

# Double external jugular vein and other rare venous variations of the head and neck

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**ABSTRACT** Superficial veins of the head and neck are utilised for central venous cannulation, oral reconstruction and parenteral nutrition in debilitated patients. Clinical and sonological examinations of these veins may provide clues toward underlying cardiac pathology. Hence, although variations in these vessels are common, a sound knowledge of such variations becomes clinically important to surgeons, radiologists and interventional anaesthetists. We report a rare case of a left-sided double external jugular vein where the common facial vein continued as the second external jugular vein, and where there was a communicating channel between the internal jugular vein on the same side and the anterior jugular vein.

Keywords: anterior jugular vein, external jugular vein, internal jugular vein, variations  
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## INTRODUCTION

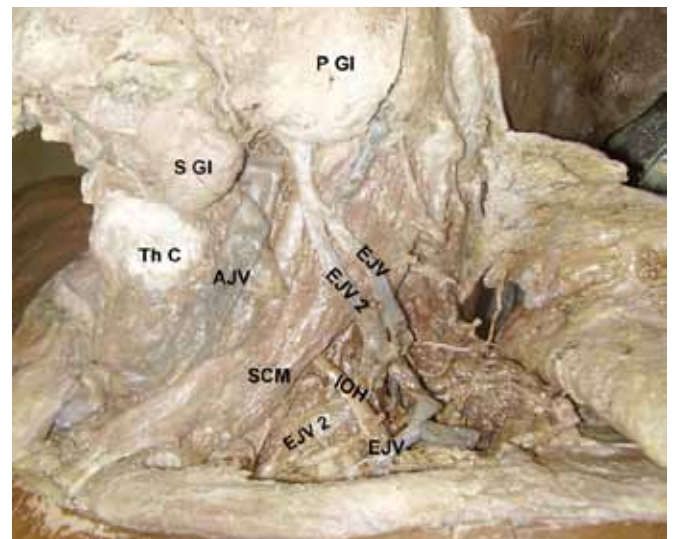
According to standard anatomical descriptions, the normal pattern of venous drainage of the head and neck is as follows: (a) the superficial temporal vein unites with the maxillary vein within the substance of the parotid gland to form the retromandibular vein (RMV); (b) the facial vein (FV) joins with the anterior division of the RMV to form the common FV, which drains into the internal jugular vein (IJV); (c) the posterior auricular vein unites with the posterior division of the RMV to form the external jugular vein (EJV); and (d) the EJV, after its formation, runs vertically downward in the superficial fascia and crosses the sternocleidomastoid muscle (SCM) from the superficial aspect. It pierces the deep cervical fascia just above the middle of the clavicle and drains into the subclavian vein (SCV).

The anterior jugular vein (AJV) usually begins in the suprahyoid region via the confluence of several superficial veins. It descends between the median line of the neck and the anterior border of the SCM. Near the thoracic level of the neck, the AJV passes laterally, deep to the SCM, to open into the EJV. Just above the sternum, the AJVs of both sides communicate via a transverse trunk, the jugular venous arch (JVA). The IJV forms the main drainage channel of the brain, and being a lateral component of carotid sheath, runs vertically downward in the neck. It terminates by joining with the SCV of the same side to form the brachiocephalic vein (BCV).<sup>(1)</sup>

According to Hollinshed, deviation from the normal pattern in the venous system is a common feature.<sup>(2)</sup> Since the superficial veins of the face and neck are utilised in various surgical and interventional procedures, variations of these veins become clinically important to the medical fraternity.

