

An Unusual Termination of Seven Veins in the Jugulo-Subclavian Junction

Inusual Terminación de Siete Venas en la Unión Yugulo-Subclavia

Eleni Panagouli; Athanasios Tsaraklis; Ioanna Gazouli & Dionyssios Venieratos

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SUMMARY: During anatomical dissection of a female Caucasian cadaver in our department, we observed an unusual termination of seven veins at the jugulo-subclavian junction. Normally, the jugulo-subclavian junction is formed by the union of the internal jugular vein and the subclavian vein, and gives rise to the brachiocephalic vein. In our case, except from these two, five additional veins, namely the cephalic vein, the transverse cervical vein, the external jugular vein, the anterior jugular vein, and the vertebral vein, were also joined at the level of the jugulo-subclavian junction, in order to form the brachiocephalic vein. Such a variation has not yet been reported in the literature.

KEY WORDS: Subclavian vein; Brachiocephalic vein; Cephalic vein; Interior jugular vein; External jugular vein.

INTRODUCTION

The jugulo-subclavian junction is formed at the base of the neck bilaterally, posterior to the sternal end of the clavicle, by the union of the internal jugular vein (IJV) and the subclavian vein (SCV) (Calen *et al.*, 1986). From this confluence the brachiocephalic vein (BCV) is formed. Then, the left and right BCV are joined in order to form the superior vena cava. In the present study we report a case in which at the level of the jugulo-subclavian junction, seven veins instead of two are joined in order to form the brachiocephalic vein.

MATERIALS AND METHOD

The reported anatomical variations were discovered in the right side of a female Caucasian cadaver (deceased at the age of 89 from respiratory insufficiency), during routine educational dissection at the Anatomy Department of the Medical School of the University of Athens, Greece.

RESULTS

On the right upper arm and posterior to the sternal end of the clavicle we discovered that seven veins were united in order to form the right BCV vein (Fig. 1). Dissecting the area from the acromial end of the clavicle to the base of the neck (supraclavical triangle), we noticed that four veins joined the SCV in the following order (clockwise, seen from the front): the cephalic vein (CV), the transverse cervical vein (TCV), the external jugular vein (EJV) and the anterior jugular vein (AJV) (Fig. 2). The next vein to join the junction was the internal jugular vein (IJV), following its expected course. The last vein to reach the common junction was the vertebral vein (VV) (also clockwise). It should be pointed out, that the CV, after piercing the clavipectoral fascia, did not join the axillary vein as usual, but instead, crossed over the clavicle and ended at the common junction. Also, the AJV was rather thick and was larger than the EJV and the IJV. Accordingly, the right BCV vein was formed after the junction from all these veins. Its length was 5.8 cm and after its formation, continued its course as expected. The course of the other seven veins was also normal (except CV) until the point of the junction.

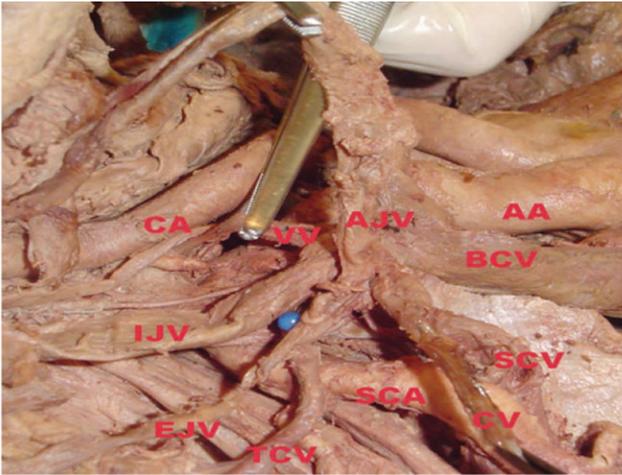


Fig. 1. Common junction of seven veins. SCV. Subclavian vein; CV. Cephalic vein; TCV; Transverse cervical vein; EJV. External jugular vein; AJV. Anterior jugular vein; IJV. Internal jugular vein; VV. Vertebral vein; CA. Carotid artery; SCA. Subclavian artery; AA. Anonymous artery; BCV. Brachiocephalic vein. The clavicle has been pulled out.

