# A MORPHOLOGIC AND MORPHOMETRIC STUDY OF INCIDENCE AND POSITION OF MENTAL FORAMINA IN SOUTH INDIAN DRY MANDIBLES

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## ABSTRACT

**Background**: The mental foramen is situated on the anterolateral aspect of the body of mandible, through which the mental nerve and blood vessels pass together to the buccal gingiva , the lower lip and chin.

**Purpose of the study**: It is an important landmark to facilitate surgical, local anesthetic, and other invasive procedures and the present study was aimed to elucidate its morphometric parameters with reference to easily accessible landmarks.

**Materials and Methods:** The study was done in the Department of Anatomy, Bangalore Medical College and Research Institute, Bangalore. The study sample consisted of a total of 87 dry mandibles (174 sides). This included 31edentulous (only incisors or canines present) mandibles (62 sides) and 56 dentulous mandibles (112 sides).

**Results**: Mental foramen was found in all the mandibles studied (100%).The mean distance of the margin of the right mental foramen from the symphysis menti was24.99mm and 25.23mm in edentulous and dentulous mandibles respectively. The superior (alveolar) border of the mandible was 8.22mm and 12.61mm, the posterior border 61.45mm and 62.98mm, and inferior border 11.95mm and 13.12mm from the margin of the mental foramen. On the left side, the measurements were 24.34mm and 25.1mm from symphysis menti, 7.82mm and 12.70mm from the alveolar ridge. The mental foramen was 62.19mm and 61.7mm from the posterior border of mandible. The distance from inferior border was 11.73mm and 12.72mm in edentulous and dentulous mandibles respectively.

**Conclusion:** The location of the mental foramen is an important factor when considering the mental incisive anesthetic block and surgery in the outer premolar mandibular region. Many earlier studies record the position of the mental foramen in reference to the teeth. This can be difficult in cases where the teeth are irregular or missing. The measurements of the present study, especially the distance from bony landmarks like symphysis menti will help in the localisation of the mental foramen in South Indians.

**KEY WORDS**: Mental foramen, Position, Measurement, Accessible landmarks, Edentulous, Dentulous.

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Akhilandeswari.B, Priya Ranganath. A MORPHOLOGIC AND MORPHOMETRIC STUDY OF INCIDENCE AND POSITION OF MENTAL FORAMINA IN SOUTH INDIAN DRY MANDIBLES.

#### **INTRODUCTION**

The mental foramen is a small foramen situated on the anterolateral aspect of the body of mandible, through which the mental nerve and blood vessels pass together to the buccal gingiva in front of the second premolars to the lower lip and chin. These nerves and vessels supply innervation and blood circulation to the lower jaw and skin of the lower face. The mental nerve, is primarily a sensory nerve and after leaving the foramen innervates the lower canines and premolars and therefore play an important role in procedures in this area such as administration of local anaesthesia and surgical intervention [1]. Variation in mental foramina is very common. As the mental foramen is an important landmark to facilitate surgical, local anaesthetic, and other invasive procedures, the present study was aimed to elucidate its morphologic features and morphometric parameters with reference to surrounding easily accessible landmarks.

#### MATERIALS AND METHODS

Fig. 1: Shows how measurements are taken from different bony landmarks to the borders of the mental foramen.



i) From symphysis menti

ii) From alveolar margin (superior)

iii) From posterior border of ramus of mandible

iv) From inferior border of mandible

The study was done in the Department of Anatomy, Bangalore Medical College and Research Institute, Bangalore. The study sample consisted of a total of 87 dry mandibles (174 sides). This included 31edentulous (only incisors or canines present) mandibles (62 sides) and 56 dentulous mandibles(112 sides). The sex of the mandibles was not taken into consideration. Dry mandibles of children were excluded.

The following parameters were analysed on both sides:

A) Incidence of mental foramen

B) Position of the mental foramen made by measuring the distance of the border of mental foramen

i)From symphysis menti

ii) From alveolar margin (superior)

iii)From posterior border of ramus of mandible iv)From inferior border of mandible

All measurements were done using vernier callipers and the mean values arrived at using Microsoft excel software.

