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Detection of Vital Anatomical Landmarks in Lower Posterior Premolars and First Molar Area (BuccallyPositioned)During Different Surgical Intervention Using Cone Beam Ct Scan

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Abstract

Background: The mental foramen (MF) is a very important structure; to avoid any trauma to mental nerve may be occur and in order to avoid that, its position, variation in anatomy and shapes should be clearly determined before any surgical procedure.

Objective: To detect the exact position of MF and thickness of cortical plates in lower premolars and first molars among the Iraqi resident.

Patients and Methods: For this prospective study, a total of 92 Iraqi adults patients (51 females, 41 males; age range 18-69 years). From October 2020 to February 2021, patients aged range from 25 to 65 years old.Five types of classification we used:

Type 1, MF under the root of the lower first premolar.

Type 2, MF between the root of mandibular first & second premolar.

Type 3, MF below the root of the mandibular second premolar.

Type 4, MF between the root of lower second premolar & first molar.

Type 5, MF below the root of the lower first molar.

Bone thickness is measured in the horizontal direction on the both side lingually and buccally.

Results: The most common situation of the MF was below the root of lower second premolar.

Conclusion: Significant difference can be noted in the mean of the distance between MF and root apex in both gender, also significant difference in mean of bone thickness noted between both genders on both sides.

Keywords: Mental foramen, surgical trauma, mandibular arch

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Introduction

The mental foramen (MF) is a very important structure; to avoid any trauma to mental nerve may be occur and in order to avoid that, its position, variation in anatomy and shapes should be clearly determined before any surgical procedure [1]. MF is a complex area with numerous characteristics in anatomical variation [2]. Trauma or damage of the mental nerve can occur in numerous methods, these method may be

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icluding dental implantation, root canal management, and dental extractions [3]. Cone Beam Computed Tomography (CBCT) is useful to obtain information about MF and adjacent area in detail, and anatomical changes that may occur when clinical factors such as sex, side, or dental status change [4]. Because of anatomic landmarks, dentists encounter various constraints during dental treatments and are compelled to change their treatment plans. So, care should be taken in in order to determine the clearly defined anatomic landmarks to reduce complications during dental treatment [5, 6]. The location of difference in anatomy of the mandibular canal, mandibular foramen, and mental foramen is essential to be recognized when the treatment plane is includes the mandibular arch, such as a pathway tracked by the course of the inferior alveolar nerve [7-9]. Following implants placement in the mandible, different study show either temporary or permanent effect on the soft tissue around the oral cavity [10]. So, it is important to detect the exact location MF before any surgical intervention in this area to avoid any complication or trauma to MF and Alveolar nerve AL [11].

MF location can be considered as a critical for both diagnostic and clinical point. Misdiagnosis may be occur to the MF (as a lesion of radiolucency) at the apices of both first and second premolars during diagnosis. During clinical practice, impairment to the mental nerve may be happen, due to incorrect information about the position of the mental nerve leading to neurovascular problems after surgery [12]. Racial group, gender, age, tooth loss and alveolar bone resorption all impact MF's position [13]. Accurately identifying the MF location and AL can be difficult. Before undertaking surgical treatments, many techniques have been introduced to detect the exact position of "MF and AL. palpation method manually, vision directly during surgical procedure, cadaveric dissect, panoramic radiographs, peri-apical radiographs, (MRI), (CT), and Cone-Beam CT" are all examples of these procedures. Most procedures have drawbacks, such as expense, radiation exposure, and magnifying [14]. Because the literature on detecting the place of MF in Iraqi residents utilizing cbct is narrow, the research we proffered was intended to identify the association between the apices of lower premolars and molars and the adjacent areas cortical plates and mental foramen in Iraqi residents utilizing cone-beam CT.

Patients and Methods

For this prospective study, a total of 92 Iraqi adults patients (51 females, 41 males; age range 18-69 years). From October 2020 to February 2021, patients aged range from 25 to 65 years old visited a second specialized dentistry centre in Baquba city to undergo CBCT scanning for various diagnostic reasons.

