

Morphology of MAXILLARY ARTERY in the Infratemporal region

Mrinmayee Deb Barma¹, Harshvardhan Ahlawat²

¹Society of Clinical Anatomists (SOCA), MBBS, MD Anatomy, Assistant Professor, Department of Anatomy, Sri Lakshmi Narayana Institute of Medical Sciences (SLIMS), Pondicherry

²Asian Medical Students' Association (AMSA), Final year MBBS Student, Jawaharlal Institute of Post Graduate Medical Education and Research (JIPMER), Pondicherry

Abstract: Maxillary artery is one of the terminal branches of the external carotid artery. It is also known as the internal maxillary artery. The maxillary artery is divided into three parts as mandibular, pterygoid and pterygopalatine parts by the key muscle, lateral pterygoid muscle of this region. As the maxillary artery is closely related to condyle of mandible, the pterygoid muscles, Otic ganglion, pterygoid venous plexus, inferior alveolar nerve, lingual nerve and other important structures in this region, it is a crucial structure to understand the normal anatomy and so the variations related to it.

Key Words: maxillary artery, internal maxillary artery, speno-mandibular ligament, inferior alveolar nerve

INTRODUCTION

Maxillary artery is one of the terminal branches of the external carotid artery. It is also known as the internal maxillary artery. The external carotid artery after giving the branches into the anterior triangle enters the substance of parotid gland, within the substance it divides into the maxillary artery and superficial temporal artery. The maxillary artery is divided into three parts as mandibular, pterygoid and pterygopalatine parts by the key muscle, lateral pterygoid muscle of this region. The mandibular part is the first part, it runs forward between the neck of the mandible and speno-mandibular ligament. When it reaches the lateral pterygoid muscle, then it shows the variability in course, either it may run superficial or deep to muscle which is the second part of the artery known as pterygoid part. Then it enters the pterygopalatine fossa as the 3rd part which is named as pterygopalatine part. The branches from the 1st and 2nd part can be seen in the infratemporal region. As the maxillary artery is closely related to condyle of mandible, the pterygoid muscles, Otic ganglion, pterygoid venous plexus, inferior alveolar nerve, lingual nerve and other important structures

in this region, it is a crucial structure to understand the normal anatomy and so the variations related to it. In subcondylar fracture of the mandible, the internal fixation is performed, another commonly performed orthopedic surgery is temporomandibular joint arthroplasty. Ligation of maxillary artery to reduce the intraoperative profuse bleeding during surgical procedures like Le Fort I, II, III is a common technique. Procedure like mandibular osteotomy, radical maxillectomy requires accurate knowledge of the region. Knowledge of this region carries immense importance to maxillofacial surgeons and dental surgeons. The inferior alveolar nerve block is a common practice to a dental surgeon.

FINDINGS

During the routine dissection, we have noted the variant morphology of the maxillary artery on the right side. We first removed the parotid gland following Patey's faciovenous plane to visualize the content in the substance of the gland. The facial nerve here divided into the temporofacial trunk and cervicofacial trunk. The temporofacial trunk gave off the temporal and zygomatic branch whereas the cervicofacial trunk gave off the buccal, marginal mandibular and cervical branch. Then we found the formation of the retromandibular vein by the maxillary and superficial temporal veins. In the deepest plane we found the external carotid artery ascending upward. We removed the masseter muscle, at this level we found a thread like, very thin masseteric nerve and artery emerging out through the mandibular notch. Then we removed the head of the mandible, at this stage we found the auriculotemporal nerve behind the neck of the mandible. Then we reflected the temporalis muscle along with the coronoid process. We found the deep temporal artery and nerve from the deep surface of the muscle. Another one small branch taking origin

from the 2nd part of the maxillary artery ascending upward. The maxillary artery arose from the external carotid artery deep to the neck of the mandible. It has a tortuous and much deeper course in this cadaver, it gave off the deep auricular artery, anterior tympanic branch, the middle meningeal artery which ascends upward entered the foramen spinosum, then accessory meningeal artery ascending upward it entered the foramen ovale, here it is encircled by the auriculotemporal nerve. Here the mandibular nerve taking exit through the foramen ovale. The calibre of the accessory middle meningeal artery is much thicker than the middle meningeal artery. To confirm it, we traced the arteries entering the cranial cavity through the foramen ovale and foramen spinosum respectively. Then it gave off another branch that is the inferior alveolar artery descending downward. The artery runs along with inferior alveolar nerve encircled by a branch of the nerve as a common component as a neurovascular bundle. The artery after giving off the inferior alveolar artery is ascending upward lateral or superficial to the lateral pterygoid muscle that is the second part or pterygoid part. From here it gave off 2 branches to the temporalis muscles, then masseteric branch, to pterygoid muscle, buccal artery, before it entered the pterygopalatine fossa it gave off another branch to temporalis muscle, at the same level from the inferior surface it gave off infraorbital artery. There we found the infraorbital nerve also emerging out from the infraorbital foramen, descending downward. The infraorbital artery is the branch from the 3rd part of the artery.

