

# Inter Observer Agreement in Evaluating the Position, Shape and Appearance of Mental Foramen by Panoramic Radiography

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## الملاصة

تهدف الدراسة الى تقييم الاختلاف في القراءات لأربعة أطباء أسنان، اثنان منهم اختصاص أشعة أسنان و الاثنان الاخران اختصاص جراحة أسنان، لغرض ترجمة إشعاعية لتعيين موضع، وشكل ومظهر الثقب الذقني لثلاثين صورة شعاعية وظهر أن أكثر موضع للثقب الذقني حسب علاقته بالسن السفلي ذو الطرفين المستدقين كان بين السن الضاحك الأول و الثاني، ثم أسفل قمة السن الضاحك الأول والثاني، والنوع الأكثر شيوعاً للشكل هو الشكل غير المنتظم، والنوع الأكثر شيوعاً للمظهر هو النوع المنفصل. وللتوافق في القراءات ظهر انه لا يوجد اختلاف في القراءات بين اختصاصيي الأشعة لكن وجد اختلافات معنوية بين القراء الأربعة في تعيين موضع الثقب الذقني.

## ABSTRACT

**Aims :** the study aims is to examine the inter- observer variability in radiographic interpretation of the variable position , shape and appearance of mental foramen. **Materials and Methods:** Four examiners, two dental radiologists and two oral surgeons evaluated 30 panoramic radiographs to evaluated the position, shape and appearance of mental foramen. **Results:** The most frequent position of mental foramen was between first and second premolars then followed by those below the apices of the first and second premolars and the most frequent shape of mental foramen was irregular where separated type is the frequent appearance of mental foramen. For agreement there was no significant difference between two radiologist for position ,shape and appearance of mental foramen , but with a significant difference was found between four observer, for the position of mental foramen. **Conclusions:** The study concluded that the position of mental foramen is most commonly below and between the premolar teeth and the most frequent shape are irregular and appearance separated type .

**Key words:** Mental foramen, Conventional panoramic radiograph

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## INTRODUCTION

The mental foramen is defined as the entire funnel-like opening in the lateral surface of the mandible at the terminus of the mental canal<sup>(1)</sup>. Knowledge of the anatomic characteristic of the mental foremen is important in a myriad of surgical procedures in the maxillofacial area. Anatomically, the mental foramen is an opening of the short mental canal, a branch of mandibular canal. Although on most standardized panoramic radiographs the radiographic landmark of mental foramen can be seen, the appearance of these landmarks varies without any change of radiographic quality; the mental foramen is an important structure that needs to be considered in the administration of local anesthesia and the performance of surgical procedures. The mental foramen identification

and preservation of mental nerve in periapical surgery, implant surgery, and maxillofacial trauma and orthognathic procedures is of al most importance<sup>(2)</sup>. The mandibular canal contains the inferior alveolar nerve and blood vessels which divides into mental and incisive segments between the roots of first and second premolar or below the second premolar. The mental canal diverts toward the mental foramen while the incisive canal continues below the incisor teeth<sup>(2)</sup>. Localization of the mental foramen radiographically is difficult due to lack of consistent anatomical landmarks for reference and the foramen cannot be clinically visualized or palpated<sup>(3)</sup>. Panoramic radiography is used in dental practice, because it provides visibility of anatomical structures of the teeth, jaws and temporomandibular joints. Pa-

panoramic radiograph is a simplified extra-oral procedure which visualizes the entire maxillofacial region with the ability to project anatomical structures such as the mandibular canal and mental foramen. Never the less, in spite of its limitation in providing sufficient information about bone morphology in two dimensions and the likely distortion and lack of sharpness, the importance of this radiographic examination is considered as an initial diagnostic aid before any surgical treatment.

Panoramic radiography has the following advantages

- 1- It is a simple procedure to perform.
- 2- It is convenient to the patient.
- 3- It can be used in the patients with intractable gagging problems.
- 4- The time required for the procedure is minimal.
- 5- Those portions of the maxilla and mandible lying within the focal trough of the machine can be visualized on a single film.
- 6- Tomographs taken for diagnostic purposes can also be useful as a visual aid in patient education.<sup>(4)</sup>

Aim of the study: The study aims is to evaluate the interobserver variability in radiographic interpretation of the variable position, shape and appearance of mental foramen.

## MATERIALS AND METHODS

This study was conducted on thirty conventional panoramic radiographs of completely dentate adult individuals who attended the maxillofacial unit in Mosul University, College of Dentistry, all radiographs were examined on a view box, 12 mA x to evaluate the appearance, shape and position of mental foramen.

The position, shape and appearance of the mental foramen was determined on conventional panoramic radiograph for both sides by four observers two radiologist, and two oral surgeons. All panoramic radiographs was performed with Or-

thopantotomography (STARTO X2000), Italy with exposure parameter of 70 kVp, 10mA, 15 sec using intensifying and Agfa and Cevaert extra oral film.

The films were processed manually in dark room and according to manufactures instruction.

