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Morphometric variations of right and left side mandibular foramen from coronoid process to the LINGULA

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ABSTRACT

Background of the study

Variation of the mandibular foramen right and left side is very important ,because to know about the vital structures passing through it and also the Variation is very important during the intra oral surgery like tooth extraction, implantation ,mandibular fracture . The knowledge of variation in mandibular formen is very important to avoid the anaesthestic error of inferior alvelor nerve blockage.

Objectives

The aim of this study is to determine the position of the Mandibular foramen conodylar process, coronoid process, to the lingua in several dry adult mandibles.

Materials and methods

A total number of 200 human dry mandibles RIGHT AND LEFT SIDE MANDIBULAR FORAMEN were examined of which 170 mandibles are normal and 30 mandible shows variations with the help of vernier caliber

.Measurement

The Measurement were taken as follows
i)Condylar Process to the Mandibular foramen
ii)Coronoid Process to the Mandibular foramen
iii)Mid portion of lingula to the Mandibular foramen

Result

According to our study, the following are the variations found,The length from the condylar process to the mandibular foramen is more on right side compared to the left side.The length from the coronoid process to the mandibular foramen is more on left side compared to the right side.The length from the midpoint lingua to the mandibular canal is more on right side compared to left side

Keyword:
CR LT - Coronoid Left CR RT - Coronoid Right
MF LT - Mandibular Foramen Left MF RT- Mandibular Foramen Right

INTRODUCTION

The mandibular foramen (MF) is an opening on the internal surface of the ramus for divisions of the mandibular vessels and nerve to pass through it. The mandibular canal starts at the MF and descends obliquely forward in the ramus, and later in the body of bone containing the inferior alveolar neurovascular bundles. This study was conducted to localize the MF Variation right and left accurately in several dry adult mandibles and provide the data to our students and practitioners in dentistry to the assessment of the MF ,which is considerable for the importance of inferior alveolar nerve anesthesia , Dento alveolar surgery planning, Endodontic treatments, and diagnosis of the lesion in the mandible. Incorrect estimations of its location might be the explanation to the unsuccessful anesthesia of the inferior alveolar nerve.

Numerous articles in the literature describe the anatomic structures relevant to successful mandibular anesthesia, but failures in this technique still persist. Some authors have estimated the failure rate of inferior alveolar nerve blocks to be approximately 20–25%.

But, no study was available to explain the technical aspect of the nerve block to overcome these failures. The purpose of this study is to determine the position of the MF from various anatomical landmarks in several dry adult mandibles and provide valuable information for dental students and dental practitioners.

AIMS AND OBJECTIVES

The purpose of this study is to identify the variation of right and left side MF landmarks that would provide the most reliable and predictable indicators of the exact position of the MF. This will also provide the clinician with a suitable modifications in the technique to accommodate these variations.

MATERIALS AND METHODS

The morphological variation of right and left mandibular foramen were examined.

The Measurement were taken from

1. Condylar Process to the Mandibular foramen
2. Coronoid Process to the Mandibular foramen
3. Mid portion of lingula to the Mandibular foramen.

