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A RARE VARIATION OF AURICULOTEMPORAL NERVE IN RELATION WITH MAXILLARY ARTERY- A CADAVERIC STUDY

Anatomy

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ABSTRACT

Auriculotemporal nerve is a branch of posterior division of the mandibular nerve. It carries sensory, secretomotor and sympathetic fibres. Clinical knowledge about this nerve, its course and relationship with adjacent vessels are important for performing neurosurgery and facio- maxillary surgeries. Aim of the present study was to observe the origin of this nerve, its relation to adjacent vessels and its communication to other branches of mandibular nerve. We studied 35 cadavers of both male and female of South Indian populations which were used for routine dissection for teaching 1st year MBBS medical graduates. During the study, we found a rare variation of auriculotemporal nerve, having 3 roots, encircling the maxillary artery instead of the middle meningeal artery. Knowledge of such rare variation will definitely help the surgeons to plan their surgery and prevent injuries to both nerve and the vessel.

KEYWORDS

Auriculotemporal Nerve (ATN), Mandibular Nerve, Maxillary Artery, Middle Meningeal Artery, Inferior Alveolar Nerve (IAN).

INTRODUCTION

The Auriculotemporal nerve is a branch of posterior division of the mandibular nerve. It is formed by 2 roots that encircle the middle meningeal artery. The nerve passes between the sphenomandibular ligament and the neck of the mandible. It then passes behind the neck of the mandible and then ascends over the posterior root of the zygoma. It runs posterior to superficial temporal vessels and divides into superficial temporal branches, supplying the skin of auricle, external auditory meatus and hair bearing temple region. It also carries post-ganglionic parasympathetic fibres to the parotid gland and post-ganglionic sympathetic fibres to the sweat glands and subcutaneous blood vessels of the skin [1]. Variations in the branching pattern and communication among other branches of mandibular nerve have been documented earlier [2]. A new classification of the auriculotemporal nerve has been made based on the roots and its relation with middle meningeal artery [3]. In the present study we found that the auriculotemporal nerve arises by three roots and it loops around the maxillary artery instead of the middle meningeal artery. Such rare variation might complicate maxillary surgeries and nerve blocks. Hence a wide knowledge about such variations is necessary for clinical practice.

MATERIALS AND METHODS

A total number of 35 cadavers (18 male and 17 female), used for routine dissection for teaching purpose of 1st year MBBS medical graduates, were used for the study. The infra temporal region was dissected on both sides in each cadaver. The dissection was done as per the conventional method using Cunningham manual of practical anatomy. The coronoid process was transected and the temporalis muscle was reflected superiorly. The lateral pterygoid was dissected after noting down the relationship with the maxillary artery. The mandibular nerve and its branches were dissected and their origin, course and branches were noted.

OBSERVATION AND RESULTS

In the present study, the origin, course and relationship with adjacent structures and branches of auriculotemporal nerve were noted. Out of 35 cadavers, in one male cadaver, on the right side we noted an abnormal and an unusual course of auriculotemporal nerve. The nerve arose from three roots, two from mandibular nerve and one from inferior alveolar nerve. The first root passed anterior to middle meningeal artery and above the first part of maxillary artery. The second root formed a loop beneath the maxillary artery and further joined the first root above and laterally. The third root emerged from the inferior alveolar nerve and communicated with the second root inferior to the maxillary artery [fig: 1].We noted the normal course of auriculotemporal nerve arising by 2 roots and encircling the middle meningeal artery on the left side of the cadaver and also in rest of the cadavers.

DISCUSSION

Various studies in the past have reported the variations in the formation of auriculotemporal nerve and its communication with the inferior alveolar nerve. Gulekon et al, in their study have reported 4 roots of auriculotemporal nerve and also a communicating branch between auriculotemporal nerve and inferior alveolar nerve [2]. Baumel JJ et al, have described the auriculotemporal nerve did not form a tight button hole loop around the middle meningeal artery, but the roots were widely separated by an elongated 'V' shaped interval [4].

Komarnitki et al, gave a new classification for auriculotemporal nerve based on the number of roots, way of root division and configuration of interradicular fibers .In their study, 50% of them arose from mandibular nerve and rest of them arose from both mandibular and inferior alveolar nerve. They suggested changing the nomenclature from “connecting branch” to “roots”. They have described auriculotemporal nerve can arise from 5 roots from mandibular nerve and inferior alveolar nerve. In their study, they found auriculotemporal nerve arising from 3 roots were more common [3]. In the present study we found that auriculotemporal nerve arises from 2 roots in all the specimens and from 3 roots in one single cadaver.

Similarly Balaji et al, also have described a communication between auriculotemporal nerve and inferior alveolar nerve [5].

