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Original Research Article

Assessment of position of mental foramen, intermental foramen distance and its correlation with age and gender among pediatric patients

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Abstract

Background: The accurate identification of the mental foramen position plays a crucial role in diagnostic, clinical, and forensic procedures. The value of inter mental foramen distance can be used as a valuable growth indicator for treatment planning and in forensic identification. .
Aim: The aim of this study was to assess the position of mental foramen, inter-mental foramen distance, and its correlation with age and gender between 9 to 12 years of age.
Design and Settings: Crossectional study conducted in the department of pediatric and Preventive dentistry between the age of 9-12 years.
Materials and Methods: A total of 300 panoramic radiographs taken for diagnostic and treatment purposes will be included in our study. Mental foramen position and intermental foramen distance were assessed using NNT software. Statistical analysis was done using SPSS software version 26.
Results: The position of mental foramen was more commonly found between the first and second premolar in both the right and left sides in both genders. There was also variation in the position of mental foramen as age advances among children between 9 to 12 years. The Intermental foramen distance was greater in females when compared to males, and increases as age advances
Conclusion: Mental foramen position and Inter mental foramen distance varies with age and gender, which plays a crucial role in the assessment of growth patterns and also in forensic identification

Keywords: Intermental foramen distance, Mental foramen, Panoramic radiograph.

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1. Introduction

The Mental Foramen is an important anatomical structure that is located in the body of the mandible. There are no precise anatomical landmarks to use as references, and the foramen cannot be directly seen or palpated. As a result, mental foramen is difficult to locate and the reported anatomical position of the mental foramen has been variable.[1] Most commonly reported location of mental foramen is below the apex of the second premolar or between the apices of the first and second premolars.[2]

According to Madera et al., in children, the mental foramen is located lower and is typically situated between the first and second deciduous molars. The position of the mental foramen is directly influenced by factors such as racial group, age, gender, alveolar bone resorption, and the presence of teeth.[3] Accurate diagnosis requires a radiographic evaluation of the mental foramen's position. The precise identification of the mental foramen's position is crucial for diagnostic, clinical, and forensic procedures.The accurate identification of mental foramen is important for all the clinical procedures in the anterior region of the mandible.[4]

Studies have shown that intermental foramen distance has got ethnic and gender variations. There are various studies that have been done by using the midline of the mandible as an anatomical landmark to estimate intermental foramen distance among the adult population. But no studies have been focused on the pediatric age group, where a significant increase is expected in the growing age.

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Age estimation is of immense importance in forensic medicine for the identification of deceased victims as well as in connection with crimes and accidents.[5] The value of intermental foramen distance can be used as a valuable growth indicator for treatment planning and forensic odontology application for age and gender determination.

Hence the study aimed to assess the position of mental foramen and its correlation with age and gender in children between 9 to 12 years of age. And to assess intermental foramen distance and its correlation with age and gender in children between 9 to 12 years of age. To our knowledge, this is the first study conducted to determine intermental foramen distance among children using panoramic radiographs among the Kerala population.

