Surg Radiol Anat (2015) 37:875–877
DOI 10.1007/s00276-015-1431-x

ANATOMIC VARIATIONS

Unilateral fenestration of the internal jugular vein: a case report

Erika Cvetko

Received: 22 November 2014 / Accepted: 14 January 2015 / Published online: 21 January 2015

Abstract The internal jugular vein (IJV) is a significant landmark that is encountered during dissection of the cervical lymph nodes in oncological surgery, central venous catheter insertion and interventional radiological procedures. The variations in the patterns of its course, and knowledge of these variations, are important. During the neck dissection of an approximately 75-year-old male cadaver, unilateral fenestration of the IJV, the medial branch of which received the submental and linguofacial veins, was found—a case that hitherto has not been reported. An embryological evaluation and the clinical implications of the anomaly are described. Clinicians and surgeons performing neck vascular or reconstructive surgery should be made aware of this variation of the IJV in the hope of preventing inadvertent injury.

Keywords Absence · Duplication · Division · Fenestration · Internal jugular vein

Introduction

The internal jugular vein (IJV) is the largest vein in the neck, and drains venous blood from the cranium, the facial region and the neck. The IJV is a significant landmark that is encountered during dissection of the cervical lymph nodes in oncological surgery, central venous catheter insertion and interventional radiological procedures; familiarity with the probable anatomical variations of the IJV is, therefore, important [1]. Divisions of the vasculature have been reported in many of the craniocervical arteries, but venous fenestrations are rarely described [8]. We report on unilateral fenestration of the IJV in the upper part of the carotid triangle, the medial branch of which received the submental and linguofacial veins, a case that hitherto has not been reported.

E. Cvetko (✉)
Medical Faculty, Institute of Anatomy, Korytkova 2, 1000 Ljubljana, Slovenia
e-mail: erika.cvetko@mf.uni-lj.si

Case report

During the gross anatomy dissection of the neck of an approximately 75-year-old male cadaver, a fenestration was observed on the left side of the IJV (Fig. 1). The IJV originated at the jugular foramen as a single vessel, descended parallel to the internal carotid and common carotid artery, before entering the subclavian vein behind the sternoclavicular joint. The IJV bifurcated into the medial and the lateral branches at a level 1 cm beneath the mandibular angle, and reunited again at the level of the hyoid bone. The fenestrated segment of the IJV was 3.5 cm in length and had a wide window. The medial and lateral branches were of approximately equal diameter. The medial branch received two tributaries, the submental vein just beneath the bifurcation and the linguofacial vein just above the reunion with the lateral branch. The lateral branch had no tributaries. The superior thyroid vein emptied into the IJV at a point 2 cm below the reunion of the fenestrated segment of the IJV. There was no venous dilatation before or after the fenestration. The accessory nerve crossed the IJV superficially, 3 cm above the fenestration. The occipital artery branched off from the anterior aspect of the external carotid artery, just behind the angle of the mandible, then turned upward and posteriorly crossed the IJV and the accessory nerve superficially. No other vascular anomalies in the neck region were observed.

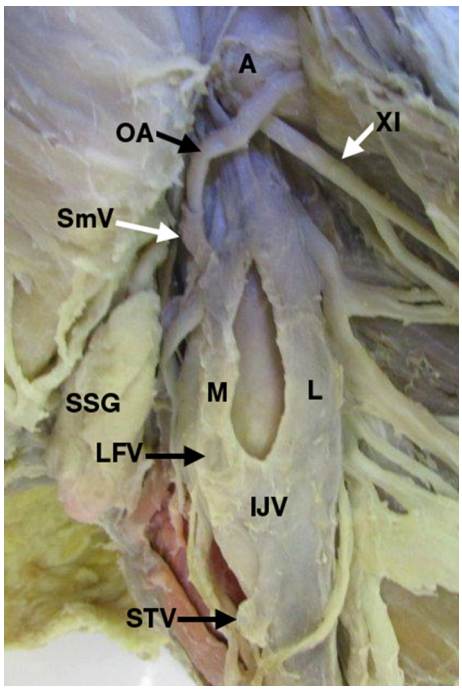

Fig. 1 Dissection showing the *left side* of the neck with fenestration of the internal jugular vein (IJV): *M* medial branch, *L* lateral branch, *OA* occipital artery, *XI* accessory nerve, *SmV* submental vein, *LFV* linguofacial vein (cut), *STV* superior thyroid vein (cut), *A* atlas, *SSG* submandibular salivary gland

The veins of the right side showed no significant variations. The medical history of the cadaver was not available.

Discussion

The IJV is an important vascular structure for oncologists, nephrologists and radiologists, and is also a frequently used central venous route. Divisions of the IJV are quite rare anatomical variations. We report on unilateral fenestration of the IJV, the medial branch of which received the submental and linguofacial veins, found during dissection—a case that hitherto has not been reported.

The clinical incidence of IJV divisions (fenestrations or duplications) is estimated to occur in as much as 0.4 % of the population [6]. In a study by Hashimoto et al. [3], the incidence was reported in 4 out of 192 unilateral neck dissections (2.1 %). Since most duplicated or fenestrated IJVs are discovered as incidental findings, the prevalence of this anomaly is undoubtedly underestimated.

To avoid confusion between the terms "duplication" and "fenestration", which are used interchangeably in the literature, Downie et al. [1] suggested that the term duplicated be limited to those cases in which the branches of the anomalous vessel remain separate over the entire course, whereas the term fenestrated should be used for those cases in which the branched vessel reunites into a single normal vessel.

Duplication or fenestration of the IJV has been mostly revealed during diagnostic imaging and neck surgery. We were able to locate only three publications on the subject of IJV division found during anatomic dissection. Downie et al. [1] found a bilaterally duplicated IJV, while Nayak [4] and Ozturk and Talas [5] reported unilateral fenestration of the IJV with the accessory nerve passing between the fenestrated IJV.

The relationship between the IJV and the accessory nerve in the case presented conformed to the classical pattern. The accessory nerve ran superficially to the IJV above the fenestrated segment of the IJV. Exposure of the IJV and the accessory nerve during surgery are important for head and neck tumors to protect both of these anatomical structures during cervical dissection [6].

The embryologic basis for IJV fenestration is not fully clear. IJV duplication is reported in association with phlebectasia, suggesting the abnormal development of the venous wall, possibly involving incomplete formation of the muscular layer [7, 9].

A duplicated or fenestrated IJV is usually subclinical, but can be present with transient neck swelling [10]. An IJV with double and single segments raises the possibility for deep venous thrombus formation secondary to changes in flow velocities [2]. An awareness that fenestrations of the IJV can occur will help avoid radiologic misinterpretations or misidentifications of the vascular anatomic structures encountered in Doppler examination or angiography when distinction of the thrombus is mandatory.

The discovery of this anatomical variation has practical implications during cervical lymph node clearance. In these surgical procedures, the IJV serves as an important landmark. Knowledge of its exact position and possible variations prevent further complications from occurring during surgery. Furthermore, interruption of the submental and lingual veins during surgery may result in a more constricted upper portion of the IJV (consisting only of the lateral branch) and theoretically predisposes the IJV to thrombosis.

Division of the IJV could be eventually accompanied by anomalies in other vessels such as the anomalous origin and course of the occipital artery in the case presented. The aberrant origin of the occipital artery from the anterior aspect of the external carotid artery in the submandibular region means that there is a significant possibility that the occipital artery may be mistaken for the lingual or facial artery. The atypical course of the occipital artery superficially to the IJV is vulnerable during surgical procedures. Disruption to the occipital artery can result in a profuse hemorrhage.

Conclusion

The presence of the reported anomaly may have serious implications for radiologic examinations and surgical procedures in head and neck regions. Head and neck surgeons, radiologists and intensive care practitioners should be made aware of this rare anomaly to prevent inadvertent injury.

Acknowledgments The dissecting work of Ivan Blažinovič and Friderik Štendler and the figure labeling of Marko Slak are highly acknowledged.

Conflict of interest None.

References

1. Downie SA, Schalop L, Mazurek JN, Savitch G, Lelonek GJ, Olson TR (2007) Bilateral duplicated internal jugular veins: case study and literature review. Clin Anat 20:260–266
2. Dona E, Fletcher JP, Hughes TM, Saker K, Batiste P, Ramanathan I (2000) Duplicated popliteal and superficial femoral veins: incidence and potential significance. Aust N Z J Surg 70:438–440
3. Hashimoto Y, Otsuki N, Morimoto K, Saito M, Nibu K (2012) Four cases of spinal accessory nerve passing through the fenestrated internal jugular vein. Surg Radiol Anat 34:373–375
4. Nayak BS (2006) Surgically important variations of the jugular veins. Clin Anat 19:544–546
5. Oztürk NC, Talas DÜ (2010) Fenestration of internal jugular vein and relation to spinal accessory nerve: case report and review of the literature. Clin Anat 23:883–884
6. Prades JM, Timoshenko A, Dumollard JM (2002) High duplication of internal jugular vein. Surg Radiol Anat 24:129–132
7. Rossi A, Tortori-Donati P (2001) Internal jugular vein phlebectasia and duplication: case report with magnetic resonance angiography features. Pediatr Radiol 31:134
8. Towbin AJ, Kanal E (2004) A review of two cases of fenestrated internal jugular veins as seen by CT angiography. Am J Neuroradiol 25:1433–1434
9. Turan-Ozdemir S, Coskun H, Balban M (2004) Phlebectasia of the external jugular vein associated with duplication of the internal jugular vein. Clin Anat 17:522–525
10. Wong BY, Strachan DR, Loney EL (2010) Duplication of internal jugular veins: case report. J Laryngol Otol 124:341–344