

**A CADAVERIC STUDY OF UNCOMMON BRANCHING PATTERN AND TERMINATION OF FACIAL ARTERY AS DUPLEX WITH A DOMINANT LATERAL ANGULAR BRANCH: CASE REPORT**

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**ABSTRACT**

**Background:** The facial artery is the primary blood vessel that supplies anterior of the face. It branches from the anterior surface of external carotid artery its location and course are crucial for the secure handling of surgical as well as non-surgical interventions like facial reconstruction and aesthetic procedures. A thorough understanding of the arteries will assist in minimizing the risk of patient. **Material and Results:** A rare case of a facial artery pattern has been found with respect to its course and branching. This variation was found on the left side of the face of a 72-year-old male cadaver during regular anatomical dissection. The left anterior branch of the facial artery arched in the direction of the labial angle, and there divided into inferior labial artery (ILA) and another branch which is further bifurcated into superior labial artery (SLA) and nasal artery. Another angular branch arising individually below the oral commissure directly from the facial arterial trunk i.e. duplex with dominant lateral angular artery (AA). **Conclusions:** Due to varying vascularization, a precise understanding of distinct facial artery anatomy may play vital role in planning flaps or tumour excisions. It can also help to prevent artery damage during aesthetic operations like filler and botulinum toxin injections.

**KEYWORDS:** Aesthetic medicine, anatomical variation, branching, facial artery, face surgery, dominant angular artery.

**INTRODUCTION**

The facial artery (FA) is a collateral branch of the external carotid artery which generally emerges anteriorly, at the limit of the inferior border of the digastric muscle and caudal to the mandibular angle, ascending obliquely anteriorly, giving rise to the blood vessels responsible for supply blood to the face.<sup>[1]</sup> It is divided into several branches including the inferior and superior labial arteries, and the lateral nasal artery. If the artery continues its course beyond the branching of these 4 arteries, the latter part is referred to as the angular artery.<sup>[2]</sup> FA describes a course that can be delimited according to its course in arteries: buccal, labial, nasolabial fold, angular nasal, dorsal nasal, and glabellar connection. Previous studies have shown a racial variation in the origin of the branching pattern and distribution patterns.<sup>[3]</sup> However, each patient has individual variations, even in their lateralities, left and right.<sup>[4]</sup> Facial artery classification in types and their occurrence.

According to other research study it is observed that, In total 187 facial arteries in 94 patients without facial tumour or vascular diseases the anatomical variations of the facial artery were classified into four types and results were: Type 1- a short course that terminates proximal to the superior labial artery were 34.3%; Type-2, an intermediate course that terminates distal to the superior labial artery near the nasolabial fold were 39.6%; Type-3, a classic course that extends to the lateral nasal ala beyond the nasolabial fold with an angular branch were 24%; and Type- 4, duplex with dominant lateral angular branch were 2.1%.<sup>[5]</sup> [Fig 1]

We have found type 4 classification unilaterally on the left side of face, during dissection was a rare branching pattern and termination of facial artery. Its percentage of variation according to studies is 1.6% to 2.1%.<sup>[6,5]</sup> In the right side of face, the facial artery was giving two branches at angle of mouth i.e. SLA & ILA. The SLA continuous as lateral nasal artery and lastly it terminates as angular artery at medial corner of eye.

Understanding the anatomy of the FA is crucial in plastic and aesthetic surgery for the best treatment outcomes and highest safety procedures. In the field of aesthetic surgery, dermal fillers are increasingly popular, and the nose, nasolabial fold (NLF), cheek, nasojugal groove, and glabella are the most common facial injection sites.<sup>[7]</sup> The most serious complications arising from the use of these fillers are associated with arterial blood supply, which may be unintentionally affected by procedures.<sup>[8]</sup> The adverse effects of inappropriate filler placement include tissue loss, blindness, stroke, and even death.<sup>[7]</sup> Recent studies have highlighted facial danger zones, which are strongly associated with the course of the main vessels supplying the face, especially the FA and its branches. Therefore, the aim of this study was to present a complete anatomical map of the FA and its branches together with its course.