Figure 1: Measuring intermental foramen distance using software

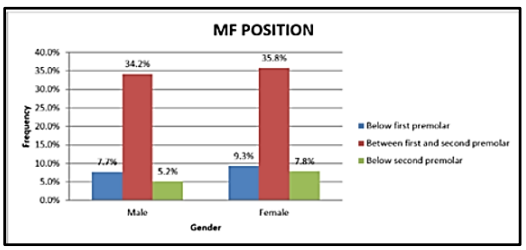

Figure 2: Mental foramen position according to gender

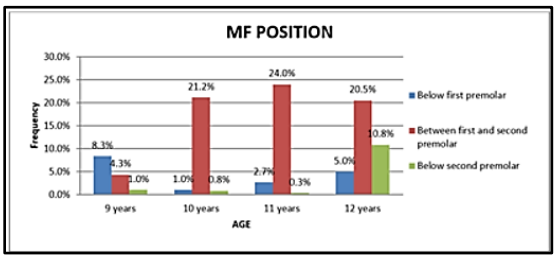

Figure 3: Mental foramen position according to age

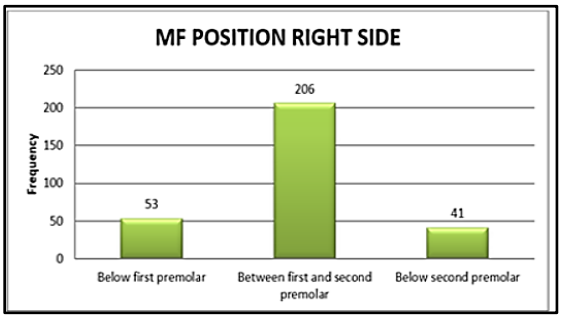

Figure 4: Mental foramen position on right side

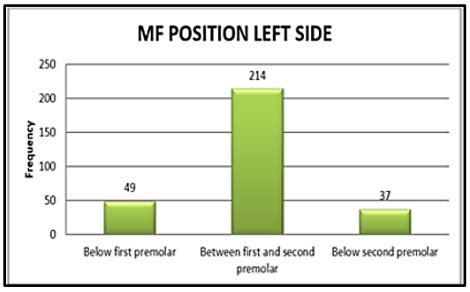

Figure 5: Mental foramen position on left side

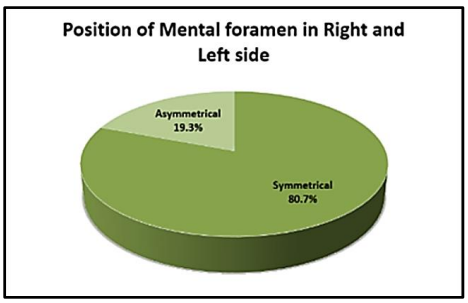

Figure 6: Position of mental foramen on both sides

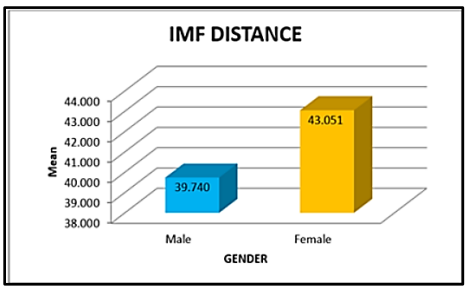

Figure 7: The mean intermental foramen distance in females and males

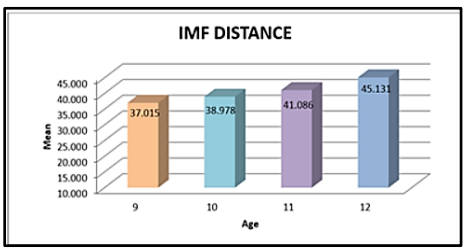

Figure 8: The mean intermental foramen distance during 9,10,11,12 years

2. Materials and Methods

This study was initiated after approval by the Institutional Ethical Committee. Patients who reported to the Pediatric and preventive dentistry department were included in our study. Our study sample included 300 patients requiring panoramic radiographs, for diagnostic and treatment purposes. All parameters of radiation protection were strictly followed in our study. The panoramic radiographs were taken using Newtom Go with exposure parameters 73kVp, 12mA, and 13.9 seconds. The position of mental foramen and intermental foramen distance was assessed using NNT software. (**Figure 1**) Radiographs with distortion, presence of

artifacts, Patients with hereditary facial asymmetries, history of surgical interventions on the lower jaw, Presence of pathologies in the lower jaw, and a congenital anomaly in the mandible that could impact the interpretation of the radiographic image were excluded from our study.

The intermental foramen distance was measured from the midpoint of mental foramen on both sides using NNT software. All the relevant parameters were documented in a structured study Performa. Confidentiality of the patient-related data was maintained.

Statistical analysis was done using SPSS software version 26. One-way ANOVA is used to compare IMF Distance between the right-side MF positions. The mean value of IMF distance below the first premolar is 40.532 with a standard deviation of 4.983, for between the first and second premolar the mean value is 41.268 with a standard deviation of 4.009 and for below the second premolar the mean value is 44.024 with standard deviation 5.413. The calculated F value is 8.303 with a p-value < 0.001. So we can conclude that there is a significant difference in IMF distance on both sides.

