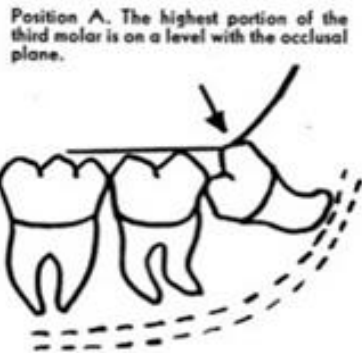

Figure 12: Class III Level A Mesioangular Impaction
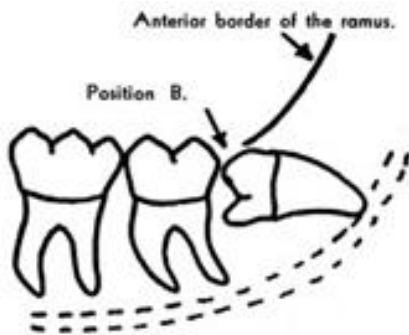
Figure 13: Class III Level B Horizontal Impaction
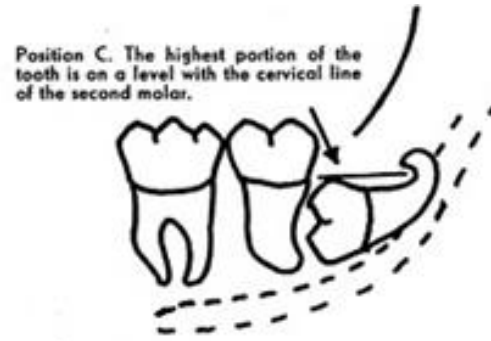
Figure 14: Class III Level C Horizontal Impaction

Different impactions require different techniques for removal. The Pell and Gregory and Winter's classifications help in choosing appropriate technique and decrease the post-operative side effects, impactions need to be properly planned. The steps of removal of Class II, position B impaction are shown in figure15-20.

Figure 15: Class II Position B Horizontal Impaction Flap Reflected

Figure 16: Occlusal and Buccal bone removed

4

Upper portion of the tooth split and re-moved.

Figure 17: Crown Hemisectioned

Spear-point or bi-bevel drill separating the remaining portion of the crown from the root.

Figure 18: Remaining crown split from root and removed

Drilling a hole in the root for the insertion of a lever.

Crown removed.
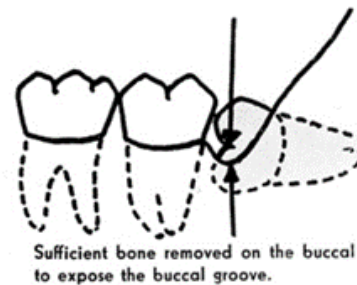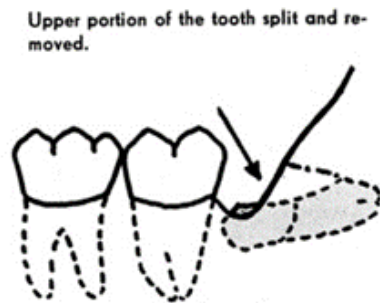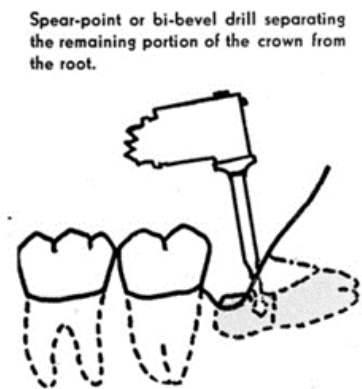
Figure 19: Purchase point made in root to engage elevator

Lever in place and the root brought forward into the space provided.
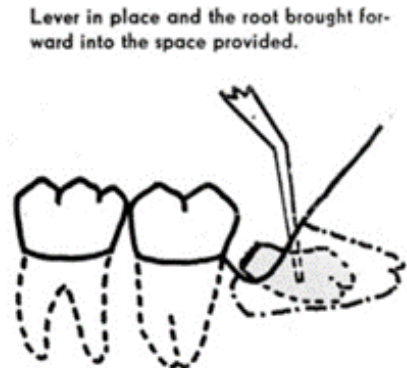
Figure 20: Root removed

Studies have revealed that impacted wisdom tooth debilitates the mandible at angle area which makes it vulnerable to fracture either during extraction of third molar or due to trauma (6). Impactions can also lead to late anterior crowding and relapse of orthodontic treatment (7).