The same radiography equipment was used for all projections, the device used to obtain images tomography was (NewTom VGi)^{TM}". These were some of the parameters that used during the measurments:

110 kilo volt is the amount of voltage used in the device, time during the exposure about 24 second, 5.7 mA was the electrical current, and the size of voxel was equal to 0.5 mm, field of view equal to 16 cm× 14 cm"

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The measurements and the analyses were done by oral and maxillofacial radiologists.
Excluded criteria:
Patients with systemic diseases affecting growth and development
The presence of any deciduous teeth in the target area.
The presence of pathological change was detected radiographically in the target area.
Previous history of surgery and/or trauma involving the target area.

Included criteria

All teeth should be present and permanent in the target area.

Cross-section and panoramic views were used to assess the position of the MF and to measure the mean of bone thickness buccally and lingually on each side of the target area Figure (1 a & b).

We classify the relation between roots of mandibular premolars and molars and the adjacent cortical plates and mental foramen into five types:
Type 1, MF under the root of the lower first premolar.
Type 2, MF located amid the root of mandibular first & second premolar.
Type 3, MF locate below the root of the mandibular second premolar.
Type 4, MF located amid the root of lower second premolar & first molar.
Type 5, MF locate below the root of the lower first molar.

Bone thickness is measured in the horizontal direction at the location of each tooth in the examined area, including (premolars and molar) on the both side lingually and buccally.

The test was done on ten arbitrarily chosen Iraqi residents to assess the reliability and reproducibility of the association between the roots of first and second mandibular premolars and molars and "the surrounding cortical plates and MF using cone beam CT scan".

Inter examiner calibration

This calibration has been done by comparing the researcher's measurement of a randomly chosen Ten sample to another well-practiced oral and maxillofacial radiologist's measurement. When the paired t-test was selected in order to comparing between measurements, insignificant difference between the measurement obtained ($p>0.05$).

Intra examiner calibration

The calibration was done by the researcher repeating the measurement of a randomly selected 10 CBCT picture two weeks following the first reading. When the test that selected in order to compare between the measurement was t-test, the difference was insignificant.

Statistical Analysis

SPSS programs used to doing statistical analysis to the measurements which is abbreviated of (statistical package for social sciences) version 19 computer software", and data analysis was converted into a digital database structure.

Positive predictive value, specificity, Sensitivities, and negative predictive value are some of the performing qualities (validity) of a test or criterion. The conditional possibility that a sick individual would get a good result is known as sensitivity. Its value could be altered by modifying the positive test result cutoff point. The conditional chance of a disease-free person having a negative test result is known as specificity.

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The provisional opportunity that a person with a positive test result is ill is the Positive Predictive Value (PPV). Its value is determined by the positive test result cutoff point and the illness prevalence in the screened population. The provisional opportunity that a individual with a negative test result is clear of the disease is known as the negative predictive value (NPV). The percentage of genuine findings among all test results is called accuracy (per cent agreement) (positive and negative) [15].

Results

As shown in table 1, the mean of distance on the left side was (4.302 ± 0.403) in males, while in female was (2.29±0.241), so the difference was a high significant between both gender p> 0.001; also we can see the mean of distance in the right side in male (4.102 ± 0.451), and in females (2.51±0.292), so the difference in right side is significant because of p value >0.05.

The table tow show the mean of bone thickness in the right side in males (buccal side) was (1.8± 0.096), while in females (1.57±0.12), here the difference was significant in the mean of bone thickness between male and female p>0.05.

The Table (3) show that the difference was significant between both gender, in the mean of bone thickness lingually p>0.05. Table (4) illustrates the most common situation of the MF on the left side was beneath the root of lower 2nd premolar type three, and the less common position was type five. Also, we can found in this table the nearest distance between the root apex, and mental foramen was in type one (1.43±0.801), but the furthermost distance can be noted in type five (7.54±1.16) while the difference was significant in all types on the left side.

