



COMPREHENSIVE ANATOMICAL STUDY OF VARIATIONS IN LINGUAL AND FACIAL ARTERIES IN ADULT CADAVERS FOR SURGICAL PRACTICE

Anatomy

**Ramitha Enakshi
Kumar. S***

Government Medical College, Omandurar Government Estate, Chennai-600002.
*Corresponding Author

Dr. P. Vahini

Government Medical College, Omandurar Government Estate, Chennai-600002.

ABSTRACT

Objective: The objective of this study is to comprehensively put forth the anatomical variations in the origin and course of lingual and facial arteries found in adult cadavers.

Methods: Ten human cadavers were dissected and studied for variations from the norm regarding facial and lingual arteries.

Results: 80% of the cadavers displayed classical origin and course of the arteries. There was a deviation from normal regarding origin of the arteries in 20% of the cadavers. Meanwhile, abnormality in the course amounted to 10%.

Conclusion: In 20% of cadavers, there were variations in origin of facial and lingual arteries, meanwhile, changes in the course of the stated arteries is 10%. These variations prove to be of significance to surgeons to prevent mishaps and hospital acquired infections, while performing carotid endarterectomy, intra-arterial catheterizations, plastic surgery of the face and resection of malignant tumours.

KEYWORDS

Lingual artery, Facial artery, Linguofacial trunk, hypoglossal nerve, carotid endarterectomy, jaw reduction surgery, Abbe flap, parotidectomy, intra-arterial catheterization, carotid angiography.

INTRODUCTION:

The external carotid artery is the chief artery that supplies the head and neck (1). From the anterior division of the external carotid artery, three arteries arise viz. the superior thyroid, lingual and facial arteries from below upwards. The hypoglossal nerve passes superficial to these.

The lingual artery after its origin, passes near the greater cornua of hyoid, wherein it forms the content of carotid triangle, by lying over the middle pharyngeal constrictor. It passes deep to hyoglossus and on the surface of the genioglossus. Accompanying it are the lingual venae comitantes and the hypoglossal nerve (1). The lingual artery chiefly supplies the tongue, the vestibule, the gingiva and the palatine tonsils by dividing into various branches before terminating as the deep lingual artery.

The facial artery arises from the anterior side of the external carotid artery. It lies deep the stylohyoid muscle and posterior belly of digastric. It takes its first loop around the neck of the mandible. Its second loop occurs along the angle of mandible near the antero-inferior border of masseter. It then passes obliquely in front of the face, along the nasolabial folds tortuously, to the medial canthus of eye and terminates by anastomosing with the internal ophthalmic artery of the internal carotid artery. It supplies the palatine tonsils, the lips, the lateral wall of nose, the platysma and the 2nd pharyngeal arch (1).

MATERIALS AND METHODS:

10 human cadavers were carefully dissected from the skin to the arterio-venous plane beneath the superficial fascia in the Anatomy Department of Government Medical College, Omandurar Government Estate, Chennai – 600002. The cadavers were formalin preserved. The bodies were obtained with intimated consent following Government protocol. The procedure for dissection was diligently followed as per the Volume 4 of the 16th edition of Cunningham's practical manual of Dissection (2).

RESULTS

8 out of the 10 (80%) of the cadavers were observed to have orthodox anatomical origin and course of the lingual and facial arteries with the respective relation to the nearby veins and nerves.

In this study performed, we appreciated 3 variations, 2 in the location of origin and 1 in the course of arteries. Therefore, about 20% of cadavers presented with aberrations in origin and 10% portrayed altered course of lingual and facial arteries.

In one cadaver, the lingual and facial arteries arise from a common point on the external carotid artery from the anterior side, contrary to the normal wherein the lingual artery arises a little below the facial artery. Both their courses are typical and they terminate in their respective locale. The hypoglossal nerve crosses the external carotid artery and its branches anteriorly (Figure 1). The posterior belly of

digastric overlies these structures. Thus, there is an aberration in the origin of arteries.

In the other cadaver, it was observed that the external carotid artery sprouted off a common linguo-facial trunk on its anterior surface, just opposite the drainage of the common facial vein into the internal jugular vein. From the linguofacial trunk, the facial artery moves superficial to the hypoglossal nerve instead of passing underneath it. Thus, the hypoglossal nerve is sandwiched in between the facial artery superficially and the lingual artery deep below it (Figure 2). Therefore, there are abnormalities in origin of both arteries and in course of facial artery.

The deduction is 20% variation in point of origin of lingual and facial arteries and 10% variation in course of facial artery.