PICTURES



FIGURE 1: showing the lateral pterygoid muscle and 2nd part of the artery

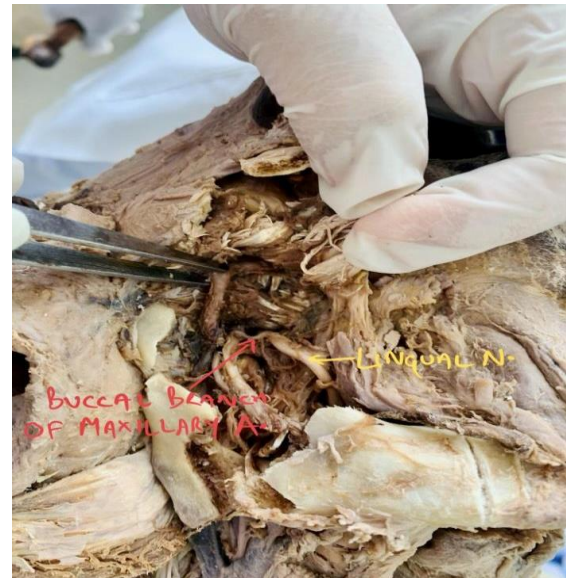


FIGURE 2: showing the lingual nerve, buccal branch from the 2nd part of the artery



FIGURE 3: showing nerve to Mylohyoid muscle

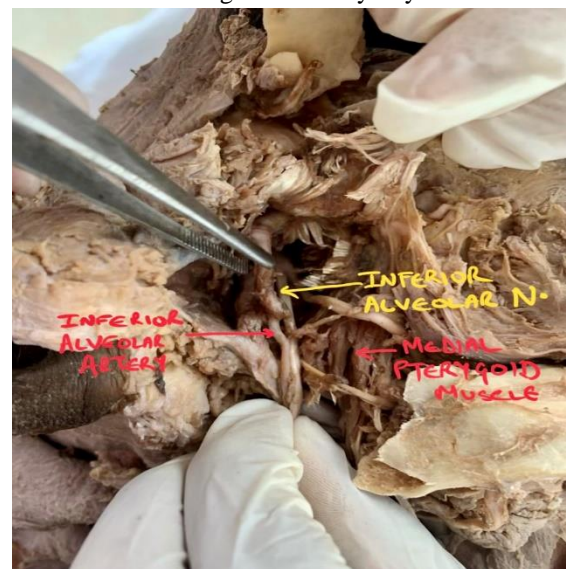


FIGURE 4: showing inferior alveolar artery, inferior alveolar nerve and medial pterygoid muscle



FIGURE 5: showing the Pterygoid branches

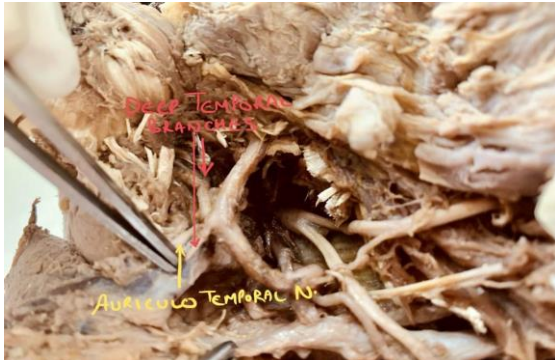


FIGURE 6: showing deep temporal branches, auriculotemporal nerve from mandibular nerve

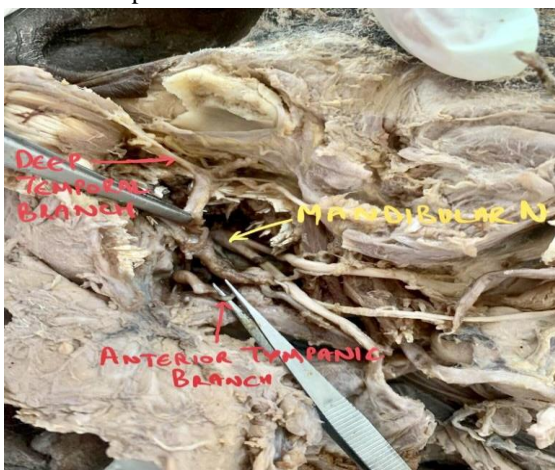


FIGURE 7: showing the anterior tympanic branch, trunk of mandibular nerve and deep temporal branches.