Improper planning surges the danger of complications including alveolar osteitis, paresthesia, bleeding, and fracture of the jaw. The stated incidence of injury to inferior alveolar canal related with removal of mandibular wisdom tooth ranges from 0.6% and 5.3%. The possibility of permanent inferior alveolar canal injury is less than 1%. These complications can be avoided by using radiographs as they can help classify the impaction and then surgeon to perform necessary precautions to avoid and plan according to difficulty of impaction.

Orthopantomogram allows an early evaluation of possible complications associated with impacted mandibular wisdom tooth. The estimated sensitivity ranges between 24% to 38%, and the specificity ranges from 96% to 98%, for radiographic signs as prognosticator of nerve injury.

Above mentioned classifications help in determining the pattern of impaction with the help of radiograph and hence facilitate dentists in coming up with better treatment planning of the impacted teeth (8). This also helps the orthodontists to plan their final occlusal relations, extractions and retention therapy more efficiently. Following this rationale, main objective of this research is to assess pattern of mandibular wisdom tooth, visiting the OMFS department, based on its angulation, depth of impaction in relation to adjacent teeth and ascending border of ramus using periapical

5

radiographs and orthopantomogram so that proper plan and sequence of the steps of extraction can be determined.

2. Materials and Methods

Ethical approval was taken from ethical committee of Riphah University's preceding the commencement of this study. A prospective study was carried out in Islamic International Dental Hospital, Islamabad from April 2018 to Feb 2019. Male and females from 15 to 35 years were included. The sample consisted of fifty patients showing up to OPD of Oral surgery department of IIDC. The data was noted down by three investigators over a period of 10 months.

Two different classification systems were used to assess the radiograph.

Inclusion criteria:

Patients older than the age of 15 years with OPG radiographs were involved in the study.

Exclusion criterion:

Patients less than 15 years of age and presenting with no or poor-quality radiographs. And presences of any craniofacial and congenital deformities or syndromes were excepted from the study.

For the purpose of study, OPG radiographs were selected. Three independent investigators assessed the radiographs to assess the position, depth, and angulation of mandibular wisdom tooth with reference to second molar and ramus of mandible. Two main classifications were used in categorizing impacted 3rd molars in this research which were Pell and Gregory classification and Winter's classification.

Level of impaction was assessed considering the depth of impaction comparative to neighboring tooth into three levels using Pell and Gregory classification. Level A is where the occlusal plane of impacted wisdom tooth is at same level as occlusal plane of neighboring tooth. Level B is where the occlusal plane of impacted wisdom tooth is stuck between occlusal plane and cervical line of neighboring tooth. Level C is where the occlusal plane of impacted wisdom tooth is beneath cervical line of neighboring tooth as displayed in figure 7 to 14. Impacted mandibular wisdom tooth is also classified in reference to its relationship with ramus of mandible and second molar. Class 1 is where adequate space is open between the anterior border of ascending ramus and distal aspect of second molar to aid in eruption of third molar. Class 2 is where the space existing between the anterior border

of ramus and distal aspect of second molar is less than mesiodistal width of crown of third molar. Class3 is where third molar is entirely implanted into bone from ascending ramus due to outright deficiency of space (14) as displayed in figure 7 to 14.

