



A RARE VARIATION OF INTERNAL JUGULAR VEIN

Dr. Radha Ramani B*	Assistant Professor, Department Of Anatomy, GIMSR, GITAM University, Visakhapatnam, Andhra Pradesh, India. *Corresponding Author
Dr. Neelima P	Professor, Department Of Anatomy, GIMSR, GITAM University, Visakhapatnam, Andhra Pradesh, India.
Dr. Ramadevi G	Assistant Professor, Department Of Anatomy, GIMSR, GITAM University, Visakhapatnam, Andhra Pradesh, India.

ABSTRACT The jugular veins of the neck are known to exhibit variations in its formation and course. Knowledge of the varying drainage patterns of veins of the head and neck, in particular, jugular veins are not only important for anatomists but also for the surgeons operating at this level and to clinicians performing catheterization. The present study has been done to detect any abnormalities of internal jugular vein. 40 dissected cadavers with age ranging 45-60 years have been examined over a period of 5 years. One male cadaver showed a variation in the course of IJV on the left side of the neck. It has been dissected clearly and photographs were taken. An abnormal vein has been seen in the carotid sheath which is joining the IJV in the lower part of carotid triangle. The common carotid artery was seen in between them. A communicating vein has also been detected connecting the IJV with the abnormal vein in the superior level of carotid sheath. The remaining cadavers showed a normal pattern of IJV. The present study depicts one of the rare anomalies of IJV. The presence of such anomalous communications may be important for surgeons and also radiologists performing angiographic and sonographic studies.

KEYWORDS : Internal jugular vein, Common carotid artery, Anatomical variations.

INTRODUCTION:

Variation in the vascular system from its usual pattern is a common feature and is more commonly observed in veins than arteries.¹ IJV anomalies are less common among the venous abnormalities. IJV being the principal vein draining the head and neck area, begins from the posterior compartment of the jugular foramen and is a continuation of the sigmoid sinus. It is located within the carotid sheath with the common carotid artery and the vagus nerve and unites with the subclavian vein to form the brachiocephalic vein.

This vein in its course receives the inferior petrosal sinus, the common facial, lingual, pharyngeal, superior, and middle thyroid veins and sometimes the occipital vein. The thoracic duct on the left side and the right lymphatic duct on the right side open into the angle of union of the IJV and subclavian vein.^{2,3} All these arise from the anterior surface of the neck and most of the times it does not give posterior branches; however, in some cases, it gives out posterior branches and may have duplication of the vein.

Anatomical variations of the IJV are uncommonly reported but few variations in the formation, lengths and drainage patterns have been documented.^{4,5} Downie et al. classified the variations of IJV into two patterns: duplication and fenestration. Duplication means where the branches of IJV remain separate over the entire course, while fenestration means the branched vessel reunites into a single normal vessel.⁶ Alaani et al. stated that unilateral duplication of the IJV is rare.⁶

These variations were noted to occur more on the left side. There is evidence to suggest that the right IJV is slightly larger and thicker in dimension compared with the left.⁷ Additionally, it is common knowledge that the ease of access and relatively less intimate carotid artery makes the right IJV a popular venous access site.

Furthermore, the IJV is of clinical importance to clinicians as inspection, auscultation and Doppler ultrasonic examinations of these veins provide evidence that may aid in the diagnosis of cardiac diseases. Consequently, dilatation of the jugular veins may be a result of compression of the superior vena cava, which indicates potential pathologies within the mediastinum or pericardial sac.⁸ Therefore, knowledge regarding varying pattern of the internal jugular vein is important to clinicians performing vascular surgeries in head and neck region, as well as those performing angioplasty, catheterization and occasionally hemodialysis. The present study has been done to detect the abnormalities of IJV.

MATERIALS AND METHODS:

40 dissected cadavers (23 male and 17 female) have been examined over a period of 5 years to detect the anomalies of IJV. The cadaver showing the anomaly was dissected clearly. A piece of X-ray film was kept underneath the anomalous vein to enhance the contrast while capturing the photograph.

RESULTS:

One male cadaver aged 50 years showed an abnormal vein in the carotid sheath on the left side of the neck which was joining the IJV in the lower part of carotid triangle. The common carotid artery was seen in between them. A small communicating vein was observed connecting the IJV with the abnormal vein in the superior level of carotid sheath.