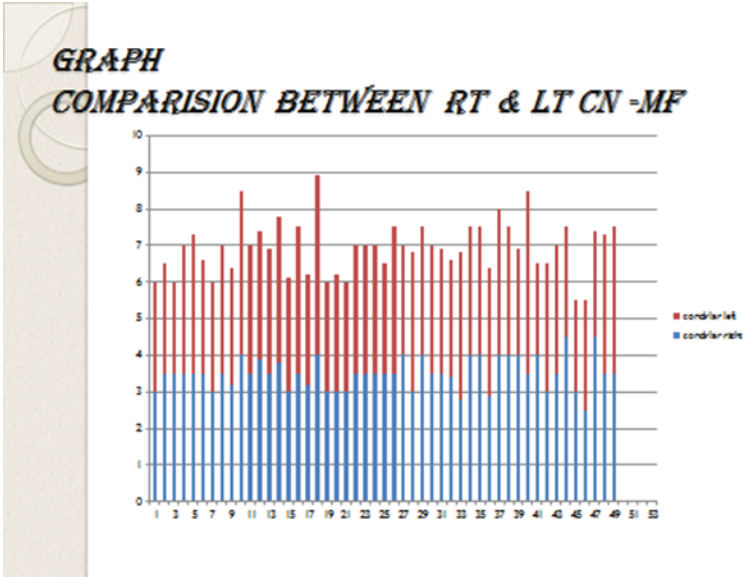

MANDIBULAR FORAMEN

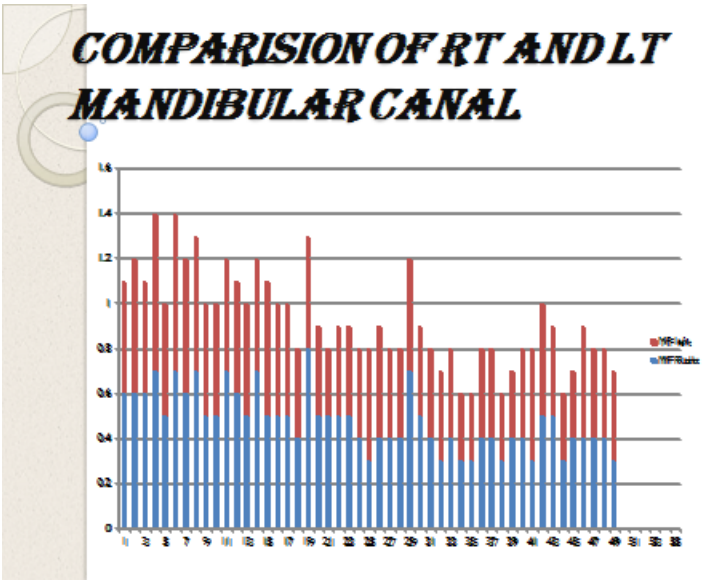
A total number of 200 human dry mandibles of South India, Tamilnadu, Nammakal district Dental colleges with the help of vernier caliper were examined, ***170 mandibles are normal and 30 mandible*** shows variations on right and left side mandibular foramen was recorded.

