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Case Report

An undocumented variation involving auriculotemporal nerve, inferior alveolar nerve and middle meningeal artery

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ABSTRACT

Auriculotemporal nerve typically has two roots, encircling the middle meningeal artery, one anterior to it and another posterior to it as well as maxillary artery. The middle meningeal artery is largest of the meningeal arteries, ascends between the sphenomandibular ligament and lateral pterygoid muscle and traverses between the roots of the auriculotemporal nerve before entering the cranial cavity through the foramen spinosum. The knowledge of the neurovascular relationships of the infratemporal region is significant in surgical practice. We present a case of unusual communication between the auriculotemporal nerve and inferior alveolar nerve together with an extraordinary change in relations with the middle meningeal artery. Some clinical implications that these relations may have on the development of the supplementary innervations and the surgical interventions in this region are discussed in this article.

Keywords: Auriculotemporal nerve, Inferior alveolar nerve, Middle meningeal artery, Variation, Decompression

INTRODUCTION

Auriculotemporal nerve

Auriculotemporal nerve is one of the terminal branch of posterior trunk of mandibular nerve, other two being lingual and inferior alveolar nerves. Auriculotemporal nerve typically has two roots, encircling the middle meningeal artery, one anterior to it and another posterior to it as well as maxillary artery. It traverses back deep to the lateral pterygoid muscle on the surface of the tensor veli palatini to pass between the sphenomandibular ligament and the neck of the mandible and then laterally posterior to temporomandibular joint in relation with the upper part of the parotid gland. Emerging from behind the joint, it ascends posterior to the superficial temporal vessels, over the posterior root of the zygoma, and divides into superficial temporal branches. The branches of the auriculotemporal nerve are: the anterior auricular, branches to the external acoustic meatus, articular, parotid and superficial temporal (Williams et al. 1995).[1]

Middle meningeal artery

The middle meningeal artery, largest of the meningeal arteries, is the branch of maxillary artery. It ascends between the sphenomandibular ligament and lateral pterygoid muscle, passes between the roots of the auriculotemporal nerve and may lie lateral to the tensor veli palatini before entering the cranial cavity through the foramen spinosum. It then runs in an anterolateral groove on the squamous part of the temporal bone, dividing into frontal and parietal branches (Williams et al. 1995).[1]

The knowledge of the neurovascular relationships of the infratemporal region is significant in surgical practice. We present a case of unusual communication between the auriculotemporal nerve and inferior alveolar nerve

coupled with an extraordinary change in relations with the middle meningeal artery, and discuss some clinical implications that these relations have on the development of the supplementary innervations and the surgical interventions in this region.

CASE REPORT

The study involved routine dissection of a 64 year male cadaver, Indian nationality perfused with formalin based fixative (10% formalin) for teaching purposes for undergraduate medical students. Bilateral infratemporal regions were dissected. The tendon of the temporalis muscle was detached, insertion of the masseter muscle was resected and the coronoid process of the mandible was cut to expose the infratemporal region and after that lateral pterygoid muscle was removed. After these procedures the mandibular nerve and its branches were clearly visible.

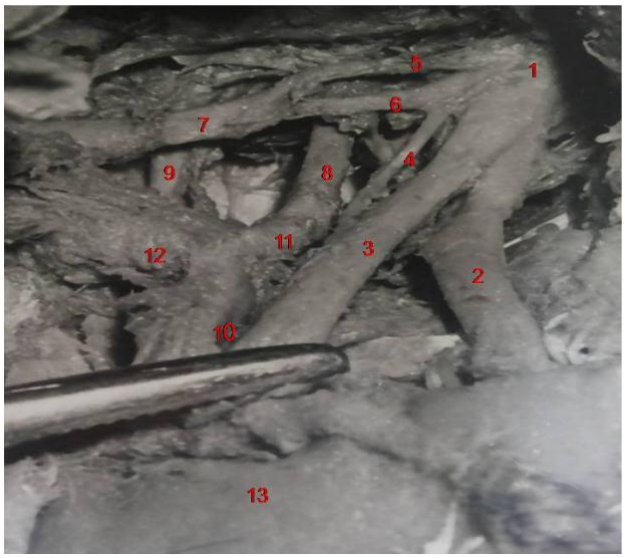

Figure 1: Dissection of right infratemporal fossa showing two roots of auriculotemporal nerve traversing anterior to middle meningeal atery and communication of inferior root of auriculotemporal nerve with inferior alveolar nerve. 1. Mandibular nerve, 2. Lingual nerve, 3. Inferior alveolar nerve, 4. Communicating branch from inferior root of auriculotemporal nerve to inferior alveolar nerve, 5.Superior root of auriculotemporal nerve, 6. Inferior root of auriculotemporal nerve, 7. Auriculotemporal nerve, 8. Middle meningeal artery, 9. Superficial temporal artery, 10. External carotid artery, 11. Maxillary artery, 12. Lateral pterygoid muscle, 13. Ramus of mandible.