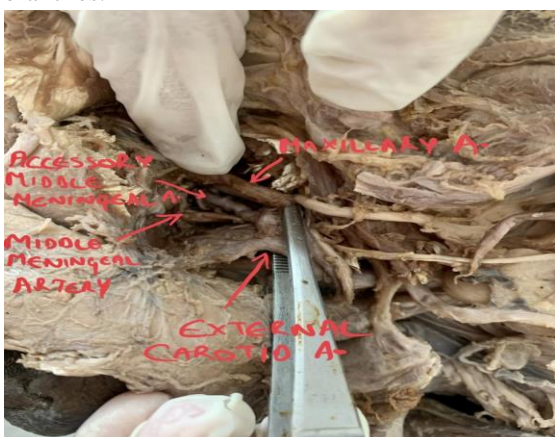


FIGURE 8: showing accessory middle meningeal artery, middle meningeal artery, deep part of the maxillary artery, external carotid artery

DISCUSSION

Maxillary artery is taking origin from the remnant of 1st aortic arch. Here we found the calibre of the accessory meningeal artery is much thicker than the middle meningeal artery. The course of the trunk of the artery was tortuous. To confirm the accessory meningeal artery, we traced the artery entering the foramen ovale and the middle meningeal artery entering the foramen spinosum. One more branch took origin from the 2nd part apart from the usual branches whereas commonly there are 2 deep temporal branches to the temporalis muscle.

The maxillary artery is present lateral to the lingual nerve but medial to the inferior alveolar nerve. Tadokoro O et al (2008)¹ reported a case of divided maxillary artery.

Kim JK et al (2010)² concluded huge anatomical variations in 1st and 2nd parts of artery. they reported 6 patterns of variations. Lasker et al reported variations of the artery related to the race as they found the artery travelled through medial aspect of the lateral pterygoid in 46% white individuals. Sashi et al reported 93% lateral to the lateral pterygoid muscle.

Uysal et al (2011)³ conducted a study on 14 sides of cadaver. Out of 14, they found the superficial course of the artery in 8 and deep course in 6 sides. They also reported the presence of middle meningeal artery in all cadavers but absence of accessory middle meningeal artery in 2 cadavers. They also reported the origin of middle meningeal artery and accessory middle meningeal artery as a common trunk.

Maeda S et al (2012)⁴ conducted a study to determine the branching patterns of the artery. they reported a case of bifurcated maxillary artery into superficial and deep trunk then they joined as a common trunk just reaching the lower border of the lateral pterygoid muscle.

Alvernia JE et al (2017)⁵ reported high variable branching pattern of the artery.

TM Warui et al (2017)⁶ in a study they found the artery within the substance of the parotid gland in 67% and in 33% medial to the gland. They also reported absence of accessory meningeal artery.

CONCLUSION

We conclude a rare type of variation of the branching pattern of the maxillary artery along with

the morphology of the important structures in the infratemporal region. In our cadaver the 1st part of the maxillary is tortuous and much deeper as compared to normal anatomy and the 2nd part of the artery is lateral in type. Such variation will be helpful for the future references.

CONFLICTS

No conflicts of the study have been reported by the authors.

ACKNOWLEDGEMENT

The authors are grateful to the noble souls who donated their bodies for the medical education purpose.

REFERENCE

- [1] Tadokoro O, Umemura Y, Utsuno H, Inoue K. A case of a divided maxillary artery in the infratemporal fossa. *Okajimas Folia Anatomica Japonica*. 2008;85(3):97-101.
- [2] Kim JK, Cho JH, Lee YJ, Kim CH, Bae JH, Lee JG, Yoon JH. Anatomical variability of the maxillary artery: findings from 100 Asian cadaveric dissections. *Archives of Otolaryngology-Head & Neck Surgery*. 2010 Aug 16;136(8):813-8.
- [3] Uysal II, Büyükmumcu M, Ünver Doğan N, Yılmaz MT, Şeker M, Ziylan T. Clinical significance of maxillary artery and its branches: a cadaver study and review of the literature.
- [4] Maeda S, Aizawa Y, Kumaki K, Kageyama I. Variations in the course of the maxillary artery in Japanese adults. *Anatomical science international*. 2012 Dec;87(4):187-94.
- [5] Alvernia JE, Hidalgo J, Sindou MP, Washington C, Luzardo G, Perkins E, Nader R, Mertens P. The maxillary artery and its variants: an anatomical study with neurosurgical applications. *Acta neurochirurgica*. 2017 Apr;159(4):655-64.
- [6] Warui TM. *Variations and Bony Landmarks of the Maxillary Artery: a Cadaveric Study* (Doctoral dissertation, University of Nairobi).