## RESULTS

**A) Incidence:** Mental foramen was found in all the mandibles studied (100%).

**B)** Position of mental foramen with reference to different bony landmarks of mandible: The mean distance of the margin of the mental foramen from the symphysis menti, the superior (alveolar) border, posterior border and inferior borders of the mandible are given in Table-1. As the measurements in dentulous and edentulous mandibles, especially the distance from superior (alveolar) border can be different, the parameters were recorded separately.

| Table 1: Shows the mean distance of the margin of the mental foramen from the symphysis menti, the super | erior |
|--|-------|
| (alveolar) border, posterior border and inferior borders of the mandible.                                |       |

| Distance of margin of             | Right side          |                     | Left side          |                     |  |
|-----------------------------------|---------------------|---------------------|--------------------|---------------------|--|
| mentalforamen(in mm) from         | <b>Edentulous</b>   | Dentulous           | <b>Edentulous</b>  | Dentulous           |  |
| i) Symphysis menti                | 24.99 <u>+</u> 2.31 | 25.23 <u>+</u> 2.28 | 24.34 <u>+</u> 2.5 | 25.1 <u>+</u> 1.75  |  |
| ii) Alveolar ridge                | 8.22 <u>+</u> 3.18  | 12.61 <u>+</u> 3.48 | 7.82 <u>+</u> 3.02 | 12.70 <u>+</u> 2.04 |  |
| iii) Posterior border of mandible | 61.45 <u>+</u> 6.15 | 62.98 <u>+</u> 8.16 | 62.19 <u>+</u> 4.7 | 61.7 <u>+</u> 7.43  |  |
| iv) Inferior border of mandible   | 11.95 <u>+</u> 1.87 | 13.12 <u>+</u> 1.74 | 11.73 <u>+</u> 1.7 | 12.72 <u>+</u> 2.13 |  |

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| Study/measurements from                 | Symphysis menti               |                 | Superior border                             |       | Posterior border  |                             | Inferior border |                             |        |
|---|-------------------------------|-----------------|---|-------|-------------------|-----------------------------|-----------------|-----------------------------|--------|
|   |                               | Rt              | Lt  | Rt    | Lt                | Rt                          | Lt              | Rt                          | Lt     |
| Oguz&Bo                                 | zkir(Turkish)[11]             |                 |   | 13.6  | 14.62             |                             |                 | 14.61R,                     | 14.29L |
| Yes,ily                                 | /urt et al[12]                | 19.18           | 19.37                                       |       |                   | 48.58                       | 48.27           |                             |        |
| Junior et al[13]                        |                               |                 |   | 13.84 | 12.82             |                             |                 | 12.95                       | 12.96  |
| Agarwal &<br>Inc                        | & Gupta (Central<br>dian)[14] | 25.55           | 25.05                                       | 14.05 | 13.82             |                             |                 | 12.16                       | 12.11  |
| llayp<br>(SriL                          | eruma et al<br>ankan)[15]     | 24.87           | 24.77                                       |       |                   |                             |                 |                             |        |
| Sivavadivel et al (South<br>Indian)[16] |                               | 26.35(No<br>fou | 26.35(No side diff found) 14.1(No si found) |       | side diff<br>und) | 61.5(No side diff<br>found) |                 | 12.7(No side diff<br>found) |        |
| Present<br>study                        | Edentulous                    | 24.99           | 24.34                                       | 8.22  | 7.82              | 61.45                       | 62.19           | 11.95                       | 11.73  |
|   | Dentulous                     | 25.23           | 25.1  | 12.61 | 12.7              | 62.98                       | 61.7            | 13.12                       | 12.72  |

Table2: Compares the distance of mental foramen from different parts of mandible in different studies.

#### DISCUSSION

The morphologic and morphometric variations of mental foramen have been recorded in dry human mandibles and on radiographs. Different anatomy and radiology textbooks give contradicting statements regarding the morphometric characteristics of the mental foramen; thereby depicting variable racial trends [2].