Winters classification labels the inclination of impacted wisdom tooth relative to long axis of second molar. The third molar or wisdom tooth can be classified as Horizontal (H), Mesioangular (Ma), Vertical (V) and Distoangular (Da) on basis of angulation based on Winter's classification (18) as shown in figure 1to 4 Three independent investigators assessed the date and recorded it. Then the meaning of the findings was noted. Data was analyzed through SPSS 23. Descriptive statistics are shown in the form of tables and charts.

3. Results

In our study of mandibular third molar impaction the sample size was of 50 patients. All patients met the inclusion and exclusion criteria. Fifty radiographs (44 OPGs and 6 periapical xrays) were assessed.

The majority of the patients were from Islamabad, making 74%, and 26% from Rawalpindi, collectively making 100%. Considering gender variation 52% were males and 48% females.

Most patients are 21 to 29 (46 %) whereas 34 % patients are of 15 to 20 age group and 20 % are of forty and above. Clinically, around 82% of patients presented with pain and swelling around the impacted molar area, this was also the chief complaint addressed by the examiners. Rest presented with carious molars adjacent to impacted third molars and with symptoms of pericoronitis. Forty-four patients had a clear medical history whereas one patient had hypertension and one had anemia. There were 41 patients with impactions who were asymptomatic however 01 patient had carious lower second molar and four had pericoronitis.

The prevalence of all the types of impactions is shown in table 1. Mesioangular impaction is most prevalent type in our study. Three patients had mesioangular impaction class 1 position A, four had mesioangular impaction class 1 position B, one patient had mesioangular impaction position 1 position C. Three patient had mesioangular impaction class 2 position A, five patients had class 2 impaction type B, one patient has class 2 impaction type C. One patient had mesioangular impaction Class 3 Position A, four patients has mesioangular impaction
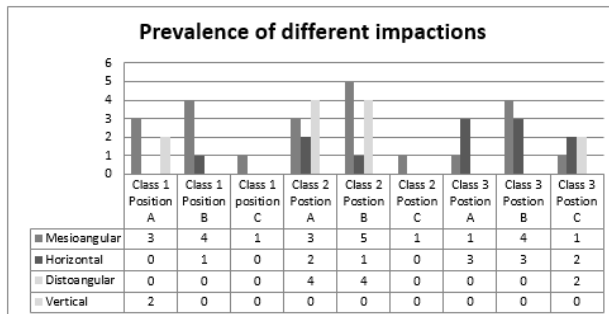
6

Class 3 position B, one patient has mesioangular impaction class 3 position C.

No patient had horizontal impaction class 1 position A, 1 patient had horizontal impaction class 1 position B, no patient has horizontal impaction class 1 position C. Two patients had horizontal impaction class 2 position A, one patient had horizontal impaction class 2 position B, no patient had horizontal impaction class 2 position C, three patients had horizontal impaction class 3 postion A, three patient had horizontal impaction class 3 position B, two patients had horizontal impaction class 3 position C.

No patient has distoangular impaction class 1 position A, B or C. four patients has distoangular impaction class 2 position A, four patients had distoangular impaction class 2 position B, no patient had distoangular impaction class 2 position C. No patient had distoangular impaction class 3 position A & B, two patients had distoangular impaction class 3 position C.

Two patients had vertical impaction class 1 position A. No patient had vertical impaction class 1 position B and C, class 2 position A, B and C and class 3 position A, B and C.

Table 1: Prevalence of different impactions

	Class 1 Position A	Class 1 Position B	Class 1 position C	Class 2 Postion A	Class 2 Postion B	Class 2 Postion C	Class 3 Postion A	Class 3 Postion B	Class 3 Postion C
Mesioangular	3	4	1	3	5	1	1	4	1
Horizontal	0	1	0	2	1	0	3	3	2
Distoangular	0	0	0	4	4	0	0	0	2
Vertical	2	0	0	0	0	0	0	0	0

4. Discussion

The present study revealed that mesioangular impaction is most prevalent which is consistent with other studies conducted in the other countries (9, 10). Distoangular impaction was second most common impaction. Vertical impaction was least common after horizontal impaction among current population studied.

