

A case of left-sided absence and right-sided fenestration of the external jugular vein and a review of the literature

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Abstract The external jugular vein is increasingly being used as the recipient vein in head and neck tissue transfers, and for cannulation to conduct diagnostic procedures or intravenous therapies. The variations in the patterns of its course, and knowledge of these variations, are therefore important. We report on a bilateral external jugular vein anomaly found during the neck dissection of an approximately 75-year-old female cadaver, a case which has hitherto not been reported. The vein was absent on the left and fenestrated on the right. An embryological evaluation and the clinical implications of the anomaly are described. Clinicians and surgeons performing vascular or reconstructive surgery should be made aware of this variation of the external jugular vein to prevent inadvertent injury.

Keywords External jugular vein · Absence · Anatomical variation · Fenestration

Introduction

The external jugular vein (EJV) is increasingly being used as the recipient vein in head and neck free tissue transfers, and for cannulation to conduct diagnostic procedures or intravenous therapies [3]. The venous segments are used for carotid endarterectomies. The EJV may give a reliable estimate of central venous pressure [8]. Hence, a thorough knowledge of the normal anatomy and variations could be useful in performing these procedures.

Generally, the EJV is formed by the union of the posterior auricular vein (PAV) with the posterior division of the retromandibular vein (RMV) near the angle of the mandible (Fig. 1). It then descends obliquely, superficial to the sternocleidomastoid muscle and the subclavian triangle where it traverses the deep fascia to end in the subclavian vein [12]. It receives blood mostly from the scalp and face.

When compared with other vessels of the neck, there are fewer studies about the course and variations of the EJV. Authors have described an unusual course, formation and termination of the EJV [3, 7, 9] (Fig. 2); however, the absence [1] and division of the EJV [4, 11] are rarely reported.

We report on an unusual bilateral venous pattern of the EJV: the absence of the EJV with the PAV emptying into the common facial vein (CFV) on the left, and fenestration of the EJV on the right, a case which has hitherto not been reported.

Case report

During the gross anatomy dissection of the neck of an approximately 75-year-old female cadaver, a variation of both sides of the EJV was observed. On the left side, the EJV was absent (Fig. 3a). An undivided RMV exited from the parotid gland and united with the facial vein (FV) to form the CFV below the angle of the mandible. The PAV was longer than usual. Along its course anteriorly it crossed the internal carotid artery and the internal jugular vein (IJV) superficially and emptied into the CFV at the posterior border of the submandibular salivary gland. The CFV emptied into the same-sided IJV.

On the right side (Fig. 3b), the formation of the veins was as per the classical pattern. The EJV was formed by

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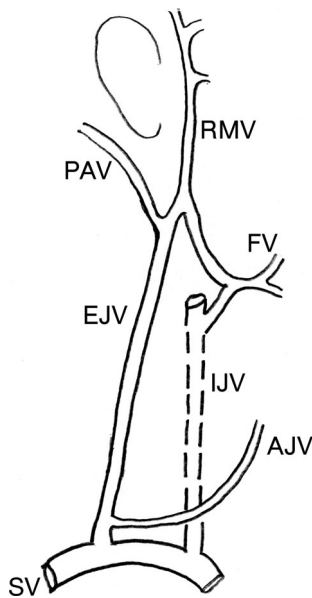


Fig. 1 The classical anatomy of the external jugular vein [10]. PAV posterior auricular vein, RMV retromandibular vein, FV facial vein, AJV anterior jugular vein, EJV external jugular vein, SV subclavian vein, IJV internal jugular vein

the union of the posterior division of the RMV and PAV. The anterior division of the RMV and the FV formed the CFV, which entered the IJV. The EJV run downwards and bifurcated into the medial and the lateral branch at the half-way point between the hyoid bone and the upper margin of the thyroid cartilage. It reunited again at the posterior border of the sternocleidomastoid muscle just before penetrating the deep fascia and entering the subclavian vein. The fenestrated segment was 4 cm in length. The diameter of the medial branch of the EJV (0.7 cm) was twice that of the lateral branch (0.3 mm). There was no

venous dilatation before or after fenestration. No other vascular variations were observed.