**Incidence:** Incidence of mental foramina is observed in all mandibles (100%) in most of the earlier studies, as is in the present study. Agenesis of mental foramen is a rare occurrence and man is the only primate known to have agenesis of mental foramen. The reasons for absence maybe atrophy, post traumatic fibrosis, osteoblastic hyperplasia, geriatric bony resorption or congenital agenesis. However, Hasan reported a case of bilateral absence of mental foramina in a dry mandible [3]. A previous study also reported absence of mental foramen in 3 (2 right, 1 left) out of 2870 sides of dry skulls studied [4].

Position of mental foramen with reference to different bony landmarks of mandible: The location of mental foramen shows changes with age. In children before tooth eruption, it is somewhat closer to the alveolar margin. During eruption period, it descends to half way between upper and lower margins and in adults with teeth preserved it is somewhat closer to the inferior border. With loss of teeth and bone resorption, the foramen moves upwards closer to the alveolar border. In extreme cases of resorption, the foramen and the adjacent part of the mandibular canal are open at the alveolar margin [5]. The location of the mental foramen is an important factor when considering the mental incisive anesthetic block and surgery in the outer premolar mandibular region. There are significant differences reported in the location of mental foramen among different ethnic groups.

In Zimbabweans, in a vertical plane, the mental foramen was predominantly located under the midpoint of line joining lower border of mandible to alveolar ridge[6]. Its vertical position was slightly below the midpoint of distance between lower border of mandible and alveolar margin, in Malawians[7].

The foramen may not appear on conventional radiographs, and linear measurements need to be adjusted to account for radiographic distortion. In general, altered lip sensations are preventable if the mental foramen is located correctly and this knowledge is employed when performing surgical procedures in the foraminal area [8].

As the mental foramen cannot be clinically visualized or palpated, it can be localized, if the distance from symphysis menti or other bony parts of the mandible is known.

Study by Gupta &Soni recorded a distance of 29.12mm from symphysis menti,76.16mm from posterior border and 14.45 mm from inferior border of mandible[9]. Study on African mandibles gives a distance of 16.16mm and 15.66mm from superior border of mandible, from inferior border 14.89mm and 14.21mm in male and female respectively [10].

In the present study, measurements were done

separately for edentulous and dentulous mandibles. Comparison of these two values show that as age advances and teeth are lost, the resorption of the alveolar ridges result in apparent change in position of the mental foramen, when measured from the superior border. The distance of the foramen from the alveolar margin is significantly reduced when edentulous.

The measurements in Turkish and African mandibles show a higher value when compared to Brazilian, Indian and Srilankan counterparts. The slight differences in values seen in same populations (Indians) may be related to different methodology and sample size. Also the mental foramen morphology (in terms of modal position and number), varies not only according to age, sex and ethnicity, but even within the same race, in different geographic populations[2].

Variability in mental foramen position may be related to different feeding habits subsequently affecting mandibular development. Prior knowledge of common positions in local populations may be helpful in effective nerve blocks and surgeries in those regions.

#### CONCLUSION

Prior knowledge of mental foramen variations helps surgeons in planning surgery in that region to avoid nerve damage and also enable effective mental nerve block anesthesia, with adequate preoperative radiological examination in clinical situation especially when closed surgery is planned.

The mental foramen is a strategically important landmark during osteotomy procedures. Its location and the possibility that an anterior loop of the mental nerve may be present medial to the mental foramen needs to be considered before implant surgery to avoid mental nerve injury[8].

Many earlier studies record the position of the mental foramen in reference to the teeth. This can be difficult in cases where the teeth are irregular or missing. Also, paleoanthropologists believe that tooth position may not be a reliable indicator of mental foramen position because of the variability of tooth size within and between taxa and during eruption level[2]. The measurements of the present study especially the distance from bony landmarks like symphysis menti will help in the localisation of the mental foramen in South Indians.

#### **Conflicts of Interests: None**

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