Following pictures depict the abnormalities

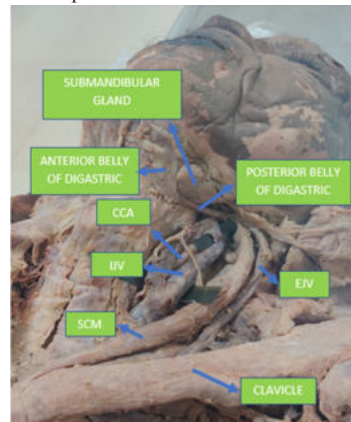


Fig 1: Whole view of dissection of left side of neck showing a variation in IJV

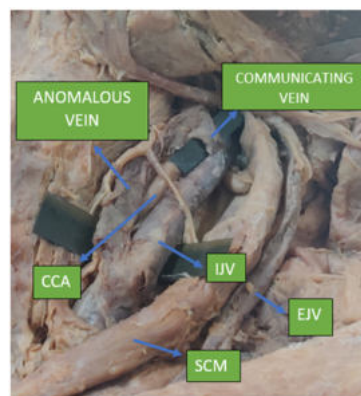


Fig 2: Closer view of anomalous vein joining the IJV in the lower part of carotid triangle with CCA seen in between them

There were no dilatations observed in the abnormal vein.

The venous drainage pattern of the right side of the neck showed no variations in this cadaver.

DISCUSSION:

The knowledge of anatomical variations of the jugular veins is significant for any venous ligations conducted during surgical procedures, such as radical neck dissections. Varying venous patterns in the head and neck region is important for the surgeons in order to avoid any intraoperative trial and error procedures which might lead to unnecessary bleeding.

Duplication of IJV is a rare anomaly. Almost always it involves the upper third of the vein.⁵

Embryologically, the origin of IJV is from the precardial vein. It has been postulated that, duplication of vessels may occur between third and sixth week of gestational period as a result of developmental derangement. Furthermore, it has been stated that IJV duplication is frequently recorded to be associated with phlebectasia, which suggests abnormalities in the development of the venous wall, possibly involving incomplete formation of the muscular layer.⁹

Three theories have been formulated to explain duplication: the vascular theory, that is usually accepted, the neural hypothesis and bony hypothesis. Duplication is thought to result from the appearance of a secondary venous ring at a lower level surrounding the spinal accessory nerve during foetal life. The persistence of this secondary ring in adult life may be important in the aetiology of venous duplication.¹⁰

There are three different types of bony bridgings at the jugular foramen. The bony bridging of the jugular foramen is established by the contact of the intrajugular process of the occipital bone projecting either from just above the hypoglossal canal (Type I) or from behind the hypoglossal canal (Type II) and secondary bony process emerging from the occipital bone in front of the intrajugular process of that bone (Type III). The third type could be associated with a high duplication of the IJV because of the presence of two bony partitions in the jugular foramen which would have been led to division of the IJV into two parts.¹¹

In the study conducted by Pillay, P. on fetuses, The 'Y-shaped' IJV occurred in 1 % of the specimens, however the 'Y-shaped' IJV gave off a tributary to the EJV in 3 % of the specimens.¹² Biondi and Paolo reported bifurcation of right IJV about 2 cm from the jugular foramen and drained into the right subclavian vein.^{13,14}

Devi Sankar and Sharmila Banu noticed fenestration of IJV in the upper part and rejoined in the lower part to form a single trunk; however, there was no duplication of the vein.¹⁵

Lalwani, R et al. reported a case with communication of the external and internal jugular vein in 45-year-old male cadaver with the communicating channel present superficial to the sternocleidomastoid.¹⁶ Dhivya S et al reported the similar finding but the communicating channel runs deep to the posterior border of the muscle.¹⁷

Lim et al. studied anatomical variations of the internal jugular veins and their relationship to the carotid arteries based on CT findings and found that the right IJV (80.5%) was more often larger than the left IJV. With reference to the Common Carotid Artery, 85.2% of the IJV were found in the lateral position, 12.5% anteriorly, 1.1% medially, and 1.1% posteriorly.¹⁸ Color Doppler sonography is essential for detecting collateral pathways.¹⁹ Collateral drainage develops through oblique jugular vein from facial vein into the external jugular vein in case of IJV ligation during radical neck dissection.²⁰

Duplication may occur because of the structures passing between anterior and posterior divisions of the vein like spinal branch of accessory nerve,²¹ C2–C3 anterior primary rami, subscapular artery.⁵

In the present study, no fenestration or duplication has been observed.

