Section: Anatomy

Original Research Article

A CADAVERIC STUDY OF FACIAL ARTERY AND ITS CLINICAL SIGIFICANCE

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Received : 07/06/2026
Received in revised form : 22/07/2026
Accepted : 05/08/2026

Keywords:
Facial artery, Linguo facial trunk, High origin, Maxillofacial surgery.

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DOI: 10.47009/jamp.2026.8.4.261

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (4); 1552-1555

ABSTRACT

Background: The facial artery (FA) exhibits significant anatomical variability in its origin and course, which is crucial in head and neck surgeries. This study observed variations in the mode and level of origin and course of the FA. **Materials and Methods:** A cross-sectional cadaveric study was conducted on 60 specimens from 30 embalmed cadavers at Government Kilpauk Medical College, Chennai, involving a conventional dissection method to expose the FA. The mode, level of origin of the FA and its distance from the common carotid bifurcation, distance of the FA crossing the lower border of the mandible from the angle of the mandible were studied, and the morphometric measurements were recorded using digital Vernier callipers. **Results:** The FA most commonly originated as a separate trunk in 49 specimens (81.66%), followed by a common linguofacial trunk in 10 (16.67%) and thyrolinguofacial trunk in 1 (1.67%). A high origin was observed in four specimens (6.67%), more commonly in the digastric triangle (3 specimens) than in the intraparotid region (1 specimen). The average distance of the FA or the common linguofacial or the common thyrolinguofacial trunk from the carotid bifurcation was 1.71 cm, ranging from 0.3 cm to 3.7 cm. The average distance of the FA crossing the lower border of the mandible from the angle of the mandible was 2.89 cm, with a range from 2.3 cm to 3.8 cm. **Conclusion:** Significant variations exist in the origin and course of the FA, necessitating thorough anatomical knowledge to improve surgical safety and outcomes.

INTRODUCTION

The facial artery (FA) (external maxillary artery) is the main artery that supplies the superficial structures of the face and is commonly involved in maxillofacial, reconstructive, and cosmetic procedures.[1] The FA originates from the anterior aspect of the external carotid artery (ECA) in the carotid triangle, and its level of origin is just above the origin of the lingual artery (LA) and the greater cornu of the hyoid bone.[2]

From the carotid triangle, it ascends upwards and forwards, enters the digastric triangle, passing deep to the posterior belly of the digastric (DG) and stylohyoid muscles. In the digastric triangle, it forms a characteristic loop around the submandibular gland (SMG) before entering the face.[2] Variations in the anatomy of the FA may increase the risk of vascular injury during flap surgeries, salivary gland procedures, and dermal filler injections.[3-6] Hence, a detailed knowledge about the vascular anatomy of the FA is crucial for catheterising the vessel in super-selective intra-arterial chemotherapy combined with radiotherapy (SSIACRT) and also for preoperative tumour vessel embolisation in highly vascular head and neck tumours.[7-9]

MATERIALS AND METHODS

This cross-sectional study was conducted on 60 hemifaces from 30 embalmed human cadavers, which were preserved for academic and research purposes at the Department of Anatomy, Government Kilpauk Medical College, Chennai. Cadavers with visible tumours, deformities, or evidence of previous surgical procedures involving the head and neck region were excluded.

The materials used in the study included embalmed human cadavers, standard dissection instruments, and digital Vernier callipers for measurements. Dissection was done as per Cunningham's manual of practical anatomy to expose the FA for its origin and course in the neck, and variations were observed.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Statistical analysis: Data were summarised using descriptive statistics. Categorical variables were expressed as frequencies and percentages, and continuous variables were presented as means with minimum and maximum values.

RESULTS

In all specimens, the FA originated from the ECA.

Mode of Origin: A separate origin of the FA was observed in 49 specimens (81.66%). Origin as a common linguofacial (CLF) trunk in 10 specimens (16.67%) [Figure 1].

A common thyrolinguofacial (CTLF) trunk was identified in one specimen (1.67%). The CTLF trunk soon gave off the superior thyroid artery (STA), and the linguofacial trunk ran upwards and divided into the LA and FA [Figure 2].

