

Variations of Inferior Alveolar Nerve

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ABSTRACT

Background: Inferior alveolar nerve block is mostly given during dental procedures. Inferior alveolar Nerve is the branch of posterior division of Mandibular Nerve.

Method: Cadaveric case study was performed in dissection Hall of anatomy department in 10 cadavers. Two unusual findings in infratemporal regions of two cadavers were observed unilaterally.

Result & Discussion: Inferior alveolar nerve was found to be arising from dual roots which joined after certain distance to split again. In another case, it was communicating with other branches of mandibular nerve. Knowledge of such unusual observations are important for maxillofacial surgeons, dentists & Radiologists.

KEYWORDS: Inferior Alveolar Nerve, Mandibular Nerve, Nerve Compression Syndromes.

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INTRODUCTION

The Inferior Alveolar Nerve (Inferior dental nerve) is the largest branch of the posterior division of mandibular nerve. It descends with the inferior alveolar artery, behind the lateral pterygoid muscle, and then between the Sphenomandibular ligament and the ramus of the mandible to the mandibular foramen [1]. It then passes forward in the mandibular canal, beneath the teeth, as far as the mental foramen, where it divides into two terminal branches, incisive and mental. The branches of the inferior alveolar nerve are the mylohyoid, dental, incisive, and mental. The mylohyoid nerve is derived from the inferior alveolar just before it enters the mandibular foramen. It descends in a groove on the deep surface of the ramus of the mandible, and

reaching the under surface of the Mylohyoid muscle supplies this muscle and the anterior belly of the Digastricus [1]. The incisive branch is continued forward within the bone, and supplies the canine and incisor teeth [1]. The lingual and inferior alveolar nerve (IAN) are the chief branches of the posterior division of mandibular nerve in the infratemporal fossa. Lingual nerve lies anterior to and slightly deeper than the inferior alveolar Nerve. The MA and pterygoid venous plexus are the important vessels in this region. Second part of maxillary artery passes superficial or deep to lateral pterygoid muscle. Its middle meningeal branch is embraced by the two divisions of Auriculotemporal nerve [2].

It is essential for the maxillofacial surgeons, radiologists and dentists to have a sound

knowledge about anatomical variations at the infratemporal fossa as this region is hard to access surgically [3]. It was reported that the variations of mandibular nerve may lead to compression of neurovascular contents causing symptoms of altered sensorium and pain in the craniofacial region [4]. The face receives sensory innervation from the branches of fifth cranial nerve, mandibular nerve. Here, in the present study, two roots of inferior alveolar nerve which were branching out from the posterior division of mandibular nerve. It is believed that such type of morphological variation in the formation of IAN can have clinical implications. It may include compression by adjacent structures and nerve entrapment. The knowledge of this variation is important to anaesthesiologists and dentists, while administering local anaesthesia. Thus, in depth knowledge of this variation of inferior alveolar nerve is also useful to the maxillofacial surgeons, neurologists and radiologists to ensure success of operative procedure performed by them.

MATERIALS AND METHODS

Routine Dissection for undergraduates was carried out in 20 infratemporal fossae of 10 formalin fixed cadavers (8 males, 2 females) in Anatomy department. 20 Infratemporal fossae of both the sides were dissected. Two unusual findings in infratemporal regions of two cadavers were observed.

Dissection was carried out using instructions from Cunningham's manual of Practical anatomy. After superficial dissection in the region of right side, masseter and ramus of mandible was removed. After breaking the ramus of mandible, Lateral pterygoid muscle was dissected out. Branches of Mandibular nerves, specially, Lingual & inferior alveolar nerve were observed.

OBSERVATIONS AND RESULT

After meticulous dissection of infratemporal fossae of 10 cadavers on both the sides, variation in inferior alveolar nerve was found in 2 right sided infratemporal fossa.

Case 1: On dissection of right side infratemporal fossa of female cadaver, two roots of

Inferior alveolar nerve were found to be communicating with lingual and auriculotemporal nerve, making a Y shape pattern. Branch of maxillary artery was seen to pass through the gap between the two communicating roots of inferior alveolar nerve.

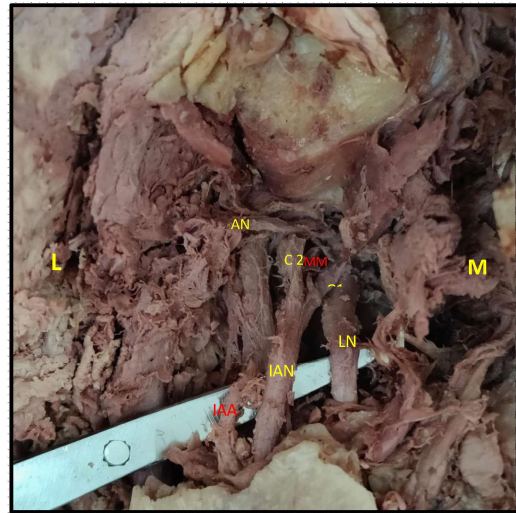


Fig. 1: Showing variation of inferior alveolar nerve in Case 1 L- lateral, M- Medial, LN- lingual nerve, IAN- Inferior alveolar nerve, AN- Auriculotemporal Nerve, C1- communication of inferior alveolar nerve with Lingual nerve. C2- communication of inferior alveolar nerve with auriculotemporal nerve IAA- inferior alveolar artery, MM- middle meningeal artery.