DISCUSSION:

Aberrations in the carotid artery system are common in both surgical practice and in cadaveric research studies. A usual variation that has been observed is the common linguofacial trunk. Research by Kumar, (3) Troupis et al (4), Yildirim et al (5), Lappas et al (6), Sanjeev et al (7), Lakshmi Gayathri (8) and Zumre et al (9) which show persistence of linguofacial trunks at the frequency of 6%, 15%, 14%, 18.92%, 22% and 20% respectively, substantiate this claim (Figure 2).

Zumre has also found thyrolinguofacial trunk and thyrolingual trunk at 2.5% each in foetal cadavers (9). Kaneko et al studied a linguofacial trunk originating from the common carotid artery (10). Vishnu Gupta has reported a 3.3% thyrolinguofacial trunk and a 11.3% bilateral linguofacial trunk in the dissected cadavers in his report (11).

Differences at the level of branching of lingual and facial arteries (Figure 1) have also been deliberated in a few studies. Thwin et al has stated a linguofaciooccipital trunk at the level of origin of superior thyroid artery itself (12). Meanwhile Gluncic discovered a thyrolinguooccipital trunk in his research (13).

In a bizarre case, Mahendrakar (14) has also reported a unilateral agenesis of lingual artery. The study by Nayak (15) has found an intra parotid origin of the facial artery. Khanal et al has reported a rare occurrence of the facial artery originating on surface of the posterior belly of digastric and piercing the submandibular gland (16).

A prior knowledge of the origin and course of the carotid system with its surroundings must be confirmed by carotid angiography before surgery. In the present case, the variations were found about 2-4 cm below the angle of mandible (Figure 1) – where skin is incised for parotidectomy. If not careful, there are chances for iatrogenic complications viz. gross haemorrhage, shock and inflammation.

These studies are also useful for ligation and catheterisation of arteries

of the face in case of jaw displacement or jaw reduction surgeries.

Carotid artery branching patterns have to be taken into account in carotid endarterectomy to prevent atherosclerotic plaques and strokes (17). Aneurysms of lingual artery though rare, (18) is more likely to occur in abnormal course and branching patterns.

In the present study here, hypoglossal nerve can be entrapped between the two arteries (Figure 2) and cause ipsilateral lingual deviation.

Medial displacement of the linguofacial trunk may prevent proper tonsillectomy as said by Fred et al. (19). Facial reconstruction surgeries, most commonly cleft lip correction and nasal tip reduction use the Abbe flap procedure, requiring extensive knowledge of the blood supply.

Microsurgical reconstruction of face and neck after surgical removal of malignant tumours as explained by Toshinori et al as well as intra-arterial anticancer treatment for the same, requires knowledge of the carotid artery system (20).

CONCLUSION:

Overall, the nonconformity in the origin of lingual and facial arteries is 20% and the deviance in the course of the arteries is 10%. Thus, an overall anomaly of 20 % has been observed in the adult human cadavers in this study regarding the criteria of origin and course of facial and lingual arteries.

Their variations must be kept in mind while performing procedures like parotidectomy, jaw reduction surgery, surgical removal of cancers, intraarterial catheterization, carotid endarterectomy, and plastic surgery in the face like cleft lip correction.

Table & Figures

Table 1: Comparison of normal arterial origin and course vs. variations

ARTERY	NORMAL ANATOMY	VARIATION IN ORIGIN OF ARTERIES	VARIATION IN COURSE OF ARTERIES
FACIAL	80%	20%	10%
LINGUAL	80%	20%	nil

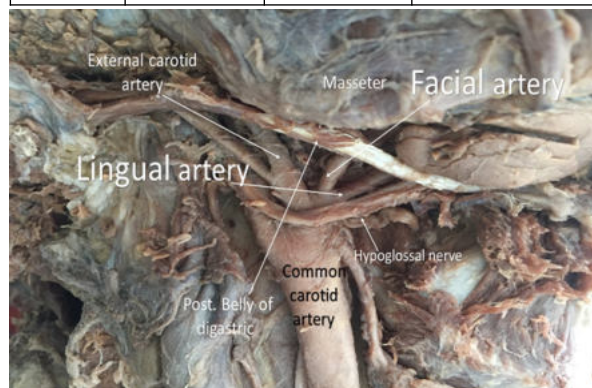


Figure 1: Facial and lingual artery arising from common point on external carotid artery