## CASE REPORT

During a routine dissection of a 60-year-old male cadaver, variations in the venous system on the left side of the head and



**Fig. 1** Photograph shows the double external jugular vein.

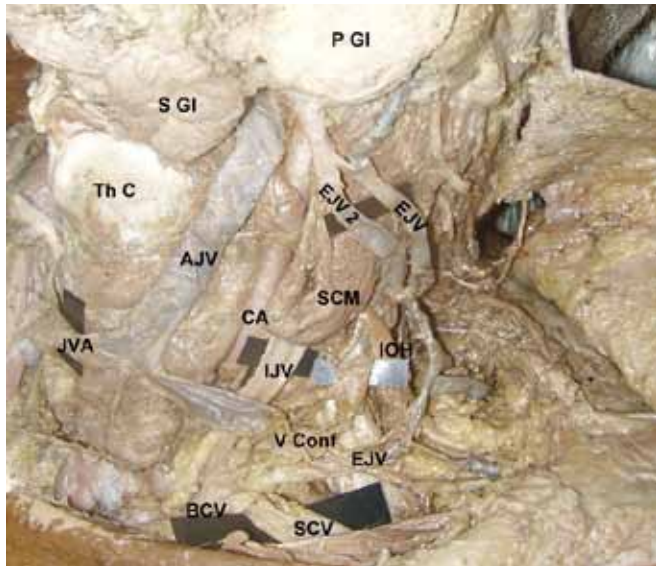
EJV: external jugular vein; EJV2: second external jugular vein; AJV: anterior jugular vein; SCM: sternocleidomastoid muscle; IOH: inferior belly of omohyoid; P GI: parotid gland; S GI: submandibular salivary gland; Th C: thyroid cartilage

neck were observed. The EJV was formed by the union of the posterior division of the RMV and posterior auricular vein, and it was comparatively thinner. It showed a normal course until it pierced the deep cervical fascia in the supraclavicular triangle (Fig. 1). After piercing the deep fascia, the EJV turned medially and terminated into the confluence of the SCV and IJV on the same side (Fig. 2).

The FV was found to have a normal course in the face. Near the angle of the mandible, it joined with the anterior division of the RMV to form the common FV. The common FV, situated further down in the neck, instead of following the normal course was found to share a similar location and run a similar course as the EJV. Hence, this vein was termed as the second EJV (EJV2).

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**Fig. 2** Photograph shows the termination of the two external jugular veins.

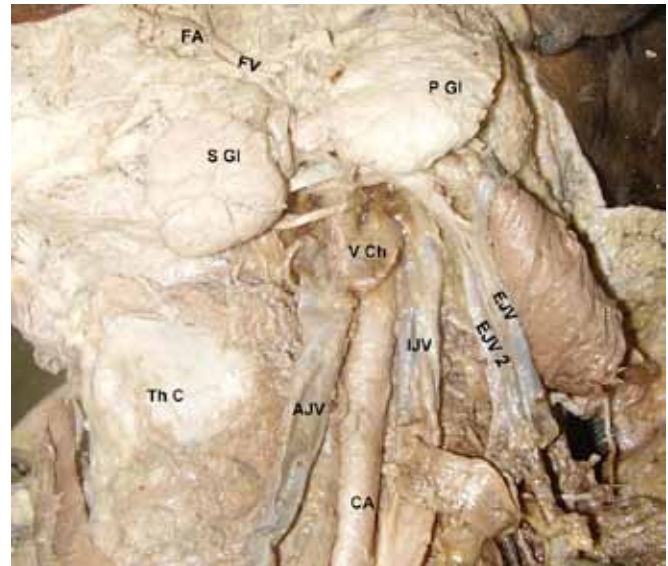
EJV: external jugular vein; EJV2: second external jugular vein; AJV: anterior jugular vein; SCM: sternocleidomastoid muscle; IJV: internal jugular vein; CA: common carotid artery; JVA: jugular venous arch; IOH: inferior belly of omohyoid; P Gl: parotid gland; S Gl: submandibular salivary gland; Th C: thyroid cartilage; V Conf: confluence of EJV2 and AJV; BCV: brachiocephalic vein; SCV: subclavian vein

Situated anterior to the EJV, the EJV2 ran vertically downward (Fig. 1), and in the posterior triangle, it pierced the deep fascia above the point where the EJV pierced the deep fascia. These two veins had three short communications with each other. After piercing the deep fascia, the EJV2 passed medially, deep into the inferior belly of the omohyoid muscle, and united with the AJV to form a common channel. Immediately after its formation, this common venous channel drained into the terminal part of the EJV (Fig. 2).