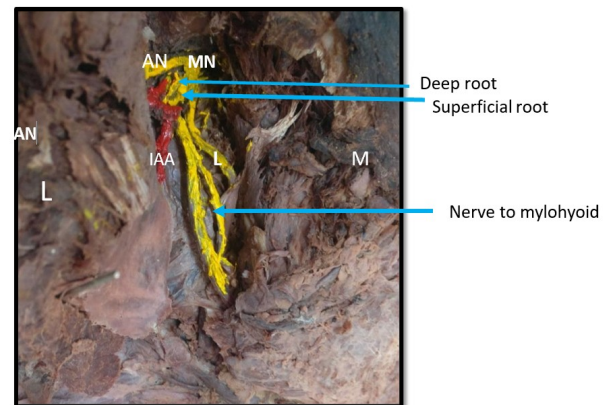


Fig. 2: Showing variation of inferior alveolar nerve in Case 2 L- Lateral, M- Medial, AN- Auriculotemporal nerve MN- mandibular Nerve IAN- Inferior Alveolar Nerve L Lingual Nerve, IAA- inferior alveolar artery

Case 2: On dissection of right side infratemporal fossa of male cadaver, inferior alveolar nerve was traced upwards, Inferior alveolar nerve was observed to be emerging as double root from the posterior division of mandibular nerve. Superficial root was thicker than deep root. Branches of maxillary artery were observed. Before entering the mandibular foramen, two roots joined together and a usual smaller branch to mylohyoid was given

out. Rest other branches of mandibular nerve were arising normally.

After taking the permission of head of department, photographs of these findings were taken. A literature review was carried out to study these finding & its clinical implications.

DISCUSSION

Many studies have depicted variations in the branches of mandibular nerve & maxillary artery in infratemporal fossa. It is one of the areas for lateral surgical approach to base of skull [5]. Therefore, it is essential for orthopedician, neurosurgeon, otorhinolaryngologist, dentist, maxillofacial surgeon. Unnathi Nayak et al reported a case of inferior alveolar nerve arising from dual roots which were encircling around pterygoid part of maxillary artery [6]. Pulsating maxillary artery can compress the nerves surrounding it. Compression of nerve can cause pain & numbness in the areas supplied by it. It is a cause of trigeminal neuralgia [7].

A study conducted by Quadros et al, a unilateral variation in the origin of inferior alveolar nerve was observed where it arose from 3 roots, 1 from lingual nerve, 2 & 3 from auriculotemporal nerve. If there are multiple roots, chances of compression get doubled [8].

In a case reported by Shweta Jha et al, mandibular nerve divided into lingual nerve and inferior alveolar nerve deep to the maxillary artery with superficial & deep roots around maxillary artery [9].

S Gandhi et al presented a rare case of unilateral atypical communication between inferior alveolar nerve & lingual nerve and lingual with mylohyoid nerve. This communication between mylohyoid & lingual nerve was found near the submandibular ganglion after the lingual nerve passes in close relation to third molar tooth [10].

According to Hasmukh A. Buch & Rajendra ji Agnihotri, a recurrent variant branch of IAN was found in 12 out of 35 sides (34.3%) & 8 of 18 cadavers (44.4%). Though it is not a very rare variation in most of the cases, it innervated the lateral pterygoid muscle. In some cases, it terminated in the lateral

pterygoid muscle. In others, it penetrated the muscle to join the anterior or posterior division of mandibular nerve or its branches. Thus, the variant nerve in such cases might be regarded as an additional root of inferior alveolar nerve [11].

Clinical significance: Knowledge of these variations of inferior alveolar nerve is crucial for maxillofacial surgeons, radiologists & neurologists. This is also important for dental surgeons and anesthesiologists while administering local anesthesia for dental or oncological procedures. This anatomical variation of inferior alveolar nerve could explain intractable trigeminal neuralgia pain conditions.

It is also kept in mind before reconstructive surgery of the infratemporal fossa and for adequate anaesthesia. Maxillary artery and middle meningeal artery can compress the nerve roots causing pain & numbness in the involved area.

Embryological significance – The neural crest cells formed in the cephalic region migrate in a ventral direction through the mesoderm of the mandibular arch with the help of multiple cell matrix interactions, contact repulsion and chemorepulsion to give rise to the mandibular nerve and its branches [12,13]. Various inhibitors from caudal somites are thought to inhibit the neural crest cell migration and may lead to variations in these nerves. Thus, separate developmental pathways for a mixed nerve may lead to formation of different roots of the inferior alveolar nerve [14,15].

Author Contributions

Soniya Arunkumar Gupta & Tanya Agarwal: Both the authors equally involved in the study right from conception of the study plan to the final draft of the manuscript.

Conflicts of Interests: None

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