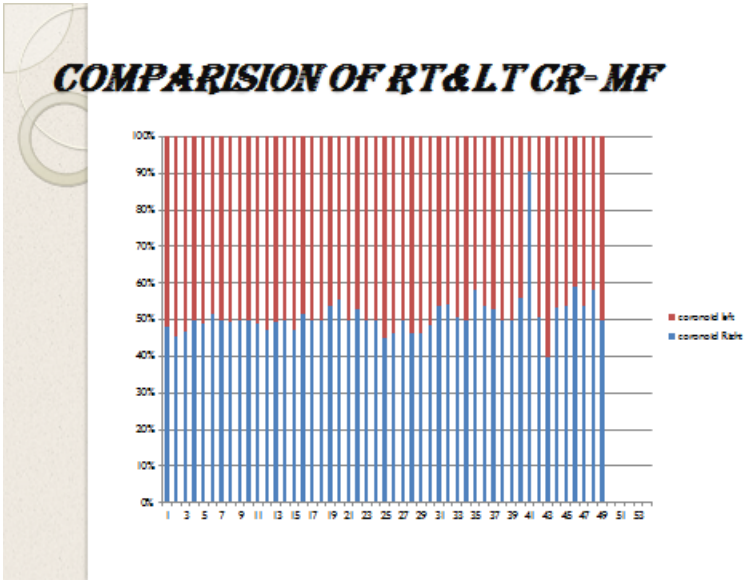
RESULT

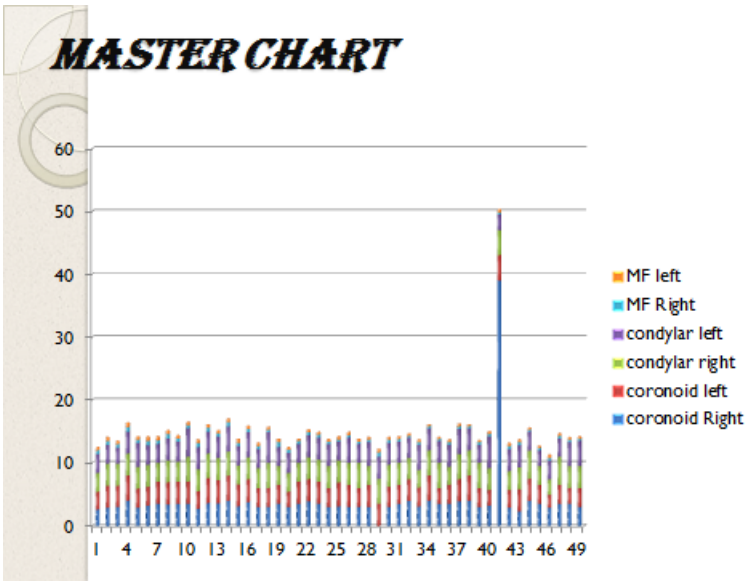
According to our study, the following are the variations found

- The length from the condylar process to the mandibular foramen is more on right side compared to the left side
- The length from the coronoid process to the mandibular foramen is more on left side compared to the right side
- The length from the lingua to the mandibular canal is more on right sidecompared to left side




COMPARISION OF RT AND LT MANDIBULAR CANAL


COMPARISION OF RT&LT CR-MF
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
coronoid left
coronoid Right



DISCUSSION

The knowledge of the position of the MF is of a great importance for many procedures in dentistry. Its precise location enables a more effective anesthesia, which in turn leads to an easier patient conditioning.The importance of knowledge of the position of MF in the inferior alveolar nerve block was mentioned in several studies which were mentioned in the introduction part of this text.

This study clearly shows that the MF is situated at or below the occlusal surface of lower teeth and at a mean distance of 19 mm (SD 2.34 mm) from AB; and without significant difference between the right and the left side (bilateral symmetry) [Table 1]; the MF was situated at a distance of 2.75 mm posteriorly from the midpoint of anteroposterior width of ramus and 3 mm superiorly from the midpoint of vertical height (between sigmoid notch to inferior border). The above findings are more or less similar to the studies carried out by Heston *et al*., Williams *et al*., Hayward *et al*., and Mbajiorgu, but differed from Nicholson's study. Heston *et al*. stated that the MF was located immediately posterior to the center of the ramus. [11] According to Williams *et al*.'s study, the MF was located above the center of the ramus on the medial surface.[12]

Hayward in their study stated that the mean size of the anterior dimension was greater than the mean size of the posterior dimension of the ramus in all instances; the MF was found to be located in the third quadrant anteroposteriorly; there was no right- or left-side dominance in the ramus size and position of the MF [13].

A study by Mbajiorgu showed that the position of the MF was highly individualistic but on average lies at about 2.56 mm (right) and 2.0 (left) behind the midpoint of ramus width [14].

According to Nicholson's study, the MF was predominantly located at the center of the mandibular ramus,which differed from our study.

Therefore, in the IANB technique, insertion of a needle 10 mm above the occlusal plane (posterior to anterior border in the medial side of ramus) and deposition of anesthetic solution at a distance of 19 mm from the anterior border should anesthetize the inferior alveolar nerve. When a patient opens the mouth, the IAN may move few mms posteriorly. Therefore, 19 plus 4 mm (23 mm) distance of needle insertion inside the tissues from the anterior border of ramus would take the needle tip nearer to the inferior alveolar nerve.

The above findings help in the success of anesthesia of the IAN block. When a dentist is aware of the location of MF from the anterior border of ramus, he/she could be sure of his/her depth of insertion to reach the nerve. The knowledge of the position of MF in relation to the occlusal plane of mandibular teeth helps the dentist

to select the site of needle insertion in the vertical plane.

Nicholson's study stated that the positions of the foramen were found to be variable; and concluded that the marked variability in the position of the MF may be responsible for an occasional failure to block the inferior alveolar nerve.[4] This study found that the variability was not significant enough to produce anesthesia failure.

Lavanya *et al*. found that the average distance of MF from the mandibular notch was found to be around 20–25 mm in both dentulous and edentulous mandibles. The same was found to be around 16 mm from the anterior border of ramus and around 13 mm from the posterior border of ramus in both groups of mandibles. In dentulous mandibles, the average distance from the third molar tooth was found to be around 15–17 mm.[15] The author would have taken the measurement from the anterior border of MF where as our study had taken the midpoint of MF for measurement and record.

Dr. K. Narayana *et al's* study confirmed the bilateral symmetry of the MF by assessing human dry mandibles; in our study also, there was no significant difference between the right and left side. He further stated the MF was located above the center of the ramus on the medial surface. He further stated, "In children aged 3 years, the MF has been located 4.12 mm below the occlusal plane; in 9-year-old children it has reached the occlusal plane; in adults it is 4.16 mm above the occlusal plane".[1] We did not study the mandibles age wise, but generally, the MF was below or at the level of occlusal plane of mandible teeth, not at above the occlusal plane as author quoted.

In 2011 Ashkenazi *et al*. studied the effect of age on the anteroposterior (A–P) position of the MF and on the size of the gonial angle (GA). According to their study, the anterior movement of the MF and the decreased size of the GA that occurred with changing age and dentition were related to growth process. The MF moves anteriorly, and the GA decreases with age.[16] Our study data could not identify this finding.

The knowledge of location of MF from the anterior border and the occlusal plane helps the dental surgeons to locate the inferior alveolar nerve entry into its foramen correctly in neurectomy surgeries and nerve block techniques. Damage to the inferior alveolar nerve can be avoided in horizontal, vertical, and oblique osteotomies in the ramus. The knowledge of distance of MF to the internal oblique ridge would be helpful in innovation of a new inferior alveolar nerve block technique using the internal oblique ridge as the main landmark.

The knowledge of distance of MF from the posterior border of ramus and the inferior border of mandible and condyle would be helpful in the innovation of new extra oral inferior alveolar nerve block techniques. It is also helpful to study of dental X-rays.

From our study, the position of foramen seems to be determined by size, width, and height of mandible. However, this did not change the position MF to occlusal plane of mandible teeth relation. Most of the studies had taken sigmoid notch as one of the main reference points to quote MF at the centre of ramus. To make a success of IANB it is essential to find the distance of MF from the anterior border and posterior border of ramus. It is also essential to find the MF position in vertical plane superior-inferiorly from the condyle to inferior border to make extra oral blocks effective. Since the sigmoid notch is difficult to feel externally, this study did not include the sigmoid notch as one of the main landmarks.

RESULT

According to our study, the following are the variations found

- The length from the condylar process to the mandibular canal is more on right side compared to the left side
- The length from the coronoid process to the mandibular canal is more on left side compared to the right side
- The length from the lingua to the mandibular canal is more on right side compared to left side

CONCLUSION

Although it is being mentioned in the literature, the anatomical variation is the cause for failure of anesthesia but this study found the foramen was always at the level of the occlusal plane or below the occlusal plane. Therefore, deposition of anesthetic solution above the foramen level should anesthetize the nerve. It was found in this study that the MF was positioned at a mean distance of 19 mm (with SD 2.34 mm) from the coronoid notch of anterior border of ramus. The variability of distance from AB to MF was also not significant enough to produce failure of anesthesia. Deposition of solution around 23 mm (mean 19 + 4 mm for posterior movement of nerve on the open position of mandible) distance from the anterior border of ramus should anesthetize the inferior alveolar nerve in larger mandibles. Deposition of solution around 20.5 mm (mean 16.5 +4 mm for posterior movement of nerve on the open position of mandible) distance from the anterior border of ramus should anesthetize the inferior alveolar nerve in smaller mandible. Therefore, we conclude the inferior alveolar nerve anesthesia failures are due to the operator error and not due to the anatomical variation. Therefore, the above said knowledge would be helpful for a dentist to introduce new technical modification to create more successful anesthesia and to perform good surgeries in the ramus of mandible

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