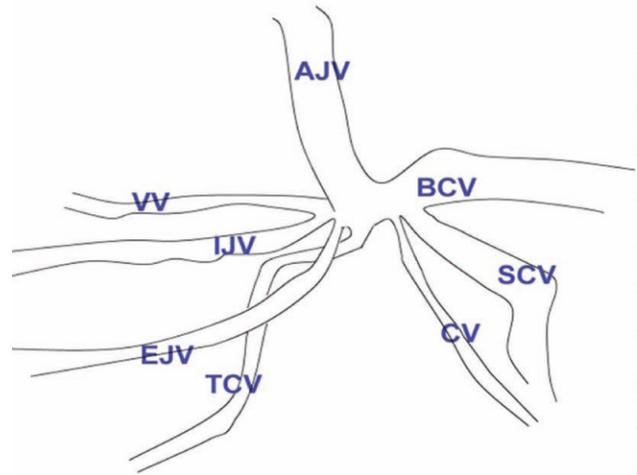


Fig. 2. Common junction of seven veins. Schematic representation. SCV. Subclavian vein; CV. Cephalic vein; TCV. Transverse cervical vein; EJV. External jugular vein; AJV. Anterior jugular vein; IJV. Internal jugular vein; VV. Vertebral vein; BCV. brachiocephalic vein.

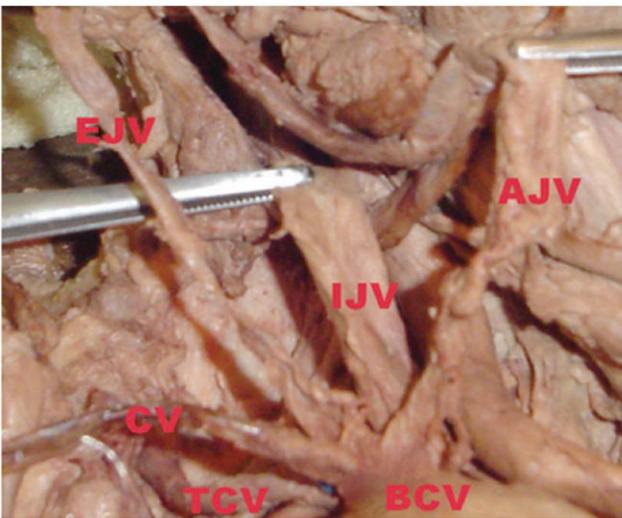


Fig. 3. Common junction from the front. CV. Cephalic vein; TCV. Transverse cervical vein; EJV. External jugular vein; AJV. Anterior jugular vein; IJV. Internal jugular vein; BCV. Brachiocephalic vein.

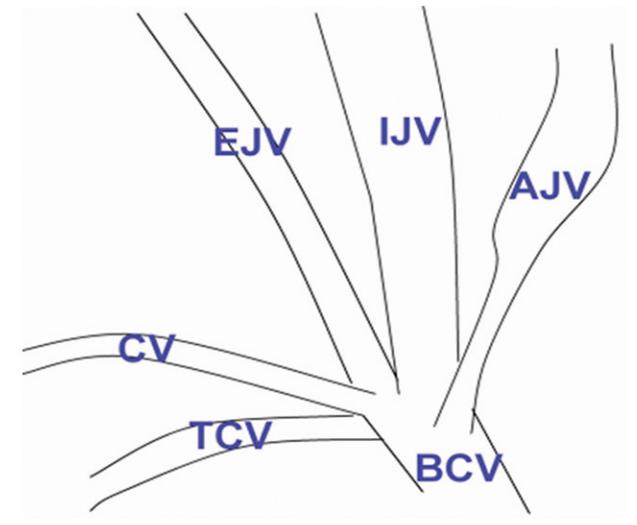


Fig. 4. Schematic representation. CV. Cephalic vein; TCV. Transverse cervical vein; EJV. External jugular vein; AJV. Anterior jugular vein; IJV. Internal jugular vein; BCV. Brachiocephalic vein.

DISCUSSION

The normal termination of the veins involved in our description (found in classical anatomic textbooks), as well as their most frequently reported variations are as follows:

The SCV is the continuation of the axillary vein. It starts at the outer border of the first rib and ends at the jugulo-subclavian junction. The IJV courses with the carotid artery

and the pneumogastric nerve in the carotid sheath and normally reaches the jugulo-subclavian junction.

The EJV normally runs superficial to the sternocleidomastoid muscle at the root of the neck where it ends in the SCV, after crossing the deep fascia. It is larger than the other veins at the region of the neck and sometimes

has even the double diameter (Standring *et al.*, 2008). The EJV has been found to flow in the jugulo-subclavian junction in the anatomical study of Deslaugiers *et al.* (1994) on 50 cadavers in 60%, either directly in 8% or after having formed a common trunk, most often formed on the right, with the TCV in 52%. The termination of the EJV in the jugulo-subclavian junction has also been noted by Sobotta as well as by Bouchet & Guilleret (Deslaugiers *et al.*). The EJV has also been found to drain into the IJV in 4% by Deslaugiers *et al.* and in one third of the cases by Hollinshead (1954).