The radiographs were choose according to the following criteria:-

- 1- High quality with respect to angulations and contrast.
- 2- All the mandibular teeth from right first molar to left first molar were present.
- 3- The mental foramen should be obvious.
- 4- Radiographs in which lower teeth were missing, had deep caries, root canal treatment or various restoration, were eliminated, because of possible associated periapical radiolucency.
- 5- The film must be free of any radiolucent or radiopaque lesion in the lower arch

The position of the mental foramen was recorded in the line with longitudinal axis of tooth using the edge of a ruler. If the mental foramen was too large or was between two teeth, the position of foramen was indicated by drawing an imaginary line parallel to the long axis of teeth. In addition, the side that showed more radiolucency was designated the side of mental foramen. The position of mental foramen was classify as antero-posterior position which recorded as 1- Anterior to the long axis of the first mandibular premolar. 2- In the line with the long axis of the first mandibular premolar tooth. 3- Between the long axis of the first and second premolars teeth. 4- In the line with long axis of second premolar. 5- Posterior to the long axis of the second premolar tooth. Superio-inferior position which recorded as 1-Above the level of the apices of the first and second premolars teeth. 2- Below the apices of the first and second premolars. 3- The level of apices of first and second premolars teeth<sup>(1)</sup>. This shown in Figure (1).

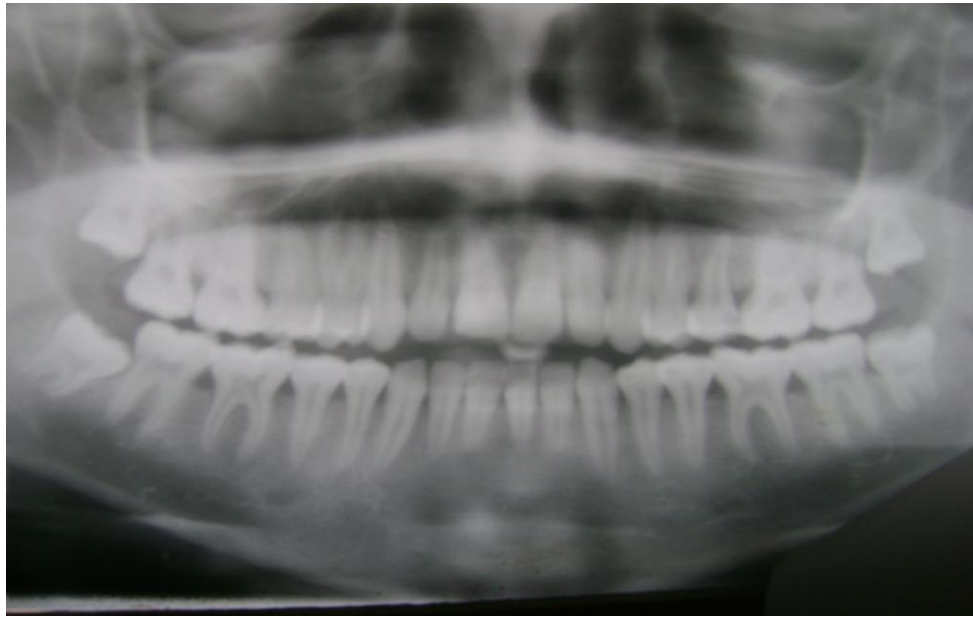


Figure (1): A panoramic radiograph showing the mental foramina at the level of 2<sup>nd</sup> premolar ,below the apices of premolars .

The shape of mental foramen was classified into three types , rounded , oval and irregular in shape according to the Yosue and Brooks<sup>(8),(9)</sup> classification. The appearance of mental foramen was classified into four types according to Yosue and Brooks<sup>(8),(9)</sup> , as a separated type, in which the foramen is distinctly separated from

the mandibular canal, continuous type , which shows the mandibular canal through the mental canal as in Figure(2) ,a diffuse type , in which the foramen has an indistinct border and unidentified type where the mental foramen can not be seen on radiograph under ordinary exposure and viewing conditions.



Figure (2): A Panoramic radiograph showing a continue type of mental foramen.

In agreement with Yosue and Brooks<sup>(8),(9)</sup> if there are multiple mental foramina, the true radiographic mental foramen was consider to be upper most one closed to the mandibular canal.

The statistical analysis of data include Wilcoxon Test which compare the agreement between two radiologist and two surgeons. And Fridman Test which compare the agreement between for observers we used Chi square to determine the significant difference between readings.

**RESULTS**

The results showed that the most frequent antero- posterior position of mental foramen was in the area of premolars teeth . In 38.3% of cases the antero- posterior position of foramen was in the area between the first and second premolars followed closely (33.3)by a position in the line with the long axis of second premolar 20% of the cases posterior to the second premolar . This is shown in Table (1).

The position of mental foramen in relation to the apices of root of the premolar teeth are shown in Table (2).

