

Relation of the Mandibular Canal to the Root Apices of Different Types of Impacted Lower 3rd Molar.

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الخلاصة

الاهداف: تهدف الدراسة الى تعيين العلاقة الإشعاعية بين قناة الفك السفلي وقمم جذور سن العقل السفلي المظمو. **المواد وطرائق العمل:** شملت الدراسة واحد وستون مريضاً، ثلاثون رجلاً وواحد وثلاثون امرأة فحصوا إشعاعياً باستخدام الأشعة الوجيهة الشاملة لتحديد العلاقة بين قمم الجذور لأنواع مختلفة من سن العقل السفلي المظمو وقناة الفك السفلي. **النتائج:** العينة شملت (61) مريضاً (30) رجل و (31) امرأة ومجموع (100 سن عقل مظمو)، عمر المرضى في هذه الدراسة يتراوح بين 17-48 سنة مع معدل العمر 23.5 سنة. سن العقل المظمو من الطرفين لوحظ في (39) مريضاً بينما سن العقل المظمو من طرف واحد لوحظ في (22) مريضاً معظم سن العقل المظمو هو باتجاه السن المجاور ويقدر (40%) من العينة، يتبع بالسن المظمو عمودياً 29% ثم السن المظمو أفقياً 23% والسن المظمو عكسياً 4% والسن المظمو يعكس السن المجاور 4%. **الاستنتاج:** وجد إن سن العقل المظمو باتجاه السن المجاور هو الأكثر خطورة لأنه قريب جدا من قناة السن ومن عصب السن وهناك احتمال حدوث خدر في الشفة السفلي بعد القلع ووجد أيضاً إن العلاقة المتجاورة بين قمة جذور سن العقل وقناة الفك السفلي هي الأكثر شيوعاً.

ABSTRACT

Aims: The study aims to determine the radiographic relationship of the inferior dental canal to the roots of impacted lower third molars. **Materials and Methods:** Sixty one patients were examined radiographically by using conventional orthopantomograph (OPG) for detecting the relationship of the root apices of different types of impacted lower third molars to the inferior dental canal. **Results:** The sample enrolled included 61 patients (30 males and 31 females) with a total of 100 impacted lower third molars. Age of patients included in the study ranged from 17 to 48 years within an average age of (32.5 %). Bilateral impaction was noticed in 39 patients (63.9 %), whereas unilateral impaction was observed in 22 patients (36.1 %). The greater number of impacted lower 3rd molar were of mesioangular angulations and were accounted in 40 impacted teeth (40 %) of the sample ,followed by vertical impaction 29 %, and horizontal impaction 23 %, while the inverted and distoangular angulations represented 4 % each. Seventy three roots (38 mesial and 35 distal roots) were categorized as "adjacent" relationship and 63 roots (32 mesial and 31 distal roots) categorized as "notching" and 53 roots (26 mesial and 27 distal roots) were categorized as "super imposition" with only one root ,mesial root categorized as "grooving". The remaining 10 roots (3 mesial and 7 distal roots) could not be placed under any of these categories. Therefore, they were placed in the category X or none. **Conclusion:** Within the limitations of this study, the mesioangular impaction is the most problematic type of impaction and "adjacent" relationship of mandibular third molar to inferior dental canal is most common type.

Key words: Impacted third molar, Inferior dental canal relationship, Conventional panoramic radiograph

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INTRODUCTION

An impacted tooth can be defined as any tooth that fails to erupt into its functional position for a variety of reasons:

- The tooth follicle may have been displaced.
- It may be impacted into an adjacent tooth

often due to overcrowding.

- When there is a lesion obstructing the path of its eruption.⁽¹⁾

The mandibular third molar germ is usually visible radiographically by the age 9 years and the cusp mineralization is completed at approximately 2 years later.

At the age of 11 years, the tooth is located within the anterior border of the ramus with its occlusal surface facing directly anteriorly. Crown formation is usually completed by the age of 14 years and the tooth is approximately 50% formed by the age of 16 years.⁽²⁾ Removal of impacted lower third molars is one of the most common operations in oral surgical practice. In most cases, it is a fairly straightforward procedure with few complications.⁽³⁾ However, when there is a close relationship between the tooth and the inferior alveolar nerve, damage to the nerve and dysaesthesia may occur. The significant risk associated with dysaesthesia is determined by the approximation of the inferior alveolar nerve which is located in the mandibular canal to the roots of third molar.⁽⁴⁾ Several studies have assessed the radiographic predictors of potential nerve injury.⁽⁵⁾ Panoramic radiography has been recommended as the primary radiographic investigation of choice in pre-operative assessment of mandibular third molar teeth and surrounding structures.⁽⁶⁾ Seddon⁽⁷⁾ has described three types of nerve injury :

Neurapraxia is a mild, temporary injury often caused by compression or retraction, there is a temporary conduction block (sensory loss, motor weakness). Spontaneous recovery usually occurs within 4 weeks or less.