The TCV usually ends in the EJV. According to Deslaugiers *et al.* the TCV flows in the EJV in 88% or in the jugulo-subclavian junction in 4%. A case where the TCV and the EJV terminated separately in the IJV has also been described (Prakash *et al.*, 2006).

The AJV descends between the midline and the anterior border of the sternocleidomastoid muscle and ends in either the EJV or the SCV (Testut & Latarjet, 1948). The AJV opens into the EJV (as reported by Deslaugiers *et al.*, 1994) in 46% and into the SCV in 54% of the cases. Its diameter is usually inverse to that of the EJV (Standring *et al.*). It might be larger than the EJV in case of thrombosis of the EJV (Nayak, 2006; Schummer *et al.*, 2004). In one case cited by Fabian & Gesase (2006) the right AJV opened into the jugulo-subclavian venous confluence while the left AJV drained into the left IJV just before the formation of the confluence. Moreover, a case of the AJV joining the common facial vein in combination with the termination of the EJV in the IJV has been also described (Prakash *et al.*).

The CV most commonly joins the axillary vein just below the clavicular level. Nevertheless, its termination has been found in the EJV (Au, 1989; Ishizuka, 1964); directly or indirectly into the basilic vein (Bergman *et al.*, 2008; Saaid

& Drysdale, 2008); and into the SCV (Ishizuka). In one case it has been found to drain into the IJV just above the confluence of the latter with the SCV (Saaid & Drysdale). In the study of Deslaugier *et al.*, the CV in 2% of the cases formed the EJV, after crossing over the clavicle. The CV is thin or absent in 20% (Le Saout *et al.*, 1983).

Finally, the VV usually ends in the BCV. In the literature accessible to us, there have been no variations of its termination reported.

In our case the SCV, the CV, the TCV, the EJV, the AJV, the IJV and the VV ended all in the same junction at the level of the jugulo-subclavian junction or confluence of Pirogoff and formed the BCV. As far as we know there no other reports yet in the literature of such a variation.

The knowledge of such anatomical variation is clinically important for surgeries in the head and neck area and for catheterizations (Le Saout *et al.*). A very common procedure is the cannulation of a central vein in the neck, such as the IJV, the EJV and the SCV (Asouhidou *et al.*, 2008; Schummer *et al.*). Particularly, the IJV seems to be the vein that is most used for central venous access and especially the right one, because of the absence of the thoracic duct (Asouhidou *et al.*; Dennis & Uretsky 1991). The AJV may be an alternative route for central venous catheterization, but also might cause malposition of the catheter (Schummer *et al.*). Additionally, the CV is commonly used for endocardial lead implantation of a pacemaker or a cardioverter-defibrillator (Le Saout *et al.*; Furman, 1986). The presence of a variation like the one we describe, might cause complications of problems during the procedures described above (noticeably, the dissected woman had a pacemaker normally implanted as usual through its cephalic vein).

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RESUMEN: Durante la disecci3n anat3mica de un cad3ver cauc3sico femenino, se observ3 una inusual terminaci3n de siete venas en el lugar de uni3n y3gulo-subclavia. Normalmente, la uni3n y3gulo-subclavia consiste en la uni3n de la vena yugular interna y la vena subclavia, que forman la vena braquiocef3lica. En nuestro caso, adem3s de estas dos venas, se observaron cinco venas adicionales, la vena cef3lica, la vena cervical transversa, la vena yugular externa, la vena yugular anterior y la vena vertebral, la que tambi3n se uni3 en el nivel de la uni3n y3gulo-subclavia, a fin de formar la vena braquiocef3lica. Tal variaci3n no ha sido reportado en la literatura.

PALABRAS CLAVE: Vena subclavia; Vena braquiocef3lica; Vena cef3lica; Vena yugular interna; Vena yugular externa.

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Correspondence to:
Dionyssios Venieratos, Department of Anatomy
Medical School, University of Athens
Mikras Asias Str. 75, 116 27
Athens, GREECE

Tel: 30 2107462394
Fax: 30 2107 462 398

Email: dvenieratos@med.uoa.gr

Received:
Accepted: