

## Variations in Branching Pattern of Facial Artery: An Anatomical Study in 50 Indian Adult Cadavers

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### Abstract

Facial artery is the principal artery of the face which arises anteriorly from the external carotid artery in

the carotid triangle of the neck. It has a sinuous course throughout its length. The normal course, branching pattern and its variations are very much important for the surgeons who perform surgeries on face for various purposes. Objective of this study was to investigate the normal course and branching pattern of facial artery both in the neck and face regions also to note the variations in its branching pattern. 50 formalin fixed adult cadavers were used for this purpose. The study technique consisted of dissection, observation of origin, course and branching pattern of facial artery. The knowledge of existence of variations in branching patterns as well as termination of facial artery will help the surgeons to avoid complications during facial reconstructive and other surgical procedures on face.

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### 1. Introduction

Facial artery is the principal artery of the face. Normally it arises anteriorly from the external carotid artery in the carotid triangle of the neck. Point of origin lies above that of lingual artery from external carotid artery and immediately above the greater cornu of hyoid bone. In the neck, initially it is covered by skin, platysma and fasciae and often by hypoglossal nerve. As it passes upward and forward it lies deep to digastric and stylohyoid muscles. Medial to mandibular ramus it arches upwards and groove the posterior aspect of submandibular gland, then it turns down and descends to the lower border of the mandible, curves around the inferior border anterior to masseter to enter the face. The facial artery pulsations are easily felt at this point. Throughout its course it is very sinuous to adapt to movements of pharynx during deglutition in the neck region. Similarly on the face the artery can adapt to the movements of mandible, lips and cheeks.

The anatomic understanding of facial artery and its branches is important for Surgeons, Radiologists and Oncologists. In head and neck cancer facial artery is often selected as target artery for administration of super selectiveintra-arterial chemotherapy by inserting catheter from superficial temporal artery (HiromitsuEzure). Variation in the origin of facial artery and its glandular branches are important in parotid surgeries and submandibular sialoadenectomy respectively. Prevention of damage to premasseteric branch and its superficial and deep branches and understanding of anatomic characteristics of the adjacent structures are of great importance during elevation or movement of flaps, repair of benign masseteric hypertrophy, prevention of fatal hemorrhaging during resection of master muscle or mandibular osteotomy (Orhan Magden et al., 2009).

Various reports are available regarding the final branch of facial artery as the lateral nasal, angular, superior labial or alar. Rare occurrence of unilateral complete absence of

facial artery, unilateral high origin of facial artery, origin of glandular branch for the submandibular gland directly from external carotid artery, termination of the facial artery before reaching the lower lip (abortive artery), facial artery taking origin from external carotid artery without making any loop in the submandibular region etc. have been reported by various researchers.

Hence present study was undertaken to find out the origin, course and branching pattern of facial artery in the cervical and facial region on both right and left side.

**2. Materials and Methods**

50 formalin fixed adult cadavers were used for this study, which were dissected during undergraduate medical students teaching. Dissection was carried out in the Department of Anatomy of MGM Medical College Navi Mumbai and Aurangabad, India. The study technique consisted of dissection, observation of origin, course and branching pattern of the facial artery irrespective of sex. Dissection was performed according to the instructions given in Cunningham’s manual of practical Anatomy (Romanes, 2004). Facial artery, the main trunk and all its branches were exposed; applied red oil paint and photographs were taken.

**3. Observations and Results**

Variation of the origin, course and branching pattern of the facial artery were studied in 50 adult cadavers on right and left side. Below are the observations:

**3.1 Origin**

In all the dissected specimens, the facial artery was arising anteriorly from external carotid artery in the carotid triangle at the level of greater cornu of hyoid bone (100 specimens i.e. 50 right and 50 left).

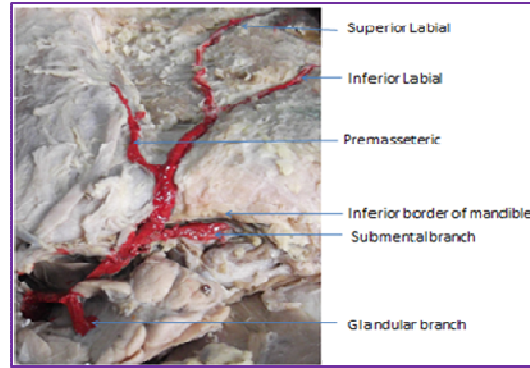
**3.2 Tortuosity**

The tortuosity in the course of facial artery was observed in all 100 specimens.

**3.3. Cervical part of facial artery**

Variation in the origin, course and branching pattern of cervical part facial artery was not detected in any of the specimen. Fig.V Shows the glandular and submental branches of Facial artery.

