

Location of the mental foramen in dry mandibles of adult individuals in Southern Brazil

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Abstract

The mental foramen (MF) guides the mental nerve which is responsible for the sensible innervation of the mandibular area. It is important to know the anatomical variations of the MF for locational blockage of the incisor nerve in periapical surgeries involving molars and premolars, and in other buccomaxillofacial surgical procedures as well. This study aims to analyze variations in the MF site in dry mandibles of adult subjects in Southern Brazil. Eighty mandibles were analyzed, and the measurements of the distance from the sagittal midline to the center of the MF (MLF); the distance from the lower rim of the mandible to the center of the MF (LRF); the location of the MF relative to its alignment with the mandible teeth, and the incidence of double mental foramens (DMF) were checked. The analyzed parameters were related to each mandible's laterality. Statistical analysis was carried out through Student's t test. Results indicate that the prevalent position of the MF in the right and left sides was posterior to the first premolar. There was no significant difference between the right and left sides regarding MLF, and LRF showed a significant difference between sides, greater on the right side. There was a prevalence of the DMF on the right side of the mandibles. These results are important for the preparation and conduction of surgical procedures in order to prevent injury to the involved neurovascular structures.

Keywords: mental foramen, dry mandibles, Brazilian population, morphometry.

1 Introduction

The mental foramen (MF) is located on the lateral surface of the mandible at the end of the mental canal (PHILLIPS, WELLER and KULILD, 1992; AGTHONG, HUANMANOP and CHENTANEZ, 2005) and it is a passageway for the mental nerve. This nerve is a ramus of the lower alveolar bundle which supplies sensorial innervation to the lower lip, the buccal vestibule, and the mesial gum as far as the first mandibular molar (MOISEIWITSCH, 1998; OGUZ and BOZKIR, 2002). Most studies describe the MF location below the apex of the second premolar, or between the apices of the first and second premolars, although individual variation is important (PHILLIPS, WELLER and KULILD, 1992; ROOPA, MANJUNATH and BALASUBRAMANUM, 2003; APINHASMIT, W., METHATHRATHIP, D., CHOMPOOPONG et al. 2006a). Despite the great number of publications on the foramen location, just a few deal with the anatomical variation according to demographics or racial variation (MBAJIORGU, EF., MAWERA, G., ASALA, SA. et al. 1998; MOISEIWITSCH, 1998; NGEOW and YUZAWATI, 2003). Knowing the variations of the MF location is important for locational blockage of the incisor nerve in periapical surgeries involving molars and premolars, and buccomaxillofacial surgical procedures. This study aims at the analysis of the variations of the MF location relative to the laterality in dry mandibles of adult subjects in the south of Brazil.

2 Material and methods

Eighty (80) dry mandibles were used of adult subjects from the south of Brazil belonging to the Human Anatomy Laboratory, of the Lutheran University of Brazil (Laboratório de Anatomia Humana da Universidade Luterana do Brasil). The measurements of the distance from the sagittal midline to the center of the MF (MLF); the distance from the lower rim of the mandible to the center of the MF (LRF); the location of the MF relative to its alignment with the mandible teeth, and the incidence of double mental foramens (DMF) were checked.

In mandibles with alveolar processes already absorbed during life only the measurements of the distance from the sagittal midline line to the center of the MF, and the distance from the lower rim to the center of the MF were made. In mandibles which showed teeth or alveolar processes only the position of MF relative to the alignment with these references (MOISEIWITSCH, 1998) was analyzed. In mandibles with edentulous alveolar processes the location of the MF was checked through the alignment of a rule vertically lying in the half of the alveolar process as far as the center of the MF. In mandibles with teeth the rule was vertically aligned along the facial surface axis of the tooth crown. If the rule crossed the MF, the position would be called "aligned" with this teeth or alveolar process. If the MF position was between the alignment of two teeth or alveolar processes, the position would be called "between" and/or posterior."

Therefore, the MF position was determined by the following references: aligned with the first premolar; aligned with the second premolar; between the canine and the first premolar; between the first premolar and the second premolar, and between the second premolar and the first molar. For distance measurements a millimetrically-accurate Mitutoyo calliper was used. All measurements were made bilaterally, and data were compared between the right and left sides of the mandibles. The statistical analysis was conducted through Student's t test for the paired and independent samples, and the significant difference was evident when $p < 0.05$.

3 Results and discussion

Data related to the MF alignment with the teeth or the alveolar processes are shown in Table 1 and the mean of MLF and LRF measurements are show in Table 2. DMF was found in 7.5% of the right side mandibles, and in 3.8% of the left side mandibles.

Studies have shown that the most traditional location of the MF is the aligned position with the second premolar, followed by the position between the first mandibular premolar and the second mandibular premolar; but these positions are regarded as possible according to anatomic references (MOISEIWITSCH, 1998). The location of this foramen is, usually, a difficult procedure due to individual variations which can locate it from the first premolar to the first molar (PHILLIPS, WELLER and KULILD, 1992). In other studies the prevalent MF position has been aligned with the second premolar for Caucasians (CUTRIGHT, QUILLOPA and SCHUBERT, 2003), Thais (APINHASMIT, W., METHATHRATHIP, D., CHOMPOOPONG et al. 2006b), Malaysians (NGEOW and

YUZAWATI, 2003), and Chinese (SANTINI and LAND, 1990); between the first premolar and the second premolar for white North-Americans (MOISEIWITSCH, 1998), and British (SANTINI and LAND, 1990); posterior to the second premolar for Negroids (CUTRIGHT, QUILLOPA and SCHUBERT, 2003); between the second premolar and the first molar for Kenyan subjects (MWANIKI and HASSANALI, 1992). In this study the prevalent position, posterior to the first premolar, was not gotten by the authors; but the second prevalent position, aligned with the second premolar, was found in other studies (SANTINI and LAND, 1990; CUTRIGHT, QUILLOPA and SCHUBERT, 2003; APINHASMIT, W., METHATHRATHIP, D., CHOMPOOPONG et al. 2006a). Taken together, the MF was located between the canine and the first molar.

For MLF measurement results did not show a significant difference for laterality, which is compatible with the findings in Asian subjects (AGTHONG, HUANMANOP and CHENTANEZ, 2005). Larger measurements were gotten in Thai subjects (APINHASMIT, W., CHOMPOOPONG, METHATHRATHIP, D., et al., 2006b), and also in Asian subjects (AGTHONG, HUANMANOP and CHENTANEZ, 2005). Smaller measurements were obtained in Korean subjects (CHUNG, MS., KIM, HJ., KANG, HS. et al. 1995), and in Western subjects (CUTRIGHT, QUILLOPA, and SCHUBERT, 2003).

For the measurement of LRF, the results showed a significant difference for laterality opposed to what was obtained in a study with Asian subjects (AGTHONG, HUANMANOP and CHENTANEZ, 2005). The authors obtained a big larger measurements than the ones obtained in this paper, exactly as in a studies in Chinese (WANG et al. 1986), and Turkish (OGUZ and BOZKIR, 2002).

The presence of DMF in 7.5% of the right side mandibles, and in 3.8% of the left side mandibles showed itself higher than the findings in Asian subjects (AGTHONG, HUANMANOP and CHENTANEZ, 2005). Lower percentages were also obtained in North-Americans (BERGE and BERGMAN, 2001), and in Thais (APINHASMIT, W., CHOMPOOPONG, METHATHRATHIP, D., et al. 2006b). In a study of the presence of accessory mental foramina in 81 different populations, were obtained results suggestive of an intralocational discontinuance (HANIHARA and ISHIDA, 2001).

4 Conclusion

When taking into account the large morphometric variety of the mental foramen relative to different populations, this study plays a role in reporting data about the Brazilian population. Besides, it becomes an important tool to prepare and implement surgical procedures to prevent injury to the involved neurovascular structures.

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Table 1. Location of the mental foramen relative to the alveolar bone crest - right and left sides.

Location	Right side		Left side	
	n	%	n	%
Aligned with 1 st premolar	8	15.1	4	7.5
Aligned with 2 nd premolar	10	18.9	12	22.6
Between the canine and the 1 st premolar	9	17.0	5	9.4
Between the 1 st and 2 nd premolars	-	-	6	11.3
Posterior to 1 st premolar	17	32.0	19	36.0
Posterior to 2 nd premolar	7	13.2	6	11.3
Between the 2 nd premolar and the 1 st molar	2	3.8	1	1.9
Total	53	100.0	53	100.0

Table 2. Mean of mental foramens measurements (in mm).

Measurements	Right side	Left side
MLF	25.98 ± 2.19	26.30 ± 2.41
LRF	14.12 ± 1.80*	13.55 ± 1.94*

MLF: measurement of the distance of the sagittal median line from the mandible to the center of the mental foramen.

LRF: distance of the lower rim from the mandible to the center of the mental foramen.

*Significant difference ($p < 0.05$).

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