

Mandibular Lingula as an Anatomical Reference Point for Inferior Alveolar Nerve Block.

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Abstract: The conventional inferior alveolar nerve block is the most commonly used nerve block technique for locally anaesthetizing the inferior alveolar nerve during minor and major mandibular surgical procedures. The inferior alveolar nerve passes through the mandibular foramen along with the mandibular vessels. In close association with the mandibular foramen is an elevated bony process known as the lingula. The foramen and the lingula, because of their relation to the inferior alveolar nerve are of clinical significance for the orodental surgeons. The lingula is used for identifying the approximate area of the mandibular foramen for determining the site of deposition of local anesthetic for inferior alveolar nerve blockage or for excision of nerve for facial neuralgia and other major surgical procedures. The exact location of the mandibular foramen on radiographs is not always easy to be established due to its radiolucency and the superimposition of contralateral mandibular structures. The lingula serves as an important landmark to localize the mandibular foramen as it lies in close proximity to it. Analysis also shows that failure to localize the lingula and mandibular foramen in addition to the variation in morphological characteristics account for a percentage of failure in achieving the inferior alveolar nerve block to about 15-20% [1] which is lower when compared to other techniques like Akinosi and Gow Gates techniques which have more failure rates [2]. Intraoperative complications such as hemorrhage, unfavorable fracture nerve injury have been documented due to improper identification of the lingula. [3] Identifying the lingula and thereby the mandibular foramen reduce the failure rate and promotes safe surgeries without potential nerve damage and hence this study. [4-9]

Key words: IANB, Lingula, Mandibular foramen

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I. Introduction

IANB is a procedure used for anaesthetizing the lower half of the mandible for dental extraction which is a common procedure used in dentistry. This involves anesthetizing the inferior alveolar nerve by depositing a solution of local anesthetic around the nerve causing a nerve block. Precise location of the inferior alveolar nerve is warranted to deposit the local anesthetic and thereby achieve adequate anesthesia for performing an effective procedure. Deposition of anesthetic in incorrect areas is likely to result in inadequate nerve block and improper anesthesia which could be due to lack of awareness of the location of the inferior alveolar nerve. The failure rate of nerve block has been estimated to be around 20-25% [10] and has been attributed to non-localizing the nerve area due to various reasons. In order to localize the nerve accurately the dental surgeon ought to have a palpable, stable identifying point. Bone provides immovable, stable palpable elevations which can be used as land marks for identifying the inferior alveolar nerve. And, Lingula is one such elevation which lies on the medial surface of the ramus of the mandible posterior-inferior to which lies an irregular foramen, the Mandibular foramen through which the inferior alveolar nerve passes along with the inferior alveolar vessels. Identifying this Lingula of the mandible not only helps the surgeon in achieving a proper IANB but also provides a guiding point to avoid injury to the vessels during performing osteotomies.

The basic anatomy of the inferior alveolar nerve shows that the nerve arises from the posterior division of the mandibular nerve. The posterior division is mainly sensory and divides into the inferior alveolar, lingual and auriculo temporal branches. The inferior alveolar nerve in turn divides into two terminal branches, the mental and incisive nerves which supply the lower teeth, chin and lower lip. Variations in the nerve anatomy which could manifest in the form of block failure could be in the form of communications between the branches of the mandibular nerve itself. The inferior alveolar nerve enters the mandibular foramen present on the medial surface of the mandible [11-16]. It is located around 2.75 mm posterior to the midpoint of the width of the ramus and at a distance of 19 mm from the coronoid notch and is either level with or below the occlusal plane in young adults and adults respectively. The foramen is also located 3 mm above the midpoint of an imaginary line running from the sigmoid notch to the inferior border of the mandible. Other studies on location of the mandibular foramen have shown that the foramen can be at the center of anterior-posterior width of the

ramus[17]2.08-2.56 mm behind the midpoint of anterior-posterior dimension[18]or on the posterior third quarter of the anterior-posterior width.[19]The foramen can also be superior to its normal anatomical location.[20]anterio-superior to the mandibular foramen is a sharp tongue shaped projection known as the lingula, an elevation where the sphenomandibular ligament is inserted.It was described by Johannes-Baptist Spix in 1815 and was therefore named 'Spix'sossicle or spine'. It has been used as a landmark to avoid the structures of the mandibular foramen from being injured during performing osteotomies and presents in different shapes.1. Triangular 102 50% 2. Truncated 69 33.82% 3. Nodular 27 11.76% 4. Assimilated 6 2.9%

II. Material And Methods

The present study was carried out in the Department of Anatomy, Government Medical College ,Srikakulam, Andhra Pradesh.A total number of 50 human cadaveric dry mandibles were examined for evaluating the location of the lingula on the ramus of the mandible.The lingula was traced on the medial side of the ramus of mandible and measurements were taken with the help of a Vernier calipers. The distance of the lingula from the anterior and posterior borders, sigmoid notch and mandibular base was measured and recorded.[21]

Assimilated and nodular types of lingula not properly visible were excluded from the study.

