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Inferior Alveolar Nerve with Multiple Roots

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ABSTRACT

Three roots of Inferior alveolar nerve (IAN) is a rare finding in the infratemporal fossa. The nerve had three roots, one from lingual nerve and two from the auriculotemporal nerve which encircled the Middle meningeal artery. This close relation of the artery to the nerve and vice versa may lead to the compression of either of the two structures involved here. Thus, this type of variation is noteworthy for the head and neck surgeons to perform surgeries in the infratemporal region.

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Introduction

Infratemporal fossa is a highly evolved and most complicated region of our body. It houses numerous important structures like the muscles of mastication, maxillary artery and its branches and the branches of mandibular nerve. Variations in the branching pattern or topographical relationships of the mandibular nerve often account for failure to obtain adequate local anesthesia for routine oral and dental procedures, and for the unexpected injury to branches of the nerve during operations¹. Variations in the mandibular nerve and its branches and the maxillary vessels may give rise to neurovascular compression causing numbness, regional pain and headache². In the present study, we report a rare unilateral finding of the origin of IAN and its relation to the maxillary artery.

Materials and Methods

During the routine dissection of the infratemporal fossa in 12 (24 infratemporal fossae) cadavers for the undergraduates, a rare variation was observed unilaterally in the anatomy of inferior alveolar nerve in a 60-year-old female cadaver. The masseter and the surrounding structures were removed to visualize the branches of the mandibular nerve.

Results

Variation in the IAN was observed in one left infratemporal fossa. The IAN presented three roots, one from the lingual nerve (1) and two from the auriculotemporal nerve (2,3). The 2 and 3 encircled the middle meningeal artery. All the three roots joined to form a single nerve trunk just before entering the mandibular foramen (Figure 1 and Figure 2). The nerve to mylohyoid emerged from this nerve trunk before it entered the mandibular foramen.

Discussion

Variations in the vessels and nerves of the infratemporal fossa have already been reported by the previous authors. In a study conducted by Roy *et al.* on 80 infratemporal fossae, one half showed the presence of two roots of IAN. He also reported that the second part of maxillary artery passed through the loop formed by the two roots of IAN³. A similar variation has been described by Babu *et al.*, Sharma *et al.* and Khan *et al.*⁴⁻⁶.

According to a case reported by Pai *et al.*, the IAN presented three roots, one each from the posterior division of mandibular nerve, lingual and auriculotemporal nerves. The maxillary artery passed in between the loop formed by the roots emerging from the posterior division of mandibular and auriculotemporal nerves⁷.

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^{8,9}. 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 IAN^{10,11}. Due to the variation in the formation of the IAN, the middle meningeal artery, instead of being encircled by the two roots of auriculotemporal nerve, is encircled by the two roots of the IAN.

It is one of the areas for a lateral surgical approach to the base of the skull¹². Therefore it is a prerequisite for the orthopaedician, neurosurgeon, otorhinolaryngologist, dentist, maxillofacial surgeon or radiologist to be aware of the normal anatomy of the contents of the infratemporal fossa and its common variations⁷.

These anatomical relations could explain certain trigeminal pain conditions and must be considered for dental, oncological, reconstructive surgery of the infratemporal fossa and for adequate anaesthesia³. The vascular compression of the afferent fibres of the inferior alveolar nerve by the pulsating maxillary artery and middle meningeal artery may cause pain and numbness without any neurological symptoms. Middle meningeal artery may be compressed by the roots of IAN encircling it, leading to reduced arterial supply to the middle cranial fossa.

Authors contribution

LSQ was involved in the conception and design of the study, literature search and wrote the article. PAR helped to perform the study and draft the manuscript. ASD helped in literature search and had given the final version to be published. All authors had gone through the final manuscript and approved it.