Table (5) demonstrate the most common situation of the MF on the right side was below the root of lower 2nd premolar type three, and the less common position was type five. Also we can found in this table the nearest distance between the root apex and mental foramen was in type one (1.9±0.32), but the farthermost distance was in type five (6.44±1.16). The difference was significant in all types (one, two, three, four, five) on the left side.

Table (1): The mean of distance between MF and the apex of root on the both side (right and left) in both gender

Gender	Distance Left Men ±SE	Distance right Mean ±SE
Male	4.302±0.403	4.102±0.451
Female	2.29±0.241	2.51±0.292
Statistical analysis	P< 0.001	P< 0.05

Table (2): Mean of bone thickness in buccal side in right and left side in both gender

Gender	Distance Left Men ±SE	Distance right Mean ±SE
Male	1.8±0.096	2.03±0.06
Female	1.57±0.12	1.71±0.911
Statistical analysis	P=0.15	P< 0.05

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Table (3): Mean of bone thickness in lingual side in right and left side in both gender

Gender	Distance Left Men ±SE	Distance right Mean ±SE
Male	1.96±0.104	1.89±0.16
Female	2.16±0.123	2.21±0.11
Statistical analysis	P=0.12	P< 0.05

Table (4): Position of the MF on the left side and distance in mm from root apex

Type	Number	Distance in mm left	P value
1	13	1.43±0.801 d	P< 0,05
2	24	2.77±0.46 c	
3	35	3.9±0.27 c	
4	12	6±2.53 b	
5	6	7.54±1.16 a	
Total	90	-	

Table (5): Position of the MF on the right side and distance in mm from root apex

Type	Number	Distance in mm Right	P value
1	13	1.9±0.32 d	P< 0,05
2	24	2.6±0.46 c	
3	35	2.9±0.27 c	
4	12	4.55±1.13 b	
5	6	6.44±1.16 a	
Total	90	-	

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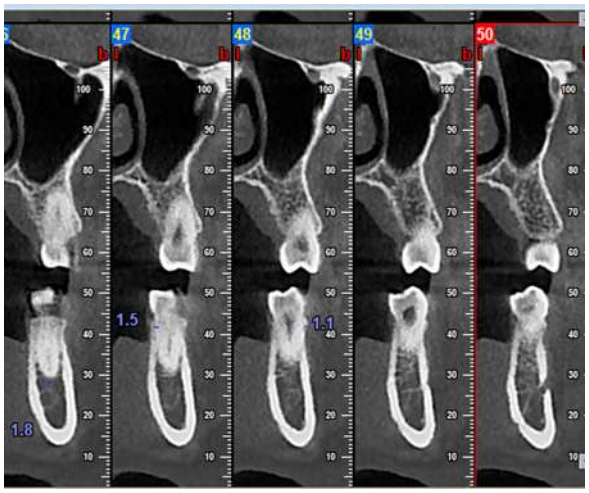

Figure (1 a): Cross-section views of CBCT showed the position of the mental foramen and bone thickness buccally and lingually on each side of the target area

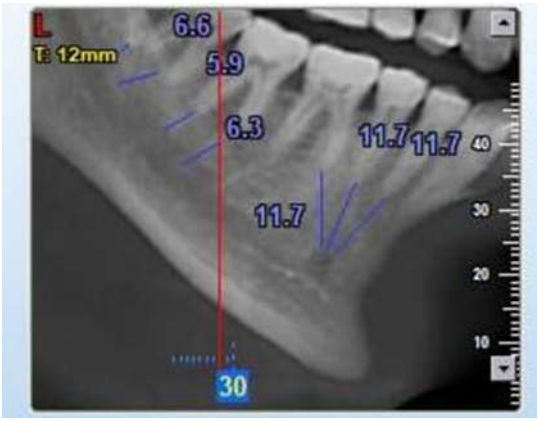

Figure (1 b): Panoramic view show the position of mental foramen in relation to mandibular posterior premolars and first molars

Discussion

Cone Beam Computed Tomography is well appropriate for craniofacial area imaging. It shows precise images of well-contrasted structures; it is also suitable for bone imaging [16, 17]. In addition, the usage of the CBCT technique in the clinical application offers several impending benefits for "maxillofacial imaging including: X-ray beam restriction", image precision, dose reduction and rapid scan time [18].