3. Results

In males, the position of mental foramen below the first premolar, below the second premolar, in between the first and second premolar is 7.7%, 5.2%, and 43.2% respectively. In females, mental foramen position below the first premolar, second premolar, and between the first and second premolar is 9.3%, 7.8%, and 35.8% respectively. From this, we can infer that in both males and females, mental foramen is most commonly found between the first and second premolars. (**Figure 2**).

The position of mental foramen in relation to age was also evaluated. At 9 years its most commonly found below the first premolar, but as age advances it is most commonly located between the first and second premolars. (**Figure 3**,)

A comparison of mental foramen position on both sides was also done. On the right side, 53 samples have mental foramen position below the first premolar, 41 samples below the second premolar, and in 206 subjects it's between the first and second premolar.(**Figure 4**) On the left side, the mental foramen position below the first premolar, below the second premolar, and between the first and second premolar is 49, 37, and 214 respectively. (**Figure 5**). When comparing the position of mental foramen on both sides, in 80.7% symmetry was observed. (**Figure 6**)

The mean intermental foramen distance in females and males are 43 mm and 40 mm respectively. When compared to males, females have more intermental foramen distance.(**Figure 7**). The mean intermental foramen distance during 9,10,11,12 years was 37.015 mm, 38.978 mm, 41.086 mm, and 45.131 mm respectively. (**Figure 8**)

4. Discussion

The comfort of many dental treatments in children particularly depends on achieving effective local anesthesia.[6] Knowing the exact position of the mental foramen allows for more effective local anesthesia and better cooperation from the child. The location of the mental foramen can change during the growth and development of the jaw, particularly during the mixed dentition period.[7]

In our study, the position of the mental foramen was mostly seen between first and second premolar (214), followed by first premolar (53) and second premolar(41). Previous studies have shown variation in these results depending on ethnicity. A study among the Saudi population showed the frequency of position mental foramen was higher under the apex of the second premolar.[8] While another systematic review by Pele et al, has given similar results compared to our study.[9]

A study by Rosana et al. concluded that the position of the mental foramen changes with increasing age.[10] According to the study conducted by Sunar et al the position of the mental foramen was found to be between the first and second premolar for both males and females.[11] Gershenson et al. reported that in the majority of cases, the mental foramen is located opposite the root of the first deciduous molar.[12]

In 19.3% of cases, asymmetry was noticed between the right and left side positions of the mental foramen. This was contradictory to the study conducted by Kalender et al which reports a bilaterally symmetrical position of the mental foramen and were no gender difference.[13] This value plays a crucial role in assessing mental foramen position while giving Local anesthesia for both sides in the same patient.

The intermental foramen distance (IMFD) showed a significant increase from age 11 to 12 years, with values increasing from 41.086 to 45.131(an increase of 4mm). This value can serve as a valuable indicator of growth patterns. Since this is the only study done in the pediatric age group, further studies need to be done to validate these values.

There was a significant increase in intermental foramen distance among females (43.051 mm) compared to 39.740 mm in males. This clearly indicates the influence of early growth spurt among females. The other reason might be hereditary factors, especially polymorphisms in the genes that influence bone metabolism, diet, and hormonal state, which also make important contributions.[14-15] Our results contradict with previous studies, which showed no significant difference among genders[16] This difference can be justified as other studies were done among older age groups.

Limitations of this study are less sample size, lesser time limit, and the usage of a two-dimensional image of OPG. Future studies with large sample sizes should be conducted using three-dimensional (3D) cone beam computed tomography CBCT to make the context evident.

5. Conclusion

One of the main complications of surgery in the mandibular canal and mental foramen regions is the paralysis of the mental nerve. Therefore, it is crucial for dental surgeons to identify the mental foramen in its various positions and perform a morphometric analysis to avoid injuring the neurovascular bundle during nerve block and surgical procedures. Our study clearly shows a significant increase in IMF distance with age and gender, which plays a crucial role in the assessment of growth patterns and also in forensic identification.

6. Source of Funding

None.

7. Conflict of Interest

None.

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