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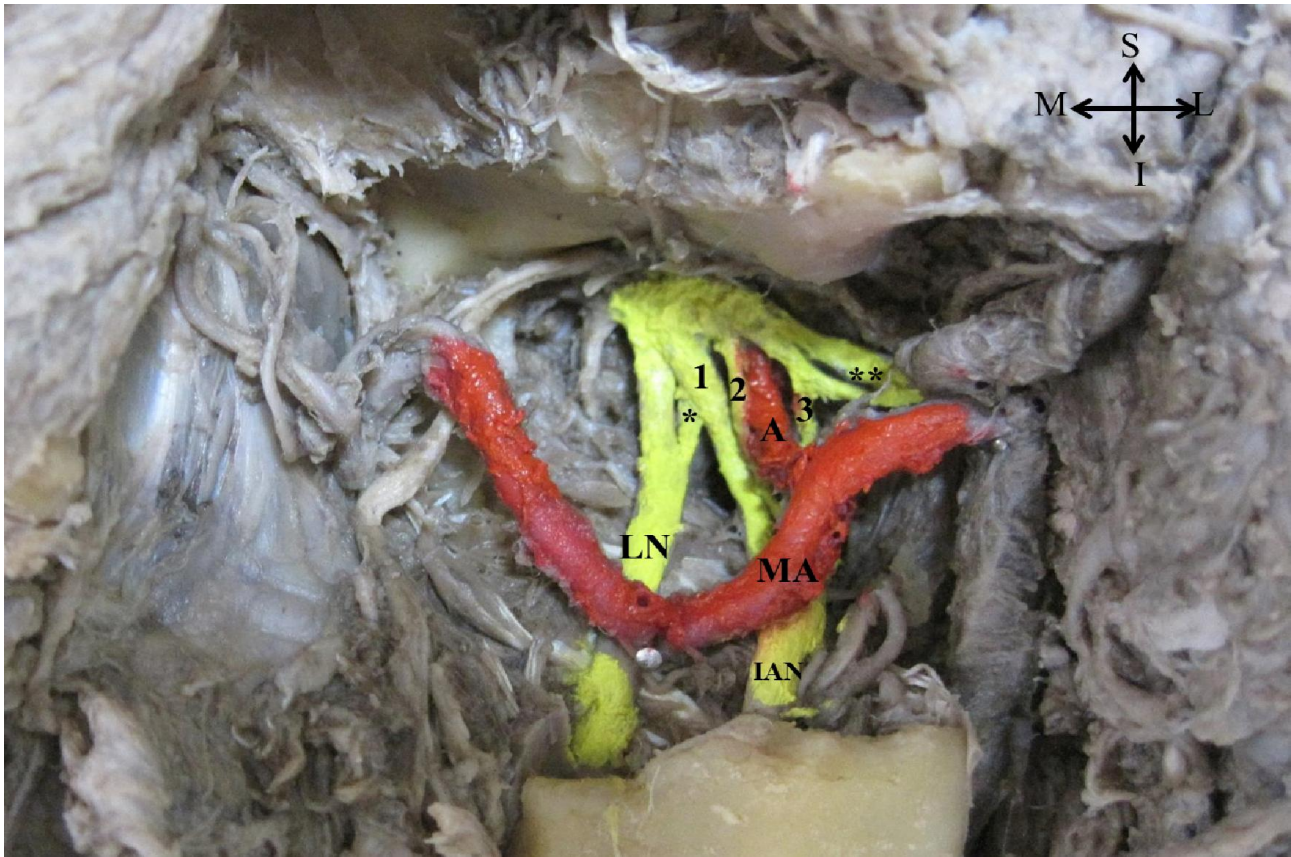


Figure 1. Left infratemporal fossa. IAN – Inferior alveolar nerve, LN – Lingual nerve, MA – 2nd part of Maxillary artery, A – Middle meningeal artery, 1 – root from lingual nerve, 2 & 3 – roots from Auriculotemporal nerve, * - Chorda tympani nerve, ** - Auriculotemporal nerve



Figure 2. Left infratemporal fossa with maxillary artery turned upwards. IAN – Inferior alveolar nerve, LN – Lingual nerve, MA – 2nd part of Maxillary artery, A – Middle meningeal artery, 1 – root from lingual nerve, 2 & 3 – roots from Auriculotemporal nerve, * - Chorda tympani nerve, ** - Auriculotemporal nerve