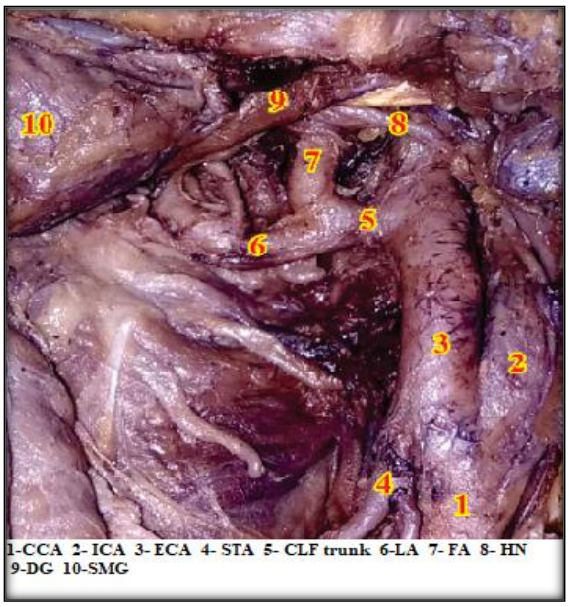

Figure 1: FA origin ECA as CLF TRUNK-Left side

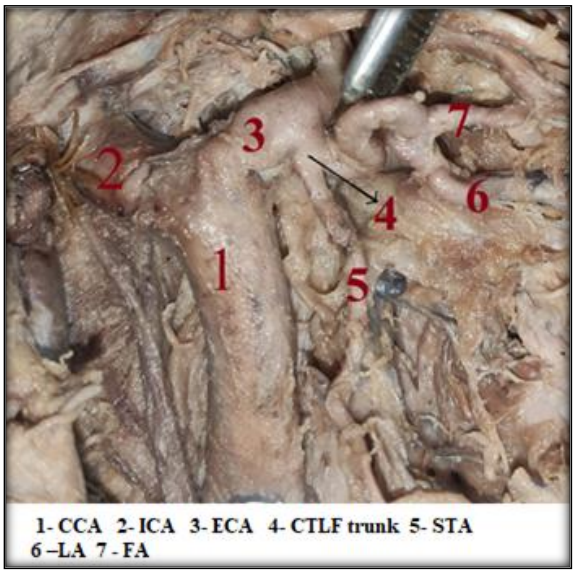

Figure 2: FA origin from ECA as CTLF trunk- Right side

Level of Origin: High origin of the FA was observed in four specimens (6.67%). Among the four, FA arose from the ECA within the digastric triangle in 3 specimens, of which 2 arose bilaterally in one cadaver and one presented as unilateral [Figure 3].

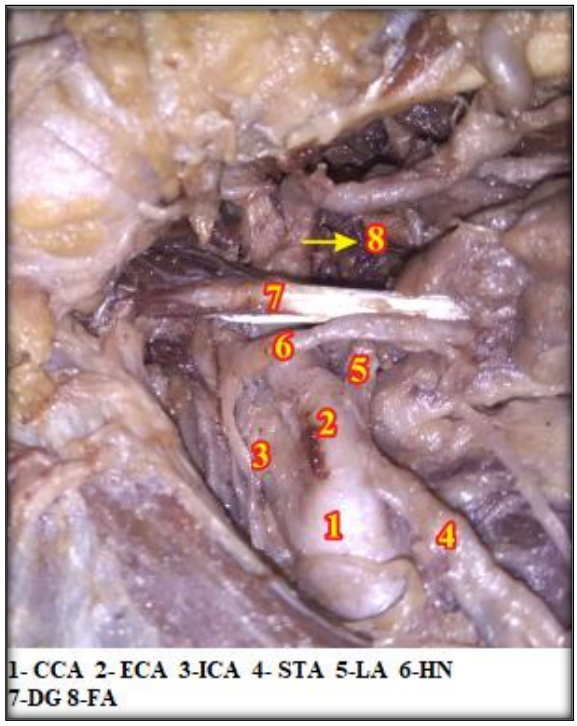

Figure 3: High origin of FA within the Digastric triangle- Right side

In one specimen on the left side, the intraparotid origin of the FA from the ECA was observed. It arose 1.1cm above the lower mandibular border within the parotid and descended downward to reach the lower border of the mandible and ran towards the submandibular salivary gland. It grooved the posterior surface of the gland, without forming the characteristic loop around the gland and entered the face after giving origin to the submental artery [Figure 4].

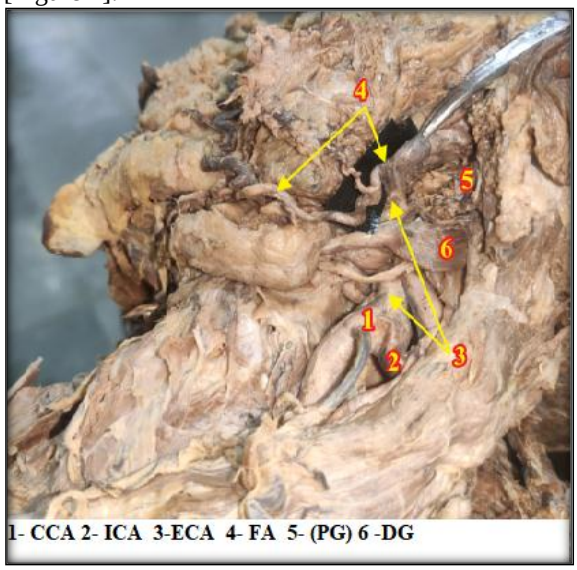

Figure 4: Intra-parotid origin of FA- Left side

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Morphometric Analysis: The mean distance of origin of the FA trunk, the CLF or the CTLF trunk from the common carotid bifurcation was 1.71 cm, with values ranging from 0.3 cm to 3.7 cm. The mean distance at which the FA crossed the lower border of the mandible(LBM) from the angle of the mandible (AM) was 2.89 cm, ranging from 2.3 to 3.8 cm.

DISCUSSION

The variations in the mode of origin of the FA are compared with other studies [Table 1].

Table 1: Comparison of Mode of Origin of FA with Previous Studies

S:No	Mode of origin	Niemann et al.[10]	Nguyen et al.[4]	Present study
1.	Separate origin	84.62%	95%	81.66%
2.	CLF trunk	12.82%	6%	16.67%
3.	CTLF trunk	-	1%	1.67%

The occurrence of a CTLF trunk in the present study and its pattern of branching off are comparable to the findings made by Baxla et al. and Juma and Ward in their case report.[11,12]

In the present study, a high origin of the FA was observed in 4 specimens (6.67%), 3 arose in the digastric triangle, and 1 was an intraparotid origin. The incidence of high origin is noted in the Niemann et al. study, but in a slightly lower percentage (2.56%).[10] This study did not find any intraparotid origins. High origin of the FA was also observed in Mangalgiri et al.'s study (2, 3.3%), in which the intraparotid origin of the FA has been reported.[13] Apart from the above studies, only very few cases have been reported in the literature about the high origin of the FA within the digastric triangle and within the parotid gland. In higher origin, the FA is more prone to injuries in parotid gland (PG) surgeries, and the artery may get severed in surgical procedures like radical neck dissection and mandibulectomy. The high origin of the FA may be misjudged as the absence of the FA, or it could be mistaken for the ECA and could be ligated instead of the ECA, in case of life-threatening haemorrhage in maxillofacial surgeries. Hence, these observations made in this study exemplified the need for sound knowledge of the possible variations, as these could cause complications in head and neck surgeries.

Elvan and Uzmansel reported a relatively consistent localisation of the FA at the inferior border of the mandible, without significant side or sex differences.[14] The morphometric measurements are compared with the previous study [Table 2]. These morphometric findings of the present study may serve as useful anatomical reference values for surgeons and radiologists for various invasive and non-invasive procedures in the neck.

Table 2: Comparison of distance FA crossing the LBM from AM with the previous study

Studies	Distance (cm)
Magden et al.[15]	2.66
Present study	2.89

CONCLUSION

The anatomical variations in the vascular anatomy of the facial artery are clinically relevant in procedures involving maxillofacial reconstruction, cosmetic procedures and vascular interventions. Awareness of these patterns may help to reduce the risk of vascular injury and improve surgical planning in the head and neck region.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556