Axonotmesis is a more significant injury; there is disruption or loss of continuity of some axon which undergo wallerian degeneration distal to the site of injury. There is prolong conduction failure and initial signs or symptoms of recovery of nerve function do not appear for 1 to 3 months after injury.

Neurotmesis is complete severance or internal physiological disruption of all layers of nerve. There is a total permanent conduction block of all impulses (paralysis, anesthesia), no recovery is expected without surgical intervention.

The method to assess the relationship of third molar to inferior dental canal depends on the following:

Angulations; the third molar could be; Mesio angular, Disto angular, Horizontal, Vertical and Inverted.
Crown; looking to; Size, shape, appear-

ance and extended of caries presence and severity of resorption.

Roots; number, shape, curvature, whether they are favorable or unfavorable

Stage of development.⁽⁸⁾

Panoramic radiography has many advantages as it is a simple procedure to perform, convenient to the patient. It can be used for patients complaining from intractable gagging problems. The time required for the procedure is minimal; those portions of the maxilla and mandible lying within the focal trough of the machine can be visualized on a single film. Tomographs taken for diagnostic purposes can also be useful as a visual aid in patient education. However, a panoramic radiography is a two dimensional (2D) image, lacking information in the bucco-lingual direction and magnification.⁽⁹⁾

The current study aimed to determine the radiographic relationship of inferior dental canal to the roots of different types of impacted lower third molars using conventional orthopantomography.

MATERIALS AND METHODS

The study was performed on sixty one young adult patients; thirty one females and thirty males with an age ranging between 17- 48 years and a mean age 32.5 years. All patients selected were those attending the Maxillofacial Surgery Department in Collage of Dentistry, University of Mosul for examination of impacted lower third molars and conventional panoramic radiographs were taken. Both sides were examined to evaluate the relationship of both mesial and distal roots of impacted lower third molars to the inferior dental canal. The exclusion criteria were as follows:⁽⁵⁾

1. Inability to identify the inferior dental canal on the radiograph.
2. Displacement of tooth due to pathology such as cyst or tumor.
3. Extracted adjacent mandibular second molar.
4. Un well processed radiographical films.

Panoramic radiograph was performed with Orthopantotomography (STARTO X2000), Italy with exposure parameter of 70 kvp ,10 M,15 Sec using intensifying and Agfa and Cevaert extra oral film .The

orthopantomoram was examined under ideal conditions including the use of subdued lights and magnifying lens. Each film was processed manually in a dark room according to the manufactures instruction. The radiograph of impacted mandibular third molars that met the above requirements were viewed on the radiographic view box, 12 mAx by a single radiologist. The impacted mandibular third molar was classified according to the long axis-occlusal plane angle. Determination of the angle between the occlusal plane or a line parallel to it and the longitudinal axis of the impacted third molars within the corresponding Winter subclasses as follows:⁽¹⁰⁾

1. Third molars with negative angle were considered inverted.
2. Third molars with an angle between 0° to 30° are considered horizontal.
3. Third molars with an angle between 31° to 60° are considered mesioangular.
4. Third molars with an angle between 61° to 90° are considered vertical.
5. Third molars with an angle larger than 90° are considered disto angular.

The radiographical relationship of the root apex of mandibular third molars to the inferior dental canal was assessed and categorized according to the following criteria.

1. Adjacent: The superior border of the canal was either touching the roots apices or within 2 mm below them.
2. Superimposed: The canal was super-

rimposed over part of the roots which appeared less radiopaque than the remaining radiological image of the roots.

3. Notching: Radiolucent band at the apex of the roots, a break in the continuity of the upper radio dense border, and narrowing at the expense of the top of the canal.
4. Grooving: Radiolucent band across the root above the apex, interruption of both superior and inferior borders of the canal and narrowing of the canal space.
5. Perforation: Radiolucent band crossing the root above the apex with loss of both superior and inferior borders of the canal at the area where they cross the roots and constriction of the canal maximal in the middle of the root.
6. None: A relationship between the canal and the root apices could not be decisively assessed.^(11,12,13)

RESULTS

Bilateral impaction was noticed in 39 patients (63.9%), whereas unilateral impaction was observed in 22 patients (36.1%). Age of patients included in the study ranged from 17 to 48 years with an average age of (32.5 %). The majority of age group being within the 21 to 25 years group which included 39 patients (63.9%) as shown in Table (1).

Table (1): Distribution of sample according to age group

Age group	Number of patients	Unilateral	Bilateral	Number of impacted teeth
<20 year	10	2	8	18
21 – 25 year	39	12	27	66
26 – 30 year	8	6	2	10
> 31 year	4	2	2	6
Total	61	22	39(78)	100

The impacted teeth were classified radiographically according to George Winter's classification into mesioangular, distoangular, vertical, horizontal or transverse

and inverted. The frequency of each impaction type in relation to the age group was shown in Table (2).