### MATERIALS AND METHODS

A rare case of facial artery (duplex with dominant angular artery) branching and termination was identified during our routine dissection. This dissection was performed on the male cadaver of 72 years old in the Department of Rachana sharir, National institute of ayurveda (Deemed university) Jaipur, Rajasthan, India. From the cadaver, which had been embalmed and fixed with formaldehyde, was selected for the dissection. The cadavers were sourced from various individuals who had donated their bodies for medical education and research purposes.

### CASE REPORT

During the routine dissection; we have identified the FA branching and its termination as duplex with dominant angular artery (Type 4) at left side of face [Fig 2]. While

performing the dissection of face on male cadaver aged 72 years through the approach of grants dissector, unilaterally on the left side Type 4 variety branching pattern of FA was observed.

FA is branch of external carotid artery. This artery crosses mandible to enter the face just anterior to the masseter muscle, lying in the groove for the facial artery on the mandible. In the face, the artery travels superficially, just below the angle of mouth it divides into two branches. One of the branches is inferior labial artery (ILA), it courses deep to the depressor anguli oris to serve the lower lip and the other branch runs superiorly till the upper lip. Here again it is bifurcated into (SLA)superior labial artery, it courses between the orbicularis oris and the mucous membrane of the upper lip to serve the upper lip and a lateral nasal artery (LNA) at the wing of the nose to supply structure and the bridge of the nose. The nasal artery is further divided into 2 branches i.e. lesser alar and one more branch [Fig 3]. Usually, it ascends lateral to the nose to terminate as the angular artery at the medial corner of the eye. The angular artery is the terminal continuation of the facial artery, supplying the tissues in the vicinity of the medial corner of eye.

But, in our study a rare branching pattern duplex with dominant angular branch was found on the left side of face. This artery is a duplex or a long course of the facial artery, which displayed an angular branch arising individually below the oral commissure directly from the facial arterial trunk.

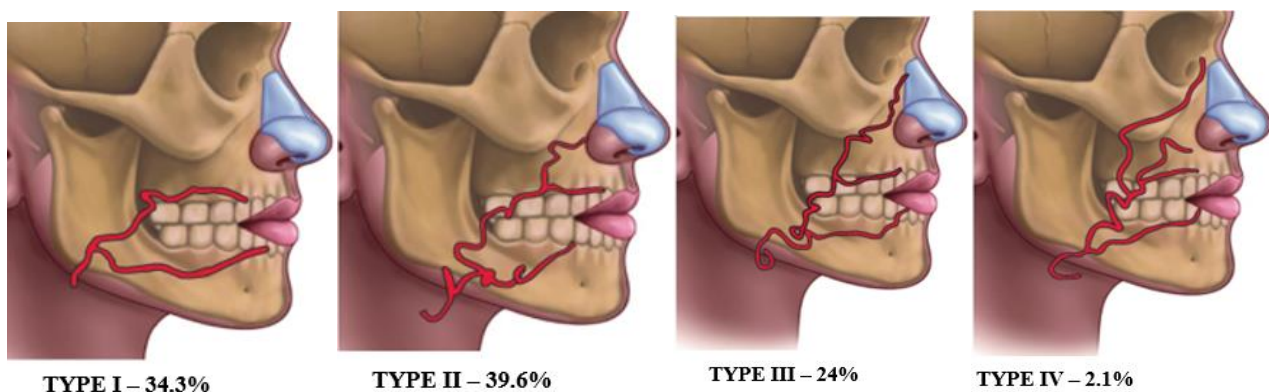


Figure 1: FA classification in types and their occurrence.