Discussion

The present case reports an unusual bilateral venous pattern of the EJV, absent on the left and fenestrated on the right. Such a case has hitherto not been reported in the literature.

The absence and the division of the EJV are very rare. We could find only two reports on the absence of the EJV [1, 2]. The absence of the EJV in the case presented is similar to the case reported by Balachandra et al. [1], who observed the undivided RMV uniting with the FV to form the CFV, which emptied into the IJV. The authors observed the CFV uniting with the PAV posterior to the IJV. In the case presented, the PAV was longer than usual. It ran anteriorly, crossing the internal carotid artery and the IJV to empty into the CFV at the posterior margin of the submandibular salivary gland.

The formation of the veins on the right side in the case presented was as per the classical pattern; however, the EJV bifurcated into the medial and the lateral branches, which reunited again just before penetrating into the deep fascia. Division of the vasculature has been described in many craniocervical arteries, but venous divisions only rarely so. Divisions (fenestrations or duplications) of the IJV are estimated to occur in as much as 0.4 % of the population [10]. We could find only three reports on EJV division [4, 5, 11]. The first report on EJV division was reported by Comert and Comert [4], who observed a duplicated segment of the EJV during neck surgery. Two further cases of EJV division were reported thereafter: fenestration through which the cervical branch of the facial

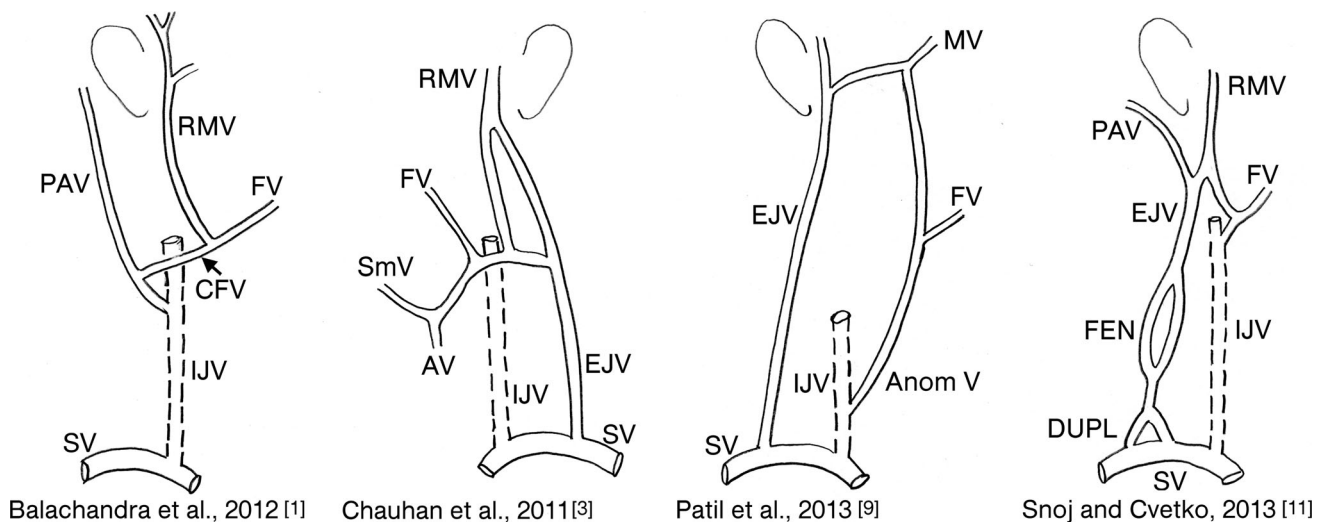


Fig. 2 The main anatomic variations of the external jugular vein previously described in the literature. FEN fenestration, DUPL duplication