Table (1): Frequency and percent of antero- posterior position of mental foramen

Anterio-superior position	Fre- quency	Per- cent%
Anterior to the first premolar	2	3.3
In line with fist premolar	1	1.7
Between first and second premolars	23	38.3
In line with second premolar	20	33.3
Posterior to second premolars	12	20
<b>Total</b>	58	96.7
<b>Unidentified</b>	2	3.3
<b>Total</b>	60	100.
		0

Table (2): Frequency and percent of superior- inferior position of mental foramen.

Superio-inferior position	Frequency	Percent%
At level with apices of premolars	4	6.7
Below apices of premolars	5	9
<b>Total</b>	9	15.7
<b>Unidentified</b>	4	6.7
<b>Total</b>	8	13.3
<b>Unidentified</b>	2	3.3
<b>Total</b>	6	10
	0	00

In 90% of cases the position was located below the apices of first and second premolars and in only 6.7 %of cases, was located at the level of the apices of pre-

molars. Table (3) shown that the majority of shape of mental foramen was irregular shape, about 41.7% followed by round 31.7% and only 23.2% are oval in shape.

Table (3): Frequency and percent of the shape of mental foramen.

Shape	Freq uency	Perc ent%
<b>Irregular</b>	25	41.7
<b>Oval</b>	14	23.3
<b>Round</b>	19	31.7
<b>Total</b>	58	96.7
<b>Unidentified</b>	2	3.3
<b>Total</b>	60	100.
		0

Table (4) we have found that the most frequent appearance of mental foramen was separated 68.3% followed by conti-

nuous 16.7% and diffuse types 11.7% and only two case appear unidentified.

Table (4): Frequency and percent of the appearance of mental foramen.

Appearance	Frequency	Percent%
	1	16.7
	0	
<b>Separate</b>	4	68.3
	1	
<b>Diffuse</b>	7	11.7
<b>Unidentified</b>	2	3.3
<b>Total</b>	6	100.
	0	0

For inter observer agreement, it was found that the agreement between two radiologist varied with Wilcoxon Test as shown in Table(5), for the antero-

posterior position of mental foramen, the range was between (0.202- 0.840) there was no significant difference in radiographic interpretation .

Table (5): The agreement between two radiologists for evaluation the position , shape and appearance of mental foramen .

Wilcoxon Test	Anterio-posterior	Suprio-inferior	Shape	Appearance
<b>Wilcoxon (Z)</b>	-1.058	-3.317	.889	-1.684
<b>P- vale</b>	0.29	0.001	.374	0.092

For superior-inferior position, the agreement was ranged between (1.433-0.152) also there was no significant difference between the two readings. For shape of mental foramen, the agreement ranged between (0.85- 0.932) with no significant difference. For appearance agreement was ranged between (1.793-0.73) with no sig-

nificant difference .

Table (6) shows the agreement between four observers varied with Friedman Test .There was a significant difference between observer for both antero- posterior and superior- inferior position of mental foramen.

Table(6): The agreement between four observers for evaluation of position of mental foramen by Friedman Test.

N	34	34
<b>Chi- Square</b>	9.769	18.640
<b>Df</b>	3	3
<b>P- vale</b>	0.021	0.000

\*N= number of comparison; \*df : Degree of freedom.

Table (7) shows a significant difference between four observers in evaluating

the shape 0.367, and appearance 0.094 of mental foramen.

Table (7): The agreement between four observers for evaluation of appearance and shape of mental foramen.

N	35	60
Chi-Square	3.162	6.394
df	3	3
P- vale	0.367	0.094

\*N= number of comparison; \*df : Degree of freedom

## DISCUSSION

This study evaluated the inter observer variability in determining the position, shape and appearance of mental foramen of Mosul population by panoramic radiographs. It was noticed in this study that the most frequent antero- posterior position of the mental foramen was in the area between the long axis of first and second mandibular premolar teeth. This result agreed with study Khateeb and Hamasha<sup>(2)</sup> but disagrees with Akekin *et.al.*<sup>(6),(7)</sup>. The study also showed that the most frequent superior-inferior position was situated below the level of apices of mandibular premolar roots this could be attributed to a variable length of roots<sup>(2)</sup>

The most frequent appearance of mental foramen observed was the separated and continuous types followed by diffuse and unidentified types. The mental foramen is rarely unidentifiable on a panoramic radiograph these cases recorded as unidentified as stated by ,Youse and Brooks<sup>(8),(9)</sup> they suggested that the reason for the absences of the mental foramen includes the inability to distinguish it from the trabacular pattern in complete dentition radiograph and over exposed radiograph.

This study showed that most of mental foramina were irregular in shape, this disagreed with Mbajiorgu *et.al.* , Igbigbi , Lebona<sup>(10),(11)</sup> which showed that the frequent shape was oval.

## CONCLUSIONS

In the current study, it was found that the position of the mental foramen is most commonly below and between the premolar teeth and the most frequent shape was irregular and appeared as separated type

and with a significant difference between the four observers in detecting the position of mental foramen. It was not possible to state which observer interpretation was correct or to determine the diagnostic value of the conventional panoramic radiograph for the detection of mental foramen. Therefore advanced imaging modalities are required for correct identification of mental foramen.

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