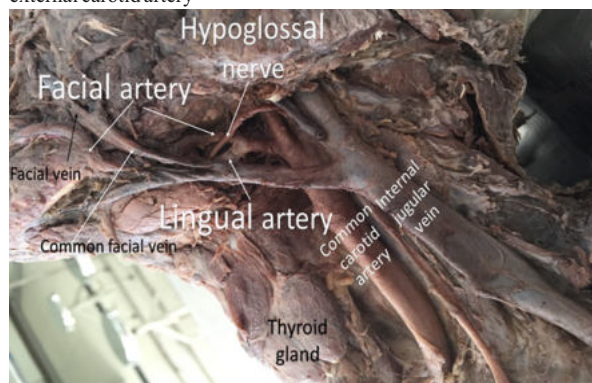


Figure 2: Facial and lingual arteries arising from common linguofacial trunk with hypoglossal nerve passing between it

Conflict Of Interest: nil

REFERENCES

- Peter L., Williams, Mary Dyson, editor. *Gray's Anatomy: 37th edition*, s.l.: Edinburgh, (Great Britain) Churchill Livingstone; 1989. p. 818.
- Koshi, Dr. Rachel. *Cunningham's Manual of Practical Anatomy, 16th edition, volume 2*. 2017.
- Abnormal Branching Pattern of Lingual and Facial Arteries – A case report*. Kumar, Dr. Binod. no. 6., s.l.: IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), 2019, Vols. vol. 18..
- Bilateral lingual-facial trunk: anatomic and clinical implications*. T. Troupis, A. et al. 4: 548–551, s.l.: Folia Morphol, 2015, Vol. 74.
- Truncus linguofacialis*. Yildirim, M., Tanyeli, E., Solyluoglu, A. I. & Tuna, Y. (1):33-4., s.l.: Morfoloji Der., 2001, Vol. 9.
- Anatomic study of the variations in the origin of the branches of the external carotid artery*. Lappas DA, et al. s.l.: Beta medical Arts, 2002, Vol. 81.
- Branching pattern of external carotid artery in humans*. Sanjeev IK, et al. 3128-3133, s.l.: Journal of Clinical and Diagnostic Research, 2010, Vol. 4.
- "Human cadaveric study on the branching pattern of external carotid artery."*. Gayathiri, Lakshmi. 2018.
- Investigation of the bifurcation level of the common carotid artery and variations of the branches of the external carotid artery in human fetuses*. Zume O, et al. 361-69., s.l.: Ann. Anat., 2005, Vol. 187.
- Unilateral anomalous common carotid artery - a case report*. Kaneko K, et al. 477-480, s.l.: Ann. Anat., 1996, Vol. 178.
- Anomalous Branching Pattern of the External Carotid Artery in Cadavers"*. Vishnu Gupta, Rakesh Agarwal. (1):28-31, s.l.: Int J Sci Stud., 2014, Vol. 2.
- Variations of the origin and branches of external carotid artery in a human cadaver*. al, Thwin S et. (2): e40, s.l.: Singapore Med J, 2010, Vol. 51.
- High bifurcation of common carotid artery, anomalous origin of ascending pharyngeal artery and anomalous branching pattern of external carotid artery*. al, Gluncic et. (2):123-125., s.l.: Surg. Radiol. Anat., 2011, Vol. 23.
- Variations in the branching pattern of external carotid artery - a case report*. Mahendrakar. 47-51., s.l.: J. Anat. Soc. India., 2007, Vol. 56.
- Abnormal intra-parotid origin of the facial artery*. S., Nayak. (10):1602., s.l.: Saudi Medical Journal, 2006, Vol. 27.
- Bilateral anatomical variation in branching pattern of external carotid artery in a male cadaver: A case report*. Khanal L, Koirala S, Shah S, Pandeya A. 0203., s.l.: Russian Open Medical Journal, 2014, Vol. 3.
- Surgical anatomy of the cervical carotid artery for carotid endarterectomy*. al, Nakamasa Hayashi et. (1):25-9., s.l.: Neurol Med Chir (Tokyo), 2005, Vol. Jan;45.
- Idiopathic Lingual Artery Aneurysm: CT Findings and Endovascular Therapy - A case report*. al, R.S. Brindle et. (1): 103–106., s.l.: Interv Neuroradiol., 2010, Vol. Mar;16.
- MB., Fred. Post-tonsillectomy lingual artery pseudoaneurysm*. www.triomeetingposters.org. [Online] 2012. [Cited: 07 21, 2013.] www.triomeetingposters.org/wpcontent/uploads/2012.
- Thyrolinguofacial trunk arising from the carotid bifurcation determined by three dimensional determined by three dimensional*. al., Toshinori I. et. (1): 75-78., s.l.: Surgical and radiologic anatomy, 2013., Vol. 35.