### Furukawa classification

**Type-1:** A short course that terminates proximal to the superior labial artery.

**Type-2:** An intermediate course that terminates distal to the superior labial artery near the nasolabial fold.

**Type-3:** A classic course that extends to the lateral nasal ala beyond the nasolabial fold with an angular branch.

**Type-4:** Duplex with dominant lateral angular branch.

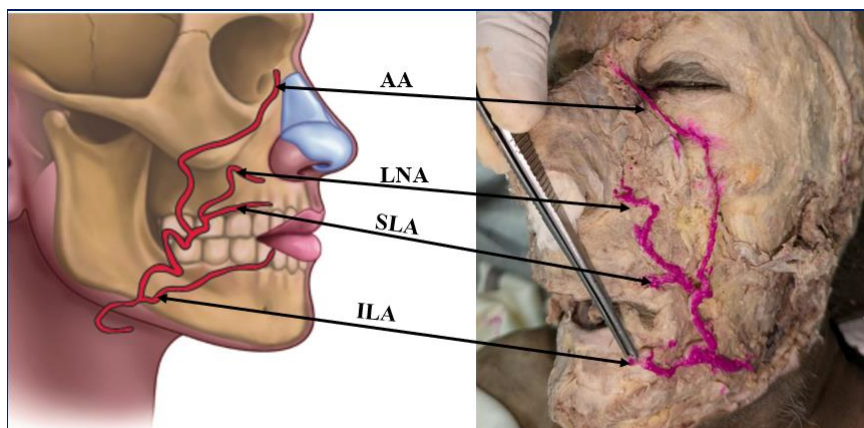
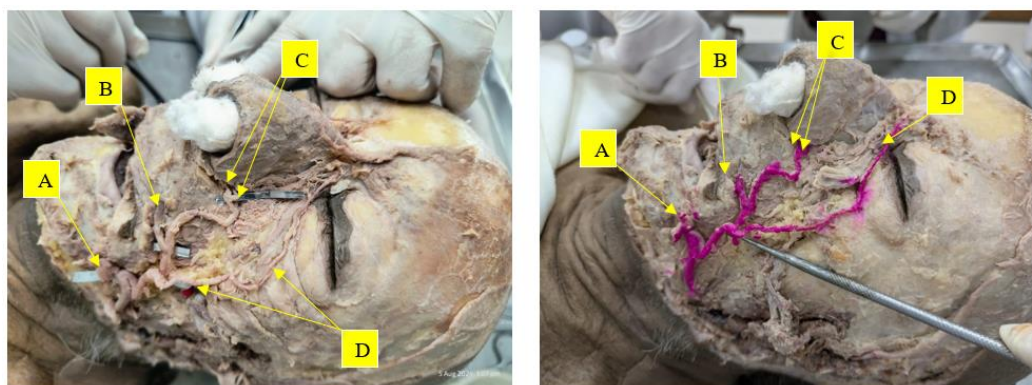


Figure 2.



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Figure 3: (A) Inferior Labial artery (B)Superior Labial Artery (C)Lateral Nasal Artery (D) Duplex with dominant angular artery.

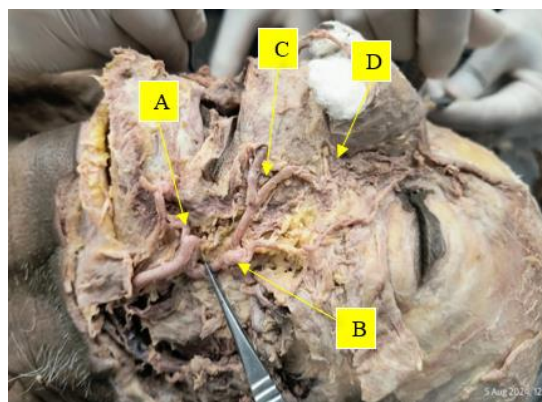


Figure 4: A) First bifurcation at angle mouth giving branch ILA. B) Second bifurcation at the level of upper lip one branch towards upper lip and other towards medial corner of eye. C)Third bifurcation at upper lip giving SLA and LNA. D) Fourth bifurcation at level of ala of nose into two branches.

The artery courses superolateral to nose just medial to suture between maxillary bone and zygomatic bone. Then the dominant angular branch runs medially to reach the medial corner of eye.

In the right side of face, the facial artery was giving two branches at angle of mouth i.e. SLA & ILA. The SLA continuous as lateral nasal artery and lastly it terminates as angular artery at medial corner of eye.

When it comes to left side, the bifurcation levels of facial artery, the first bifurcation was present lateral to angle of mouth, the second was at upper lip here it is bifurcated into two branches i.e. one branch running towards upper lip and one running superiorly beneath the orbicularis oculi to terminate at the medial corner of eye.

Third bifurcation, the branch which was running towards the upper lip was further bifurcated into superior labial artery and nasal artery. The fourth bifurcation into inferior alar artery and lateral nasal artery [Fig-4].



## RESULTS

The left anterior branch of the facial artery arched in the direction of the labial angle, and there divided into inferior labial artery (ILA) and another branch which is further bifurcated into superior labial artery (SLA) and nasal artery. Another angular branch arising individually below the oral commissure directly from the facial arterial trunk i.e. duplex with dominant lateral angular artery (AA).

## DISCUSSION

While variations in the branching pattern of the facial artery have been described previously, most of these variations apply to the terminal branching of the artery<sup>[9,10]</sup>, and not to a split of the artery into two main branches.

The research study conducted by Matakazu Furukawa is observed that, In total 187 facial arteries in 94 patients without facial tumour or vascular diseases the anatomical variations of the facial artery were classified into four types and results were: Type 1- a short course that terminates proximal to the superior labial artery were 34.3%; Type- 2, an intermediate course that terminates distal to the superior labial artery near the nasolabial fold were 39.6%; Type-3, a classic course that extends to the lateral nasal ala beyond the nasolabial fold with an angular branch were 24%; and Type- 4, duplex with dominant lateral angular branch were 2.1%.<sup>[5]</sup>

Loukas et al.<sup>[11]</sup> described a duplex or a long course of the facial artery, which displayed an angular branch arising individually below the oral commissure directly from the facial arterial trunk, but which terminated as the superior alar artery. Their pattern does not correspond to the here-presented findings, since in this case the branching was observed at the level of the base of the mandible and the branches took a completely separated course.

According to Koziej et al.<sup>[6]</sup> Modified Furukawa classification: Type I terminates proximal to the superior labial artery (24.7%; Type II terminates distal to the superior labial artery, close to the nasolabial fold (31.4%); Type III textbook course, lateral nasal or angular artery as the final branch (40%; Type IV duplex with a dominant lateral angular branch (1.6%). The additional type of facial artery course (Type V), where the vessel is hypoplastic and the remaining course is supplied by the dominant transverse facial artery (TFA) (2.4%).

Type 4 classification what we have found unilaterally on the left side of face, during dissection was a rare branching pattern and termination of facial artery.

The knowledge of the anatomy of the facial artery is of special importance for plastic and maxillofacial surgeons in order to reduce the risk of iatrogenic injury to the artery as well as flap necrosis during procedures such as

tumour resection (e.g., of squamous cell carcinomas which are often located in the cheek)<sup>[12]</sup> and lip repair. When creating a commonly used facial artery Musculo-mucosal flap the facial artery needs to be identified and dissected. Therefore, knowledge of the branching of the facial artery branching and its area of supply is important to avoid flap necrosis due to avascularisation.<sup>[13,16]</sup> Additionally, knowledge of the anatomy of the facial artery is important in aesthetic procedures when fillers are injected, as a risk of blindness or necrosis of parts of the face has been described.<sup>[17]</sup> Furthermore, radiologists may benefit in the interpretation of facial artery angiography.<sup>[18]</sup> The present case of the facial artery and the narrative review of the literature, as well as the schematic representation of described branching patterns of the facial artery and their frequency may provide useful information for anatomists and for applications in different fields of clinical practice and surgery.

## CONCLUSION

The arterial circulatory system of the face varies significantly between people, and even between the left and right halves of the same person. The potential interventions that each physician may undertake for vascular issues of the facial territory include arterial puncture, extravascular compression, incorrect delineation of the mucous muscle flap of the facial artery (FAMM), blindness, and necrosis. Because of this, it is crucial to understand the progression of FA, its implications, variations, and anatomical relationships. By doing so, various surgical techniques and minimally invasive treatments can be carried out with greater safety and effectiveness, reducing the risk of iatrogenesis and consequences.

A good knowledge of all variations and anomalous branching patterns is of academic and clinical significance for general practitioners, plastic and maxillofacial surgeons, radiologists, otolaryngologists, and traumatologists.

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