



## MORPHOLOGICAL SPECTRUM OF SUPERFICIAL FACIAL AND CERVICAL VEINS: A CADAVERIC INSIGHT

### Anatomy

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### ABSTRACT

The superficial veins of neck, precisely external jugular vein is commonly used for the purpose of cannulation for intravenous therapies, conducting diagnostic procedures and even for assessing jugular venous pressure. An observational cadaveric study was conducted on eight adult cadavers in the Department of Anatomy at Lady Hardinge Medical College, New Delhi. Multiple variations were observed in the Superficial Facial and Cervical veins in one of the cadavers. An undivided Retromandibular vein joined the posterior auricular vein to form external jugular vein. The external jugular vein was joined by maxillary vein and directly drained into internal jugular vein of same side. There was absence of the common facial vein and the facial vein drained directly into the Internal Jugular vein. Knowledge of such variations are important to avoid any intra-operative error that may lead to unnecessary bleeding and can reduce cosmetic complications in Botox application on face.

### KEYWORDS

Bleeding, Botox, External Jugular Vein, Retromandibular Vein, Subclavian Vein

### INTRODUCTION

Knowledge of venous drainage of head and neck is as important as its arterial supply. An abnormal vascular circulation in the head and neck can lead to modifications in the plan of intervention and surgery. Normally, the superficial temporal vein and maxillary vein join inside the parotid gland to form the retromandibular vein (RMV), which splits into anterior and posterior branches. The anterior branch merges with the facial vein to create a common facial vein that drains into the internal jugular vein; the posterior branch joins the posterior auricular vein to form the external jugular vein (EJV), which empties into the subclavian vein near the jaw angle. [1,2] These veins—and especially the facial vein and EJV—are critical in procedures such as carotid endarterectomy and oral reconstructive surgery, where good blood flow is essential [3]. Clinical examination and ultrasound assessment of the EJV may provide useful information about central venous pressure and underlying cardiac conditions. Knowledge of EJV variations is important for plastic, cosmetic, dental, and oral and maxillofacial surgeons. Altered venous drainage may compromise tissue perfusion and increase the risk of complications such as skin-flap necrosis. This is particularly relevant during procedures such as sagittal split ramus osteotomy (SSRO) [4]

### MATERIALS AND METHOD

The present study is an observational cadaveric study that was conducted on eight adult cadavers (six females, two males; aged between 70–80 years) from January to December 2025 in the Department of Anatomy at Lady Hardinge Medical College, New Delhi. Dissection of head and neck was performed following the steps from Cunningham's manual. To begin with, the platysma was separated from mandible using scalpel and toothed forceps and reflected. The cadaver was dissected carefully to preserve connective tissue and parotid gland. Now piece-meal dissection of parotid was done for observing the formation of RMV embedded in the gland. Then the sternocleidomastoid muscle was incised, to expose IJV. Subsequently, digastric muscle was exposed and intermediate tendon was incised. Abnormal formation and drainage of superficial veins was observed in one out of eight cadavers on right side. No other venous anomaly was observed in rest of the seven cadavers. Measurements were recorded using vernier-callipers and photographs were taken.

### RESULTS

Two superficial temporal veins after draining the temporal region, fused anterior to external acoustic meatus at distance of 21mm. They ran as a common channel of 7mm length. This common stump was joined by a tributary (T1) from pterygoid venous plexus of length 7mm. This led to the formation of an undivided retromandibular vein. The undivided retromandibular vein coursed a distance of 27.8mm and was joined posteriorly by the posterior auricular vein forming External

jugular vein. EJV formed 35mm below the origin of sternocleidomastoid muscle of the same side. This external jugular vein it was joined by maxillary vein at a distance of 19mm from joining of posterior auricular vein. The external jugular vein commonly drains into subclavian vein. In one of the cadavers EJV drained into IJV at a distance of 83mm after its formation.

Usually, the facial vein joins the anterior division of RMV before draining into IJV, but in the same cadaver, since RMV was undivided, facial vein drained directly into IJV, 17mm below the mandible. The length of IJV from point of facial vein connection, to the point of draining into Subclavian vein was 84mm. Undivided RMV and absent common facial vein were observed in 6.25% cases in our study [Fig.1].