In the place of a thin, slender AJV, we found a larger vein (Fig. 1). This vein originated from deep inside the digastric muscle, coursed downward and medially, superficial to the carotid sheath. The AJV was situated superficial to the infrahyoid muscles. Just below the cricoid cartilage, this vein turned laterally, passed deep to the SCM and united with the EJV2, as mentioned earlier. A transverse channel connecting this AJV with the AJV on the other side was found just below the level of the cricoid cartilage, forming the JVA. In this case, the JVA was a conspicuous vessel and was situated at a higher level (Fig. 2). We also found a conspicuous venous channel connecting the AJV and IJV above the level of the hyoid bone. This channel ran downwards and medially, and had the same diameter as the IJV (Fig. 3).

## DISCUSSION

Variations in the formation, course and termination of the EJV have long been reported in the literature. In 2008, Vollala et al reported variations in the formation of the EJV – a very low formation of the EJV in one cadaver, and an EJV that was formed by the union of the FV and the undivided RMV in another cadaver.<sup>(3)</sup> There are also studies that have illustrated instances of the FV draining into the EJV.<sup>(4,5)</sup> It has been postulated that such a variation may represent



**Fig. 3** Photograph shows the double external jugular vein and a venous channel connecting the anterior jugular vein and the internal jugular vein.

EJV: external jugular vein; EJV2: second external jugular vein; AJV: anterior jugular vein; IJV: internal jugular vein; CA: common carotid artery; P Gl: parotid gland; S Gl: submandibular salivary gland; Th C: thyroid cartilage; V Ch: venous channel connecting the anterior jugular vein and the internal jugular vein; FV: facial vein; FA: facial artery

the persistence of the communication of the primitive linguofacial vein with the EJV, which develops secondarily in that region.<sup>(5)</sup>

In 1994, a study examining the termination of the EJV in 50 cadavers reported that the EJV in 60% of the cases drained into the jugulosubclavian junction – 52% united with the transverse cervical vein to form a common trunk, which in turn drained into the jugulosubclavian junction, while the remaining 8% drained directly into the jugulosubclavian junction without uniting with any other vein. This study also found that the EJV drained into the SCV in 36% of the cases and into the trunk of the IJV in 4% of the cases.<sup>(6)</sup> In 1996, another study found that the EJV terminated into the jugulosubclavian venous confluence, the SCV and the trunk of the IJV in 72%, 26% and 2% of the cases, respectively.<sup>(7)</sup> Comert et al in 2009 reported a case of partial duplication of the EJV near the middle third, along the posterior border of the SCM before the vein penetrated the deep fascia, which to the authors' knowledge, had never been reported in the past.<sup>(8)</sup> In 2004, Povoski reported that the EJV cutdown procedure for chronic indwelling central venous access device in cancer patients was a technically feasible, safe and successful alternative to the SCV approach.<sup>(9)</sup>

In the present study, we observed that there were two EJVs running close to each other. The EJV was formed by the union of the posterior division of the RMV and the posterior auricular vein, and terminated into the confluence of the IJV and SCV. After the formation of the common FV, it continued distally as the EJV2, joining with the AJV and terminating into the EJV, just before the latter drained into the junction of the IJV and SCV. Since the EJV is increasingly utilised for therapeutic and diagnostic procedures like central venous cannulation and IJV reconstruction,<sup>(10)</sup> and as a pedicle for facial myocutaneous flaps, this study may be useful

for surgeons, radiologists and interventional anaesthetists, as duplication of the EJV has not been previously mentioned in the literature.