Table(2): The frequency of each impaction type in relation to the age group

Type of im- paction	Age group 1 Less than 20 y	Age group 2 21 -25 y	Age group 3 26-30 y	Age group4 More than 30	Total
Mesioangular	7	29	2	2	40
Distoangular	0	1	3	0	4
Vertical	10	18	1	0	29
Horizontal	1	17	3	2	23
Inverted	0	1	1	2	4
Total	18	66	10	6	100

The greater number of impacted lower 3rd molar were of mesioangular angulations and were accounted in 40 impacted teeth (40 %) of sample, followed by vertical impaction 29 %, horizontal impaction 23 %, while the inverted 4% and distoangular type represented only 4 %. Patients in the age group 21 -25 years had the greater number of impacted teeth (65) and most of the impacted teeth in this group

were of the mesioangular type unilateral and bilateral (29). Both mesial and distal roots were categorized according to its relation to the inferior dental canal (IDC). The positional category of the IDC on the mesial root was identical to that of the distal root in 71% of impacted teeth and with different root relations in 29 % of impacted teeth as shown in table (3).

Table(3): The similarity and difference in roots relation to inferior dental canal

Type of impaction	Similar roots relation	Different roots relation
Mesio angular	24	16
Disto angular	4	0
Vertical	23	6
Horizontal	18	5
Inverted	2	2
Total	71	29

The position of the inferior dental canal IDC was decisively demonstrated and, thereby, categorized according to its rela-

tionship to both mesial and distal roots as shown in Table (4).

Table (4): The relationship of mesial and distal roots to inferior dental canal

Relation	Mesial root	Distal root	Total
A	38	35	73
S	26	27	53
N	32	31	63
G	1	0	1
P	0	0	0
X	3	7	10
Total	100	100	200

Accordingly, 73 roots (38 mesial and 35 distal roots) were categorized as adjacent relationship and 63 roots (32 mesial and 31 distal roots) categorized as "notching" and 53 roots (26 mesial and 27 distal roots) were categorized as super imposition with only one root ,mesial root categorized as grooving. The remaining 10

roots (3 mesial and 7 distal roots) could not be placed under any of these categories. Therefore they were placed in the category X or none. The number of impacted mandibular 3rd molar in each category related to the type of impaction was described in Tables (5) and (6).

Table(5): The relationship of mesial root to inferior dental canal to each type of impaction.

Mesial root	Mesioangular	Distoangular	Vertical	Horizontal	Inverted	Total
A	10	3	11	11	3	38
S	8	1	11	6	0	26
N	20	0	5	6	1	32
G	1	0	0	0	0	1
P	0	0	0	0	0	0
X	1	0	2	0	0	3
Total	40	4	29	23	4	100

Table(6): The relationship of distal root to inferior dental canal to each type of impaction.

Distal root	Mesioangular	Distoangular	Vertical	Horizontal	Inverted	Total
A	13	3	6	11	2	35
S	11	1	10	4	1	27
N	14	0	11	6	0	31
G	0	0	0	0	0	0
P	0	0	0	0	0	0
X	2	0	2	2	1	7
Total	40	4	29	23	4	100

DISCUSSION

Extraction of an impacted mandibular third molar can cause neurological complications that consist of temporary or permanent sensory alteration due to the damage in the inferior alveolar nerve.⁽¹⁴⁾ The risk increases dramatically when there is a contact between an impacted molar and mandibular canal defined as the absence of cortical bone around the alveolar nerve, the point at which the root touches the nerve.⁽¹⁵⁾ It is not surprising that all surgeons use panoramic radiographs since it is readily available and useful for screening purpose as well as planning of surgical procedures.⁽⁴⁾ In this study the patients group between 21-25 years had the greater number of impacted teeth. This may be due to that most of patients were young adults.⁽¹⁶⁾ The majority of films were taken for presurgical radiographical assessment prior to third molar removal. This study showed a 71% of mandible with bilateral impaction and demonstrated a degree of symmetrical configuration, which disagreed with the result of Hazza, a *et.al*⁽¹¹⁾ who showed only a small minority of mandibles with bilateral impactions. This finding suggests that the surgeon can predict the configuration of the canal as the other side. The position of the inferior dental canal varies with re-

spect to the apices of the root of impacted mandibular third molar with the majority being "adjacent" followed by superimposition, notching, grooving and only few cases could not be placed under any of these categories and therefore placed in the category none. The mesioangular impaction had the greater number of impactions and adjacent relationship of apices of third molar to the inferior dental canal for both mesial and distal root had a greater number followed by superimposition and notching. This result agree with the study of Canto *et.al*⁽¹⁷⁾ but disagreed with the result of Hazza, a *et.al*⁽¹¹⁾ whom found that the vertical impaction had a great number and also disagreed with Monaco *et.al*⁽¹⁵⁾ whom found that the horizontal impaction is the most dangerous position in terms of contact between the root apices and mandibular canal.

CONCLUSION

Mesioangular impactions are the troublesome types of impaction and surgeons should be careful when dealing with this type of impacted lower third molar. The adjacent relationship of mandibular third molar to the inferior dental canal is most common one followed by superimposition and notching.

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