A STUDY OF VARIATIONS IN NERVES OF INFRA-TEMPORAL REGION AND IT'S EMBRYOLOGICAL EXPLANATION

Nikha Bhardwaj[1,*], Dushyant Agrawal[2], Vineeta Tewari[3], Brijendra Singh[4], M.S.Siddiqui[5]

[1,3,5]Department of Anatomy, Era's Lucknow Medical College,
[2,4]Department of Anatomy AIIMS Jodhpur,

***Corresponding Author-**
E-mail ID: nikhabhardwajdr@gmail.com

ABSTRACT

Introduction: *The knowledge of the neurovascular relationships of the infratemporal region is relevant in dentistry and surgery.*
Aims and objective: *To study the variations of nerves and maxillary artery in human cadavers through infratemporal dissection. The branches from the posterior division of the mandibular nerve studied and analyzed for abnormal course and branches.*
Material and method: *85 human cadavers were dissected and studied.*
Result: *A rare type of bilateral communication between the auriculotemporal and inferior alveolar nerve is reported in this study. This communicating nerve is neither related to maxillary artery which is superficial to lateral pterygoid muscle in this case, nor it is related to origin of mylohoid nerve (these type of variations are described in most of the previous studies).Other variations are deep course of maxillary artery, variations in origin of nerve to mylohyoid etc.*

Key words: *dental surgery, inferior alveolar nerve, infratemporal fossa, lingual nerve, maxillary artery.*

INTRODUCTION

Inferior alveolar nerve block is the technique most frequently used for local anesthesia when performing restorative and surgical procedures in the mandible, however, the approximate failure rate of these procedures ranges from 5 to 15% or 15 to 20% according to Kaufman(1984), reaching even higher percentages in pulpal anesthesia[1,2,3,4,5].

The anesthetic techniques for mandibular structures present a lower success rate compared to those for maxillary structures, because of the greater density of the mandibular alveolar bone, limited access to the inferior alveolar nerve, marked anatomical variations, in addition to the need for deeper needle penetration into the soft tissue[6]. The inferior alveolar nerve, auriculotemporal nerve, lingual nerve and maxillary artery were studied in 85 human cadavers through infratemporal dissection; along with other variations an unusual variation of the inferior alveolar nerve was observed. The inferior alveolar nerve originated from the mandibular nerve by single root but a communication was present b/w auriculotemporal nerve and inferior alveolar nerve. An embryologic origin of this variation and its clinical implications is discussed.

MATERIAL AND METHODS

The inferior alveolar nerve and maxillary artery were studied in 85 human cadavers through infratemporal dissection. Maxillary artery and branches from the posterior division of the mandibular nerve--namely the lingual, inferior alveolar and auriculotemporal nerves were carefully dissected, and their branches were studied and analyzed for abnormal course.

RESULTS

In most of the cadavers maxillary artery run superficial to lateral pterygoid muscle(63 cadavers). Middle meningeal artery is looped by auriculotemporal nerve in 84 cadavers, in one case it is superficial and not looped by auriculotemporal nerve bilaterally. A rare communication between branches of the posterior division of the mandibular nerve was observed in this cadaver. The inferior alveolar nerve originated from the mandibular nerve by single root but a communication was present b/w auriculotemporal nerve and inferior alveolar nerve approximately 19

m.m. below origin of inferior alveolar nerve on rt side and approximately 14 mm below the origin of inferior alveolar nerve on left side .That rare type of communication between the auriculotemporal and inferior alveolar nerve is described in this study. This communicating nerve is neither related to maxillary artery which is superficial to lateral pterygoid muscle in this case, nor it is related to origin of mylohoid nerve (these two types are reported in various studies). Lingual nerve follow its normal course in all cases. There are slight variations of distances of fusion of chorda tympani nerve to lingual nerve which is not significant. Auriculotemporal nerve loop around neck of mandible in all cases. Inferior alveolar nerve gives its nerve to mylohyoid branch before entering into mandibular canal in 81 cases in 4 cadavers nerve to mylohyoid arise just after entering into mandibular canal. In all cases inferior alveolar nerve is accompanied by inferior alveolar artery. Post division of mandibular nerve divides into three branches in all cadavers.

DISCUSSION

Anatomical variations like this rare variation can be explained by the process of development of first arch structures. Embryo logically, the mandibular nerve and its branches develop from the neural crest cells in the cephalic region, which migrate ventrally through the mesoderm of the mandibular arch with the help of multiple cell matrix interactions, contact repulsion and chemo repulsion. F-spondin and T-cadherin liberated from the caudal somites are thought to inhibit neural crest cell migration and may lead to variations in these nerves. As the inferior alveolar nerve is a mixed nerve, separate developmental pathways for the motor and sensory fibres may lead to the formation of different roots, which may reunite to form a single trunk. The maxillary artery is developed from a vascular network in the infratemporal region, contributed by the pterygoid mass of myoblasts. The stapedial artery feeds the network first, followed by the external carotid artery in later development. During this process the vascular network disappears except for some vessels that develop into the maxillary artery[7,8,9,10,11,12,13]. The persistance of first arch vessels for longer duration and its presence in b/w fibres of inferior alveolar nerve and auriculotemporal nerve can lead to formation of anomalous communication. There is also a possibility that postganglionic fibres from otic ganglion initially run along with the fibres of inferior alveolar nerve and then they form a communicating branch and finally come to unite with auriculotemporal nerve. In cadaveric studies like this we can't verify this possibility.

The inferior alveolar nerve (IAN) is a mixed nerve that provides sensory innervation to the lower teeth, lower lip and buccal mucosa located between the premolars and lower central incisor through the mental nerve. The motor innervation of the inferior alveolar nerve is addressed to the mylohyoid muscle and anterior belly of the digastric muscle through the mylohyoid nerve.

Numerous variations of posterior trunk of mandibular nerve especially communications of lingual and inferior alveolar nerve, loops of inferior alveolar nerve giving passage to maxillary artery or nerve to mylohyoid were reported [14,15] but in this case anomalous loop of inferior alveolar nerve is not related to maxillary artery or nerve to mylohyoid and its presence can only be explained by embryological relation of mandibular nerve and first arch artery. These anatomical variations can cause dilemma during nerve block or surgeries of this region and need further studies.

Fig 1: Superficial course of Maxillary Artery and lingual nerve

Fig 2: Branches of Posterior Division of Mandibular nerve and anomalous communication between Auriculotemporal & Inferior Alveolar Nerve.

CONCLUSION

Now it is clear that knowledge of the anatomical variations of nerves and its relation to infratemporal structures is very important. A sound knowledge of possible anatomical variations can lead to more chances of successful surgeries .Further detailed studies are needed in future to explore other possible variations and possibilities of associated anomalies with these variations because mostly these variations have developmental explanation of anomalous origin or course.

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