Different patterns of variations in the other veins of the head and neck have also been reported in the past. An unusual termination of seven veins in the jugulosubclavian junction, where the cephalic vein, transverse cervical vein, EJV, AJV and vertebral veins joined at the level of the jugulosubclavian junction to form the BCV, has been reported.<sup>(11)</sup> Literature published in 2006 also revealed multiple variations of the left-sided veins in the head and neck region. One study reported duplication of the IJV above the level of the hyoid bone, the FV continuing as the AJV, and a large communicating vein between the AJV and the anterior division of the IJV, and described the JVA as abnormally large, duplicated and highly positioned.<sup>(12)</sup> In the present study, the AJV was found to be a larger vessel and the JVA was found to be at a higher level than its normal position. There was also a communicating venous channel between the IJV and AJV above the level of the hyoid bone. Even though the AJV is a slender vein, it is a clinically significant vessel. It provides a collateral venous channel across the midline in case of any unilateral occlusion of the BCV. It has been reported that the AJV can be used as an alternative channel for cannulation.<sup>(13)</sup> Since the AJV can be used to reconstruct the IJV,<sup>(10)</sup> the presence of a venous channel connecting these two veins, as observed in this study, becomes clinically significant. Also, knowledge of the presence and possible variations of the AJV becomes significant during emergency operations like tracheostomy. Clinically significant variations of the veins can be attributed to the complex development of the vascular system. The relevance and importance of such variations in the vascular system warrants the attention of general surgeons, plastic surgeons, interventional anaesthetists and radiologists.<sup>(14)</sup>

It is thus important to remind medical professionals that awareness of the variations of the veins in the head and neck region is important in order to avoid inadvertent injury during diagnostic and therapeutic utilisation of these veins.

## REFERENCES

1. Standring S, ed. *Gray's Anatomy: The Anatomical Basis of Clinical Practice*, 39th ed. London: Elsevier Churchill Livingstone, 2005.
2. Hollinshead WH. *Anatomy for surgeons*. 3rd ed. Philadelphia: Harper and Row, 1982.
3. Vollala VR, Bolla SR, Pamidi N. Important Vascular Anomalies of Face and Neck – A Cadaveric Study with Clinical Implications. *Firat Tip Dergisi* 2008; 13:123-6.
4. D'Silva SS, Pulakunta T, Potu BK. Termination of the facial vein into the external jugular vein: an anatomical variation. *J Vasc Bras* 2008; 7:174-5.
5. Choudhry R, Tuli A, Choudhry S. Facial vein terminating in the external jugular vein. An embryologic interpretation. *Surg Radiol Anat* 1997; 19:73-7.
6. Deslaugiers B, Vaysse P, Combes JM, et al. Contribution to the study of the tributaries and the termination of the external jugular vein. *Surg Radiol Anat* 1994; 16:173-7.
7. Kopuz C, Akan H. The importance of the angulation and termination of external jugular vein in central venous catheterization in newborn. *Okajimas Folia Anat Jpn* 1996; 73:155-9.
8. Comert E, Comert A. External jugular vein duplication. *J Craniofac Surg* 2009; 20:2173-4.
9. Pivoski SP. External jugular vein cutdown approach for chronic indwelling central venous access in cancer patients: A potentially useful alternative. *World J Surg Oncol* 2004; 2:7.
10. Kamizono K, Ejima M, Taura M, Masuda M. Internal jugular vein reconstruction: application of conventional type A and novel type K methods. *J Laryngol Otol* 2011; 125:643-8.
11. Panagouli E, Tsaraklis A, Gazouli I, Venieratos D. An unusual termination of seven veins in the jugulo-subclavian junction. *Int J Morphol* 2009; 27:1257-60.
12. Nayak BS. Surgically important variations of the jugular veins. *Clin Anat* 2006; 19:544-6.
13. Schummer W, Schummer C, Bredle D, Fröber R. The anterior jugular venous system: variability and clinical impact. *Anesth Analg* 2004; 99:1625-9.
14. Mehra S, Kaul JM, Das S. Unusual Venous Drainage Pattern of Face: A Case Report. *J Anat Soc India* 2003; 52:64-5.