III. Results

The results obtained after duly measuring the distances between the borders and the lingula have been tabulated and compared.

The distance between the posterior border and the lingula measured a minimum of 14.48 and a maximum of 20.24mm averaging to 17.36+/-2.88mm.

The border of the Sigmoid notch was 13.14mm to 19.1mm away from the lingula with an average of 16.12+/-2.98mm.

Table.1. Showing the distance between the borders of the mandible to the lingula.

S.no.	Distance(in mm) of Lingula to	Min	Max	Average
1	Anterior border	15.7	22.72	19.21+/- 3.51
2	Posterior border	14.48	20.24	17.36+/- 2.88
3	Sigmoid notch	13.14	19.1	16.12+/-2.98
4	Angle of mandible	28.27	36.89	32.58+/-4.31

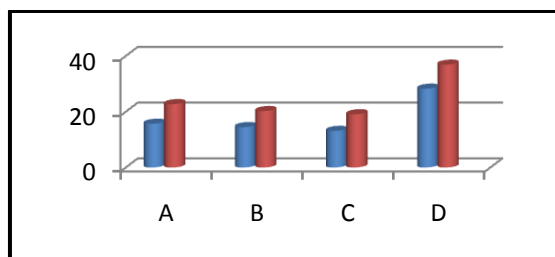


Fig.1. Distance from Lingula to A-Anterior border of Mandible, B-Posterior border of Mandible C-Sigmoid notch of Mandible, D-Angle of Mandible.

Table.2. Showing the distance of the lingula from the mandibular foramen.

S.no.	Distance (in mm) of lingula from Mandibular foramen	Min.	Max.	Average
1	Anterior border	0.78	0.94	0.86+/- 0.08
2	Superior border	7.5	10.9	9.2+/- 1.7

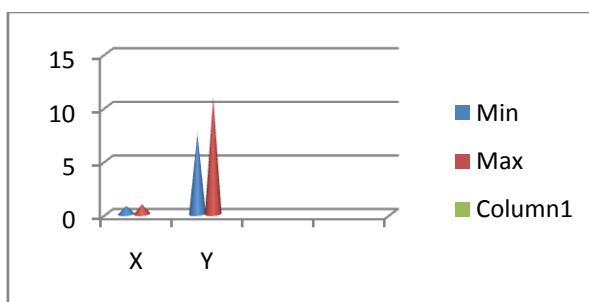


Fig.2. Distance of Lingula from Mandibular Foramen. X- Anterior border, Y- Superior border

The lingula lies antero-superior to the mandibular foramen. The vertical distance when measured showed a minimum of 7.5mm and a maximum of 10.9mm from the superior border of the mandibular foramen with an average of 9.2±1.7mm. The horizontal distance when measured from the anterior border of the mandibular foramen to the lingula showed a minimum of 0.78 to a maximum of 0.94 averaging 0.86±0.08mm.

IV. Discussion

The inferior alveolar nerve block is the most common form of local anesthesia used in dental surgery providing anesthesia to the lower teeth, gingiva, mucous membrane and lower lip. The mandibular canal which holds the inferior alveolar nerve has a bony spicule anterosuperiorly which acts as a landmark for the identification of the mandibular foramen. (Gardner 1992; Williams, Bannister Berry et al. 1995; Abrahams, Hutchings and Marks 1998). This bony spicule, the lingula is present in different shapes Triangular, Truncated, Nodular and assimilated, out of which triangular is the most common and assimilated the least. The lingula also shows sexual dimorphism showing lesser distance from the occlusal plane in females. Variations in the height of the lingula from the occlusal plane is documented by Kanno et al. 3 in which it was seen to be located 6mm and 10mm above in 7- 8-year-old and 9-10- year-old children.

It is to be noted that the location of the lingula varies in various ethnic and racial groups. The height level of the mandibular lingula posterior inferior to which the mandibular foramen is located is an important reference for the inferior alveolar nerve block which was reported by Monazzi et al [21] The mandibular foramen was located 0.86±0.08 mm posterior and 9.2±1.7mm inferior to the lingula.

Finally, identification of the lingula can be used as a landmark to locate the mandibular foramen which lies posterior inferior to the lingula and lodges the inferior alveolar nerve. It is useful radiologically as well.

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V. Conclusion

The lingula is a prominent spicule which is in proximity to the mandibular foramen and the average measurements from the anterior border and angle of the mandible give a measure of the approximate location of the mandibular foramen. [22] This is of relevant clinical significance to dental surgeons in giving inferior alveolar nerve block and also avoiding injury to the neurovascular structures while performing osteotomies.

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