The study discovered striking neurovascular anomalies in the right infratemporal region. It was observed that two roots of auriculotemporal nerve were crossing anterior to middle meningeal artery; one superior and other inferior in the right infratemporal region. Usually, the two roots of auriculotemporal nerve encircle the middle meningeal artery. Also, an aberrant nerve trunk 3 cm long arising from the inferior division of auriculotemporal nerve was found to be joining the inferior alveolar nerve (Figure 1). Coexistence of these anomalies namely both roots of auriculotemporal nerve passing anterior to middle meningeal artery and together with a connection between the inferior division of auriculotemporal nerve with inferior alveolar nerve are rare in literature. There are few articles suggesting communication between auriculotemporal nerve and inferior alveolar nerve. However our study is different from the classical description and previous studies. This finding of communication of inferior root of auriculotemporal nerve with inferior alveolar nerve and both roots of auriculotemporal nerve passing anterior to middle meningeal artery are not reported in literature. In this study we report this undocumented variation and its clinical implications. On the left side no unusual variation was observed.

DISCUSSION

Few studies in the past have reported variations in the formation of auriculotemporal nerve or its communication with inferior alveolar nerve. Communications between the inferior alveolar nerve and the auriculotemporal nerve have been reported by Gülekon et al. (2005).[2] Contradictory to our finding on right side only Anil et al. (2003)[3] described a communication between the inferior alveolar nerve and the auriculotemporal nerve bilaterally. In a study by Roy et al. (2002)[4] it was observed that the origin of inferior alveolar nerve was by two roots and the second portion of the maxillary artery passed through the two roots of the inferior alveolar nerve. Similar variation was also observed by Kim et al. (2004)[5] who described a communication between the inferior alveolar nerve and the nerve for the lateral pterygoid muscle.

Anatomical relationships between the auriculotemporal nerve and the neighboring vessels, muscles of mastication and temporomandibular joint in the area of the infratemporal fossa create favourable conditions for entrapment syndromes. It has been suggested by Komarnitki et al. (2012)[6] that entrapment of the auriculotemporal nerve plays a role in the pathogenesis of temporo-mandibular joint pain syndromes, headaches, as well as pain symptoms or paraesthesias within the external acoustic meatus and auricle.

If there is communication between auriculotemporal nerve and inferior alveolar nerve, postganglionic secretomotor fibres of otic ganglion which reach the auriculotemporal nerve can also reach inferior alveolar nerve. So, if there is stimulation of auriculotemporal nerve it can lead to sweating of skin of lower lip and chin through the connections with post ganglionic fibres of otic ganglion. Also, if there is lesion of inferior alveolar nerve due to injury/pathology above the site of communication with auriculotemporal nerve, it is

providing an alternate pathway for the area of supply of inferior alveolar nerve.

In some reports[7] surgical decompression of precise peripheral nerves in the head and neck for the relief of migraine headache symptoms has proven to be effective in most patients. Some patients, however, continued to have residual symptoms even after these measures. In an effort to better recognize possible etiologies for failure of treatment, an investigation was performed to conclude whether or not vascular-mediated peripheral trigger points exist that have not been described that may be contributing to persistent symptoms. In our study we have found an unusual relationship between auriculotemporal nerve, inferior alveolar nerve. and midldle meningeal artery and thereby we suggest that one such probable trigger point for persistent symptoms may be the interaction of middle meningeal artery with the auriculotemporal nerve. The variations such as found in our study may serve as an anatomical explanation for this point as a source of migraine headaches in some patients. A topographical map of the relationship between these two structures may serve as a guide for surgeons interested in decompressing the nerve from the artery when indicated. A cadaveric investigation on a larger scale should be performed to advance this anatomical understanding of this relationship.

It has been suggested that[8] complications resulting from intravascular puncture of the maxillary artery due to the administration of local anesthetic can cause a hematoma in this region (the roof of the infratemporal fossa), which can exert a soft pressure on other anatomical structures around the artery in this space, like auriculotemporal nerve, inferior alveolar nerve and lingual nerve generating sensory alterations, which must be considered in the differential diagnosis of facial pain, hyperalgesia, allodynia, and so on.

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