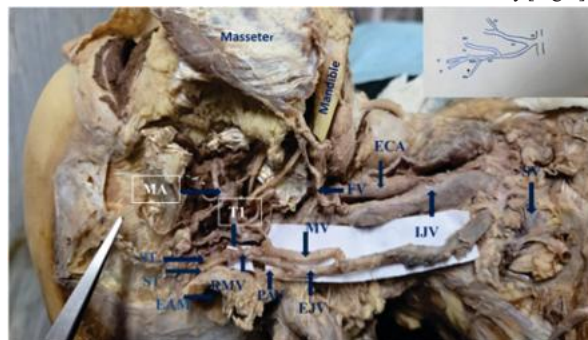


**Fig.1.** Showing undivided RMV in front of EAM, MV joining EJV, FV draining in IJV and EJV draining at the junction of IJV and SV. ST=Superficial temporal vein, RMV=Retro mandibular vein, PAV=Posterior auricular vein, EJV=External jugular vein, MV=Maxillary vein, FV=Facial vein, IJV=Internal jugular vein, SV=Subclavian vein, ECA=External carotid artery, EAM=External acoustic meatus.

### DISCUSSION

Superficial veins lie deep to platysma, while IJV lies in carotid sheath [5]. Literature states that RMV is formed by fusion of superficial temporal and maxillary veins in front of external acoustic meatus, continues as a single trunk, and divides into anterior and posterior divisions.[1]

In one of the cadavers in current study, two superficial temporal veins drained the temporal region and joined in front of external acoustic meatus to form a common stump. This stump was joined by a tributary from pterygoid venous plexus (T1), forming an atypical retromandibular vein (RMV), which remained undivided. It was further

joined by PAV and continued as EJV. Subsequently, EJV was joined by maxillary vein (MV). Similarly, Nishi K et al observed three large veins emerging from pterygoid venous plexus (PVP) into RMV; one drained into RMV trunk and two into anterior divisions. A masseteric vein and transverse facial vein also drained into this junction.[6]

Ankolar et al reported RMV formed by joining STV and Facial Vein. The anterior RMV division joined submental veins to form an anomalous trunk. Common facial vein was absent, while the posterior division had normal fate.[7] The absence of common facial vein was similar to our finding.

Rajni S et al reported RMV dividing normally into anterior and posterior divisions on left side; both were joined by facial vein to form EJV, while PAV was absent [3]. In the current study, RMV was undivided and joined by PAV to form EJV in one of the cadavers.

J Patil et al reported absent RMV on right side with normal course on left. On right, maxillary vein divided into anterior and posterior divisions; posterior division joined superficial temporal vein to form atypical EJV, which drained into SV. [8]. In current study, reports maxillary vein draining directly into EJV in 6.25% cases.

Chauhan NK et al reported normal RMV formation with division into anterior and posterior divisions but absence of PAV. Posterior division continued as EJV and drained into junction of SV and IJV.[9] In present study, RMV was undivided and joined by PAV.

Sanjay Sanyal et al classified RMV based on its characteristics into typical and variant types (Tab. I). In our case, RMV is variant root RMV with dominant posterior division and EJV is atypical.[10]

**Table 1. Classification of RMV Root Variants.[10]**

| RMV characteristics | Divisions of RMV                                                                                                                                                                                                                                                              | EJV                                                                                                                            | CFV                                                                                                                                                     |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Typical root RMV    | Divisions present<br>Anterior Divisions:<br>Unites with FV to form CFV<br><br>Posterior Divisions:<br>Unites with PAV to form EJV.<br>No Divisions<br>PAV drains into RMV but may drain anywhere else. Whole RMV goes towards the posterior triangle of neck over SCM as EJV. | EJV present<br>Drains into SCV.                                                                                                | CFV present<br>Drains into IJV.                                                                                                                         |
| Variant root RMV    | Posterior Dominant;<br>Whole RMV goes into the posterior triangle of neck, superficial to SCM as EJV.<br><br>Anterior Dominant:<br><br>Whole RMV goes into anterior triangle and forms CFV.                                                                                   | Typical root; EJV present<br>drains into SCV.<br><br>Atypical: drains elsewhere<br><br>Typical: EJV absent<br>Atypical: others | Typical: CFV absent<br>FV drains into IJV<br><br>Atypical drains anywhere.<br><br>Typical: CFV present<br>Drains into IJV<br>Atypical drains elsewhere. |

The fate of EJV is variable, with possible duplication and fusion before termination. It may also form a jugular facial venous circle with common facial vein [11]. EJV drains into jugulo-subclavian venous confluence in 60% cases, similar to present study; after fusing with IJV, it drains into subclavian vein at a distance in 36% cases and into the trunk of IJV in 4% cases [2].