CONCLUSION:

In this study we attempted to report a rare variation of IJV on the left side of the neck. Knowledge of variations in the anatomy of IJV is of immense importance clinically. Awareness of these variations is

important for the surgeons to prevent accidental injury and bleeding from the vein and will also help to avoid radiologic misinterpretations of the veins of neck during conventional radiographic procedures.

ABBREVIATIONS

IJV -Internal jugular vein

EJV -External jugular vein

CCA -Common carotid artery

SCM – Sternocleidomastoid

REFERENCES:

- Hollinshead WH. Anatomy for Surgeons. 3rd ed. Vol. 3. Jagerstown: Harper and Row; 1982. pp. 467–70.
- Standring, S. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 40th ed. Philadelphia, Elsevier, 2012
- Sinnatamby, C. S. Last's Anatomy. Regional and Applied. 12th ed. New York, Churchill Livingstone/Elsevier, 2011
- Nayak, B. S. Surgically important variations of the jugular veins. Clin Anat. [Epub ahead of print], 2006.
- Downie SA, Schalop L, Mazurek JN, Savitch G, Lelonek GJ, Olson TR. Bilateral duplicated internal jugular veins: Case study and literature review. Clin Anat. 2007; 20:260–6. [PubMed: 16838288]
- Alaani A, Webster K, Pracy JP. Duplication of internal jugular vein and relation to the spinal accessory nerve. Br J Oral Maxillofac Surg. 2005; 43:528–31. [PubMed: 15896889]
- Saiki K, Tsurumoto T, Okamoto K et al. Relation between bilateral differences in internal jugular vein caliber and flow patterns of dural venous sinuses Anat Sci Int 2013; 88: 141–150
- Baumgartner, I. & Bollinger, A. Diagnostic importance of the jugular veins. Vasa., 20:3-9, 1991
- Rossi A, Tortori-Donati, P. Internal jugular vein phlebectasia and duplication: case report with magnetic resonance angiography features. Pediatr. Radiol., 31(2):134, 2001
- Prades JM, Timoshenko A, Dumollard JM, Durand M, Merzougui N, Martin C. High duplication of the internal jugular vein: Clinical incidence in the adult and surgical consequences, a report of three clinical cases. Surg Radiol Anat. 2002; 24:129–32. [PubMed: 12197023]
- Dodo, Y. Observations on the bony bridging of the jugular foramen in man. J. Anat., 144:153–65, 1986.
- Pillay, P.; Ishwarkumar, S. & Satyapal, K. S. Variations of the external and internal jugular veins: A fetal study. Int. J. Morphol., 36(1):145–148, 2018
- Biondi, P.; Colella, G.; Gherardini, G.; Tartaro, G. & Rauso, R. Internal jugular vein duplication. Indian J. Plast. Surg., 42(2):273–4, 2009
- Paolo B, Giuseppe C, Giulio G, Gianpaolo T, Raffaele R. Internal jugular vein duplication. Indian J Plast Surg. 2009; 42:273–4. [PubMed: 20368879]
- Sankar KD, Bhanu PS. Variant anatomy of fenestrated internal jugular vein with unusual retromandibular and facial vein. Int J Anat Var. 2011; 4:144–8.
- Lalwani, R.; Rana, K. K.; Das, S.; Khan R. Q. Communication of the external and internal jugular veins: A case report. Int. J. Morphol., 24(4):721–722, 2006.
- S. Dhivya, S. Chitra. "External jugular vein communicating with internal jugular vein - a case report". Journal of Evolution of Medical and Dental Sciences 2013; Vol2, Issue 30, July 29; Page: 5512-5516
- Lim CL, Keshava SN, Lea M. Anatomical variations of the internal jugular veins and their relationship to the carotid arteries: A CT evaluation. Australas Radiol. 2006; 50:314–8. [PubMed: 16884415]
- Conkbayir I, Men S, Yanik B, Hekimoglu B. Color Doppler sonographic finding of retrograde jugular venous flow as a sign of innominate vein occlusion. J Clin Ultrasound. 2002; 30:392–8. [PubMed: 12116103]
- Bernard J. Leininger and William E. Neville. use of the internal jugular vein for implantation of permanent transvenous pacemakers. Ann. Thorac. Surg. 1968; 5: 61-65
- Prakash A, Prakash S, Shrestha BL, Baskota DK, Sinha BH (2009) Duplication of internal jugular vein: a rare case report and review of literature. Internet J Otorhinolaryngol 9(1)