Few studies have noted the variations in the course of auriculotemporal nerve in relation with adjacent vessels. Sampath Madhyastha et al, have described the maxillary artery passing through the loop of auriculotemporal nerve instead of the middle meningeal artery, also found that the maxillary artery further passed deep to the inferior alveolar nerve but superficial to the lingual nerve [6]. In the present study, we found that the auriculotemporal nerve formed a loop around maxillary artery instead of middle meningeal artery which coincides with the above study. We also noted the artery further coursed deep to all the branches of mandibular nerve which is a rare finding.

Sunitha Kalra et al, described 3 roots of auriculotemporal nerve, 2 arising from the mandibular nerve and one from the inferior alveolar nerve and they passed anterior to the middle meningeal artery [7].

Shakuntala Nallagatla et al, have described a communicating root of auriculotemporal nerve with inferior alveolar nerve, forming a loop around the accessory middle meningeal artery [8].

Mangala M. Pai, et, al has described the development of mandibular nerve and its branches. The neural crests that migrate ventrally are influenced by multiple cell matrix interactions [9]. Factors that inhibit neural crest cells migration might cause variation in the neural pathway. The head neural crest also contributes to the tunica media of the aortic arch arteries. In the present study the auriculotemporal nerve looped around maxillary artery and the artery further passed medial to all the branches of mandibular nerve may be due to the factors that inhibit the neural crest migration.

The knowledge of neurovascular relationships of the infratemporal region is essential for maxillofacial surgeries. The auriculotemporal nerve is very well implicated in Frey's syndrome or auriculotemporal syndrome. It occurs following a parotid gland surgery or any facial trauma where the post- ganglionic parasympathetic fibres innervate the denervated sweat glands and cutaneous blood vessels of the skin. T.J.Storrs have described an unusual case of gustatory vasodilation following a closed mandibular fracture and concluded the peripheral nerve block had relived the symptoms [10]. Some studies have shown the relationship of auriculotemporal nerve with the superficial temporal artery and their decompression leads to relieving the migraine headaches [11,12]. In the present study, auriculotemporal nerve is closely related to maxillary artery and decompressing the nerve from the artery may help to relieve the symptoms of headache when necessary. It has also been suggested earlier that intravascular puncture of maxillary artery during administration of local anesthetic can cause a hematoma in the roof of infratemporal region. This can exert a pressure on adjacent nerves and create sensory disturbances on their distribution [13].

CONCLUSION

The variations in the formation of the auriculotemporal nerve and its communications have been widely studied earlier. It has important clinical implication in treating referred pain in the mandibular region. Only few studies are there about the relationship with the auriculotemporal nerve and the adjacent vascular structures. This present study has revealed the unusual relationship of auriculotemporal nerve with maxillary artery. The knowledge about this variation will definitely help the neurosurgeons and facio- maxillary surgeons to avoid injury to the neurovascular structures while performing the surgeries.

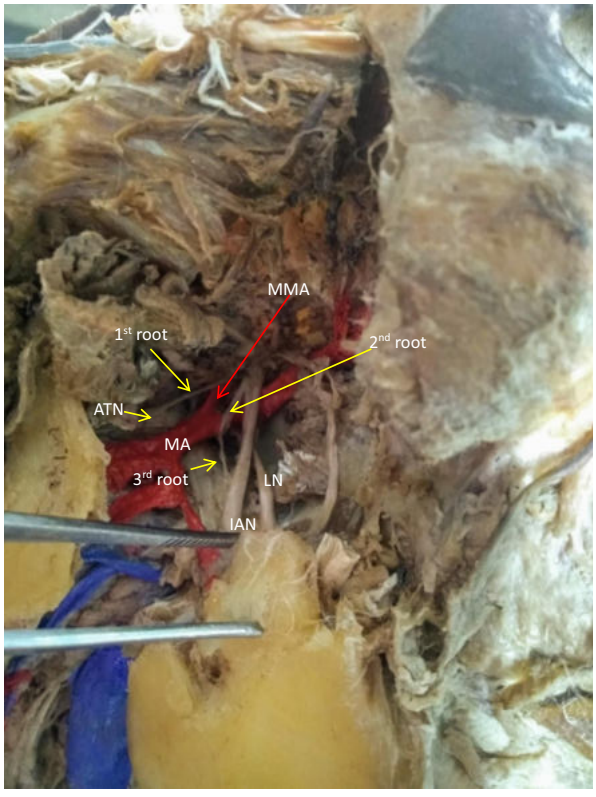

Figure 1: Showing 3 roots of Auriculotemporal nerve, forming a loop around maxillary artery. ATN- Auriculotemporal nerve, MA- Maxillary artery, IAN_ Inferior alveolar nerve, LN- Lingual nerve, MMA- Middle meningeal artery.

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