The aim of this article was to evaluation the position of MF in the Iraqi population. Throughout surgical operations in the designated region, as well as during the injection of local anesthetic, the proper identification of MF and AL is regarded as an essential element. However, because there is just one research within the Iraqi population, only similar research in other populations can compare the parameter MF's position differs by racial group. Still, according to some

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researchers, it's most commonly positioned between the 1st and 2nd premolars [19-23].

According to research conducted on the Saudi population, the most prevalent MF position would be below the apex of the second premolar, accounting for 52.8 per cent of scans [24]. Also, a similar study on the Korean population showed that The majority of the mental foramina were located under the second premolar (62.5 per cent) [25]. Also, a study in the Peruvian population showed that the MF's horizontal location is not sexually dimorphic, and it is typically in level with and beneath the 2nd premolar tooth [26]. Another study done in the Iranian population reveals that the MF is near to the second premolar and the mandible's inferior border [27].

Conclusions

The sample in the Iraqi population reveals that the MF can located most commonly under the root apex of lower 2nd premolar, also significant difference can be noted in the mean of the distance between MF and root apex in both gender, and significant difference in mean of bone thickness (Cortical plates) can be noted between both gender on both sides (right and left).

Recommendations

Studying the same variable with large sample size, comparison the same variable between different races.

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Ethical clearance: This study has been conducted following ethical approval from relevant body and approval has been acknowledged within the manuscript

Conflict of interest: Nil

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الكشف عن الموقع الدقيق للثقبة الذقنية و للصفائح القشرية وسمكها في الضواحك السفلية والأضراس الأولى للعينات المستخدمة (الوضع الشدي) أثناء التدخل الجراحي المختلف باستخدام فحص الأشعة المقطعية

علي حكيم توفيق [١]

الملخص

خلفية الدراسة: الثقبة الذقنية هي تركيب مهم للغاية. لتجنب حدوث أي صدمة للعصب العقلي ، يجب تحديد موضعه ، والتنوع في التشريح والأشكال بوضوح قبل أي إجراء تدخل جراحي.

اهداف الدراسة: لكشف عن الموقع الدقيق للثقبة الذقنيةو للصفائح القشرية وسمكها في الضواحك السفلية والأضراس الأولى للعينات المستخدمة.

المرضى والطرائق: في هذه الدراسة الاستباقية ، بلغ مجموع المرضى العراقيين البالغين(٩٢ مريضا) ٥١ إناث ، ٥١ ذكور للفترة من أكتوبر ٢٠٢٠ إلى فبراير ٢٠٢١ ، تتراوح أعمار المرضى من ٢٥ إلى ٦٥ عام . خمسة أنواع من التصنيفات تم استخدامها لتحديد موقع الثقبة الذقنية :

النوع ١ ، تحت جذر الضاحك الأول السفلي .

النوع ٢ ، بين جذر الضاحك الأول والثاني للفك السفلي .

النوع ٣ ، تحت جذر الضاحك الثاني للفك السفلي .

النوع ٤ ، بين جذر الضاحك الثاني السفلي والضرس الأول .

النوع ٥ ، تحت جذر الضرس الأول السفلي .

تم قياس سماكة العظام ايضا في الاتجاه الأفقي على كلا الجانبين من الناحية اللغوية والشدقية.

النتائج: كان الوضع الأكثر شيوعًا لموقع الثقبة الذقنية أسفل جذر الضاحك الثاني السفلي.

الاستنتاجات: يمكن ملاحظة اختلاف كبير في متوسط المسافة بين الثقبة الذقنية وقمة الجذر في كلا الجنسين ، كما لوحظ فرق كبير في متوسط سمك العظام بين كلا الجنسين وفي كلا الجانبين الايمن والايسر.

الكلمات المفتاحية: الثقبة الذقنية، الصدمات الجراحية ، قوس الفك السفلي

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