Paraskevas G et al mentioned three EJV divisions—lateral, intermediate and medial draining into ipsilateral SV.[5]

Olubu reported absent EJV in 14.2% cases; 60% on right and 40% on left side, with absent PAV and undivided RMV continuing antero-

inferiorly before joining facial vein. They reported EJV formation by union of PAV and posterior RMV division in 82%, direct continuation of PAV in 11%, and continuation of RMV in 6.6%. In one case, a large anterior RMV division and hypoplastic EJV were observed; the anterior division joined lingual and facial veins, which drained into both SV and IJV anterior to SCM. EJV termination was reported as 92.3% in SV, 5.5% in IJV and 2.2% at the confluence of SV and IJV.[12] In current study, EJV was formed by union of PAV and undivided RMV in one of the cases.

Brown S noted EJV drainage into SV in 56.4% cases, IJV in 30.8%, and both IJV and SV in 6.2% cases [13].

### Embryological Basis & Clinical Correlation.

Venous pattern of head and neck develops from constant formation and regression of cephalic veins and is related to development of interconnecting venous space giving rise to plexiform arrangement. RMV and EJV develop from the same capillary plexus derived from cephalic vein in temporal and neck region. Abnormal venous pattern develops as a result of developmental errors during embryonic period [14]. However venous fenestrations are less common as compared to arterial fenestrations around head and neck [8,15].

At 18mm stage of embryo, Lingulo-facial vein (LFV) receives a tributary from RMV and forms CFV. This CFV drains into IJV. EJV has a posterior communication (pc) from RMV called as PAV (posterior auricular vein). EJV also have (a.c.) anterior communication with IJV and ultimately drains into SV on right side [fig 2.a]. This is the normal developmental embryology of venous drainage of neck. With further development, lingulo-facial vein becomes, lingual vein and facial vein, anterior communication disappears, and posterior communication continues as posterior auricular vein [Fig.2.a].

In our case, the variations appeared in the venous system of neck, where anterior communication continued to persist between IJV and EJV, due to which EJV was draining at the confluence of IJV and SV. Undivided RMV after receiving PAV became EJV and Facial vein drained directly into IJV as there was no common facial vein (CFV). RMV remained undivided due to which MV drained directly into EJV [ Fig 2.b].

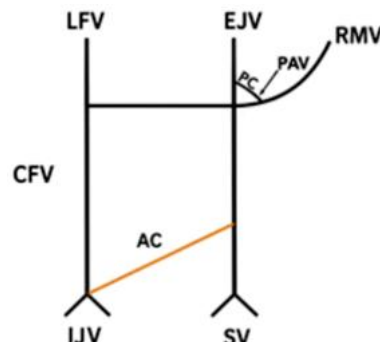


**Fig.2.a** Diagrammatic representation of superficial venous pattern of neck at 18wks of development. EJV- External Jugular Vein, RMV- Retromandibular Vein, PAV-Posterior auricular Vein, PC-posterior communication, LFV- Lingulo-facial Vein, CFV-Common facial vein, IJV-Internal jugular vein, AC-anterior communication. Black lines represent remaining initial pattern. Orange line represents obliterated segment of initial pattern.

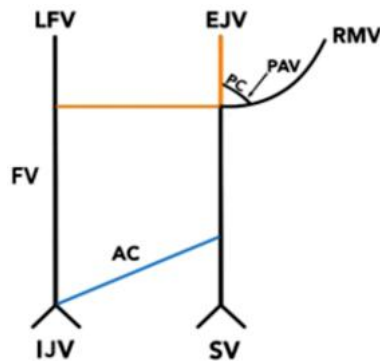


**Fig.2. b.** Diagrammatic representation of embryological basis of

venous variation in our study. Black line represents remaining initial pattern. Blue line represents persisting initial pattern and orange line representing obliterated initial pattern.

## CONCLUSION

It is important to know about the possible variations in superficial veins of neck. Awareness about these variations will help clinicians and surgeons to perform vascular, neck and reconstructive surgeries safely.[2] EJV is involved in clinical condition like Lemierre syndrome. Hence its embryology and formation is important to know.[16]

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