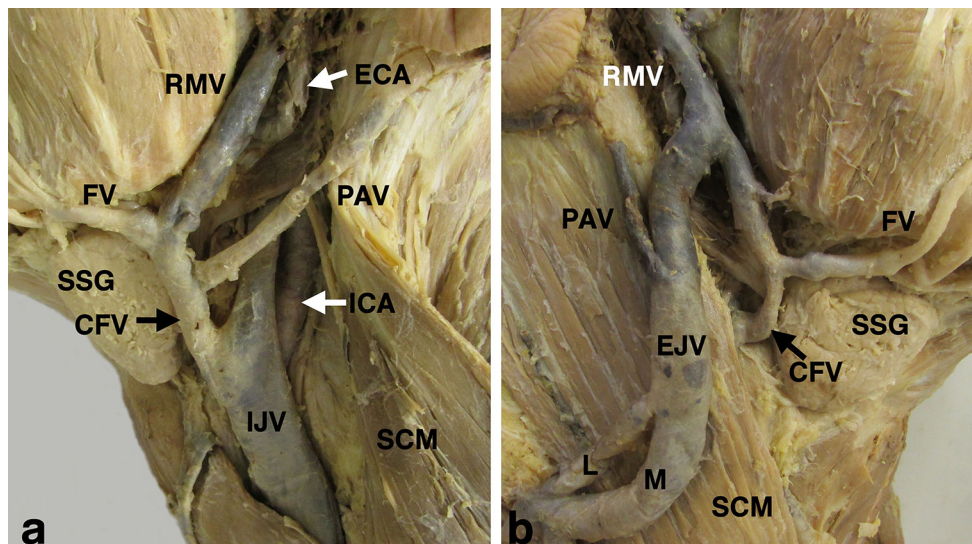


Fig. 3 Dissection showing the left (a) and right (b) side of the neck. On the *left* the external jugular vein (EJV) is absent, the undivided retromandibular vein (RMV) joins the facial vein (FV) to form the common facial vein (CFV) into which the posterior auricular vein

(PAV) empties. The CFV enters the internal jugular vein (IJV). On the *right* there is a classic venous drainage pattern; however, the EJV is fenestrated into the medial (M) and the lateral (L) branches, which reunite again into a single vein. SSG submandibular salivary gland

nerve passed [5] and a case where the left EJV had a fenestrated and duplicated segment [11].

To avoid confusion between the terms “duplication” and “fenestration”, which are used interchangeably in the literature, Downie et al. [6] suggested that the term duplication be limited to those cases in which the branches of the anomalous vessel remain separate over the entire course, whereas the term fenestration should be used for those cases in which the branched vessel reunites into a single normal vessel.

Venous pattern development is a complex process initiated by the formation and eventual regression of the cephalic veins and is associated with the formation of interconnecting venous spaces. Upon further development, the selective retention and regression of some network channels results in a definitive venous pattern [10]. The EJV develops as a secondary channel from a capillary plexus derived from a tributary of the cephalic vein in tissues of the neck and anastomoses secondarily to the anterior facial vein. At this stage, the cephalic vein forms a venous ring around the clavicle from which it connects with the caudal part of the precardinal veins. The deep segment of the venous ring forms the subclavian vein and receives the external jugular vein. Developmental errors during crucial stages of venous formation result in abnormal venous pattern in particular venous channels. It is suggested that the disappearance of the cephalic and caudal parts of the EJV on the left and abnormal development of the EJV wall, led to the variations found in the case presented.

The ease of access to the EJV has facilitated its use for therapeutic procedures and for monitoring by clinicians. The EJV is increasingly being used for cannulation to conduct diagnostic procedures or intravenous therapies [3]. An anomalous pattern of the EJV, particularly variant formation and termination, absence or its division may interfere with this approach. The superficial veins of the neck are preferred as the first choice of veins to be grafted into the carotid artery during endarterectomy and are also used for surgery involving microvascular anastomosis, especially in oral reconstruction procedures [7]. Variant patterns of superficial head and neck veins are vulnerable to profuse bleeding during neck surgery. It is therefore advisable to have knowledge on the abnormality before performing any clinical or radiologic examination.

The EJV has also been used to monitor central venous pressure [8]. Estimation of EJV pressure at the fenestrated part of the EJV, as presented in our study, could cause it to be underestimated. The EJV with double segments raises the possibility of the potential for deep venous thrombus formation secondary to changes in flow velocities.

Conclusion

The absence and fenestration of the EJV are rare. Clinicians should be made aware of the presence of bilaterally different anomalies of the EJV, as in the case presented. This variation alerts clinicians and surgeons performing neck, vascular or reconstructive surgery to this unexpected variation of the EJV to prevent inadvertent injury.

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Conflict of interest None.

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