**Figure 5:** Right FA with its glandular and submental branches



**3.4 Facial part of Facial artery:**

**3.4.1 Branches**

Table - I. Facial part of facial artery showed 2 branches in 2 specimens (2%), three branches in 18 specimens (18%), four branches in 43 specimens (43%), five branches in 36 specimens (36%), and six branches in 1 specimen (1%) in our study.

**3.4. Facial part of Facial artery:**

**3.4.1 Branches**

Table - I. Facial part of facial artery showed 2 branches in 2 specimens (2%), three branches in 18 specimens (18%), four branches in 43 specimens (43%), five branches in 36 specimens (36%), and six branches in 1 specimen (1%) in our study.

**Table 1:** Branches of facial artery

Number of branches.	Number of specimen.	Percentage.
6	2	2%
7	18	18%
8	43	43%
9	36	36%
10	1	1%
Total	100	-

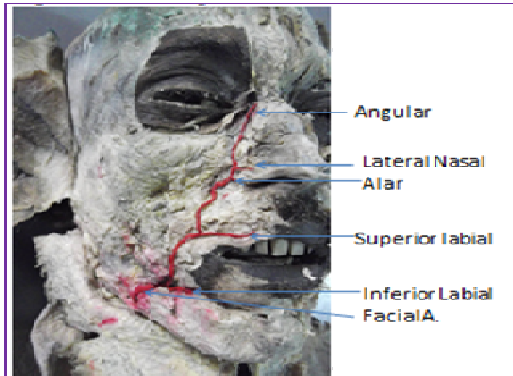
**3.4.2 Terminal branch**

Table- II. The facial artery terminated as Angular artery in 36 specimens (36%) (Fig.I), Lateral nasal artery in 44 specimens (44%) (Fig.II), and Superior labial artery in 20 specimens (20%) (Fig. III & IV).

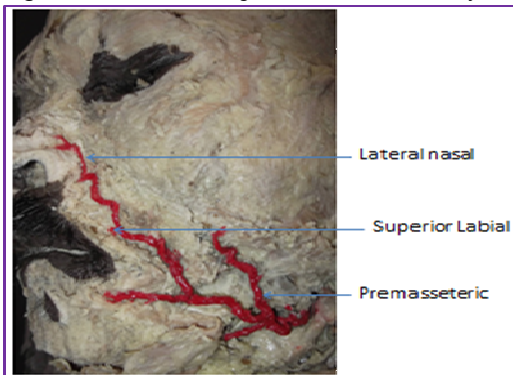
**Table 2:** Terminal branch of facial artery

Name of terminal branch.	Number of specimens.	Percentage
Angular artery	36	36%
Lateral nasal artery	44	44%
Superior labial artery	20	20%

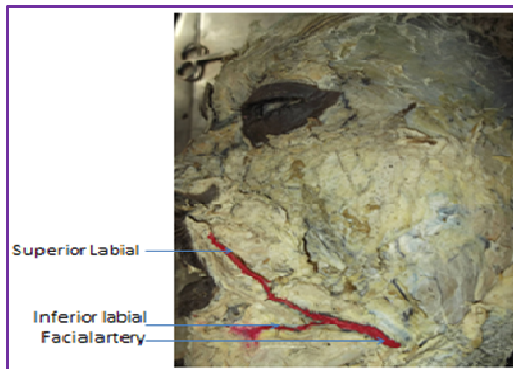
**Figure 1:** FA terminating as AA and Premasseteric absent



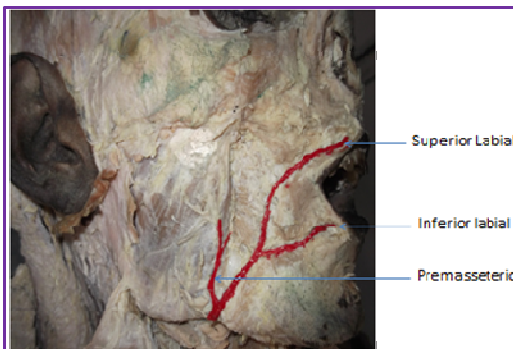
**Figure 2:** FA terminating as LNA is rudimentary



**Figure 3:** FA terminating as SLA and Premasseteric branch is absent



**Figure 4:** FA terminating as SLA and presence Premasseteric



### 3.4.3 Variations

Premasseteric branch was absent in five specimens (Fig.I & Table-III). Superior labial artery was rudimentary in one specimen (Fig. II). All other specimens showed normal pattern of SLA. Alar branch was present on right side in two specimens (Fig.I & Table - III). Lateral nasal artery was present in 80 specimens (80%) (Fig.I & Table-III). Angular artery was present in 36 specimens (36%) (Fig.I).

Variations were more dominant on the right side of the face compared to the left side of the face.

**Table 3:** Number of specimens with specific branch of Facial artery

Branch of facial artery	Present	Absent
Lateral nasal	80	20
Alar	2	98
Angular	36	64
Premasseteric	95	5

## 4. Discussion

Knowledge of origin, course and branching pattern of facial artery is important for the Surgeons, Radiologist and Oncologist.

Discussion part is divided into different groups as per the study -

### 4.1 Origin of the Facial Artery

In the present study the facial artery was arising anteriorly from the external carotid artery in the carotid triangle at the level of greater cornu of hyoid bone (considered as normal origin) in all the specimens.

Unilateral high origin of facial artery was reported by Mohandas Rao et al., 2009. In their study the facial artery was originating from the external carotid artery about 2 cm above the level of posterior belly of digastric muscle in the deeper part of the digastric triangle.

Unilateral complete absence of facial artery reported by Hiromitsu Ezure et al., 2011. In his study the left facial artery was completely absent and its absence was compensated by the transverse facial artery, which had larger than usual diameter.

### 4.2 Course of Facial Artery

In the present study all the specimens showed the normal course of the facial artery both in cervical as well as in facial part.

Samapriya et al., 2012 reported a case of

normal course of facial artery, in this the right facial artery was piercing the whole substance of submandibular gland before winding around the lower border of mandible to enter the facial region. In another case reported by Chakravarty Marx et al., 2008 the facial artery was not making any loop around the submandibular gland and keeping its course straight, crossed the lower border of the mandible just anterior to the anterior border of the masseter.

**4.3 Branching of Facial Artery:**

**4.3.1 Terminal branch: Table-II & IV**

KohKS et al., 2003 studied the branching pattern and symmetry of the course of the facial artery. In their study the final branch was the lateral nasal in 44%, angular artery in 36.3% of the cases. Present study showed that the terminal branch of the facial artery as the angular artery in 36% (Fig. I), lateral nasal artery in 44% (Fig.II) and superior labial artery in 20% (Fig.III& IV) of specimens. As far as the final branch as angular artery and lateral nasal artery is concerned the present study is comparable to the study conducted by KohKS et al.

The course of the facial artery, branching pattern, termination of anomalous variants were studied by Lohn et al., 2011. In their study the facial artery was predominantly terminated as lateral nasal artery (49%). In 5% of cases the facial artery was undetectable. In present study all the 100 specimens showed normal origin of facial artery. There was no specimen with undetectable facial artery, but terminal branch as lateral nasal, our findings are closer to their findings.

In the study by Niranjana et al., 1988 the facial artery was terminated as angular artery in 34 (68%), lateral nasal artery in 13 (26%) and superior labial artery in 2 (4%) and in one, facial artery terminated as alar. Our present study results, related to termination of facial artery is not comparable with the study of Niranjana.

Midy D et al., 1986 studied 40 facial arteries, the facial artery terminated as angular artery in 27.5% cases, superior labial in 40%, nasal in 30% cases and abortive artery in one case. Their findings are not similar to our study.

**Table 5:** Comparison of incidence of terminal branch of present study with other studies

Name of author	Year	Number of specimens	Terminal branch(%) incidence		
			Angular artery	Lateral Nasal Artery	Superior Labial Artery
Present study	2012	100	36%	44%	20%
KohKS et al	2002	94	36.3%	44%	--
Niranjana	1988	50	68%	26%	4%
Midy D et al	1986	40	27.5%	30%	40%

**4.3.2 Premasseteric branch: Table - III**

In the present study 95% of specimens showed the pre-masseteric branch. The pre-masseteric artery is small and inconstant. When present, it passes upwards along the anterior border of masseter muscle and supplying the surrounding tissue. In 5% specimens the pre-masseteric branch was absent. Orhan Magden et al., 2009 studied 14 cadavers and their study revealed presence of pre-masseteric branch in all cases and its course was observed along the anterior border of the masseter muscle.

**Conclusion**

Study of anatomy of facial artery and its branches are necessary considering its surgical and clinical importance for various procedures in maxillofacial region. Knowledge of variations of the facial artery is important for Surgeons, Radiologist as well as Oncologist. This study concludes that anatomical variations of facial artery, especially the facial part are very common.

We hope our study will give some useful input regarding the course and branching pattern of facial artery to the surgeons who routinely operate on face.

**Conflict of Interest**

Authors declare that they have no conflict of interest

**Authors Contribution**

- Phase 1: Dissected the cadavers and collected the data
- Phase 2: Collected similar studies and identified the lacunae
- Phase 3: Compiled the data as per journal requirement.

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