Marwa et al. assessed the level of third molar impaction and found that at level B, the proportion of impacted third molars found in the mandible at level B was 61.5% (11) which is in accordance with our study as 44 % of impactions in our study were level B.

The depth of wisdom tooth to the neighboring tooth is thought to be one of the significant prognosticators in forestalling struggle of surgical intervention (12). Extraction of level A wisdom tooth can be easier as compared to level B molar, and level B wisdom tooth can be easier as compared to level C wisdom tooth. Twenty-four patients had their occlusal plane at level B i.e below the occlusal plane of neighboring tooth whereas 16 patients had level A impaction in current study.

In the current study, all vertical impactions were found in young age from 15 to 30 years. Angulation is one of the noteworthy points the surgeon considers when determining whether to do extraction or not. In this study, there were no vertical impactions in patients older than 22 years and the incidence of mesioangular and horizontal impactions was greater in young population. Class 1 impaction increased with increasing age in current study, this can have a noteworthy influence to cut surgical complications as the tooth may erupt in oral cavity. This indicates the significance of reassessing patient radiographically bearing in mind likely variations of impacted wisdom molar teeth that can arise over time, mainly for younger patients (13).

In the current study, the most found type of impaction was mesioangular with widely held cases among the ages 18–30 years which is constant with previous researches (14) In current study, most of female candidates were of the age group between 18–30 with mesioangular or horizontal impaction, which is also constant with previous researches. This is generally childbearing age and therefore if the females are screened timely for mandibular impaction, it can help in making decision of early prophylactic extraction of the third and can aid in continuing a good oral wellbeing during perinatal period (15).

Hashemipour et al., and Hugoson et al. described a upper gender predilection for females having impaction and they concluded that it can be due to the fact that female reach growth spurt before men which may lead to a reduced jaw size, The third molar eruption begins in women normally occurs after mandibular growth is completed where as in men, mandible keeps growing during the eruption of third molar and thus offers more space for the tooth (16, 17). In our study, more males presented to OMFS clinic with impactions which is consistent with Bozatello et al. (18). Some studies however found no statistically significant difference in prevalence of impacted wisdom teeth between both

7

genders. And they concluded that both genders are vulnerable to having an impacted third molar, whereas gender does not appear to be a possible root cause for impaction incidence (19).

In a study conducted in 2008, caries in the third or adjacent second molar was the chief cause (63.2%) for the mandibular wisdom tooth removal, preceded by recurrent pericoronitis (26.3%) and periodontitis (9.2%) (20). However in the current study majority of patients' had no complaint and their impactions were asymptomatic at the moment.

Nevertheless according to a study, asymptomatic teeth in a horizontal, mesioangular, or inverted position present a fourfold to tenfold greater risk of developing infectious and noninfectious problems (21). This is due to the fact that teeth which are malaligned, malpositioned and otherwise not in normal position may be difficult to clean and favors the buildup of food and debris. This can cause caries in a malaligned tooth, which under normal environments would possibly not progress (22).

The point of contact that the wisdom tooth makes with the second molar is another important factor that is linked with the risk of developing distal caries in neighboring molar. Partially erupted mesioangular wisdom tooth that touches the cementoenamel junction of the second molar puts the second molar at larger risk of developing caries (2). Current study reported most cases of mesioangular and horizontal impactions in partially impacted state i-e class II. This signifies that in future these impactions can cause caries in second molar even though they may be asymptomatic in current state. This fact can help the surgeon in deciding the fate of impaction.

Due to limited time and resources, the sample size was small. This study can be conducted on a multicenter level in future as the prevalence of impaction with respect to angulation, depth and age can significantly help surgeon make decision and review a treatment plan.

5. Conclusion

The pattern of third molar impaction was prospectively evaluated based on radiographs in this study. There was a slight male prediction for mandibular third molar impaction in this study. The most common type of angulation was level B class 2, mesioangular impaction. This data can help the surgeons to make a surgical plan and prevent future complications.

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