

# THE ARGUMENT FOR RIGHT OVER LEFT CANNULATION OF INTERNAL JUGULAR VEIN — AN ANATOMICAL STUDY

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## ABSTRACT

**Objective:** To record the diameter of internal jugular veins on each side in adults.

**Material and Methods:** This study was conducted in the department of Human Anatomy, Faculty of Medicine, Umm al Qura University, Makkah, Kingdom of Saudi Arabia from April 2014 to December 2014. Twenty-eight (16 male and 12 female) cadavers were dissected on both sides and average measurements of the diameter of Internal Jugular Veins (IJVs) were taken using calipers. The data was organized and statistically analyzed.

**Results:** Maximum diameter observed was in the male and on the right side (2.16 cm) while minimum diameter (0.66 cm) was seen in the female on the left side. Mean diameters were:  $1.91 \pm 0.37$  cm and  $1.43 \pm 0.81$  cm in the male and  $0.84 + 0.17$  and  $0.63 + 0.12$  in the female on the right and left sides respectively. Comparisons between the two sides and genders were statistically significant at  $p < 0.05$ . Larger diameter on the right side was more prevalent both in the male (81.25%) and in the female (66.6%). Equal diameter on both sides was not seen.

**Conclusion:** Right internal jugular vein due to its larger diameter is more suitable for catheterization and cannulation in both genders.

**Key Words:** Internal jugular vein, diameter, central venous catheterization, cannulation.

## INTRODUCTION

Catheterization of the internal jugular vein (IJV) is an everyday life-supporting procedure in the hospital for hemodynamic monitoring, medication and parenteral nutrition. Surface anatomical landmarks are used as guides for this purpose. These days ultrasound is routinely used to place the catheter<sup>1</sup>. The IJV along with the subclavian and femoral veins are used for central venous catheterization. IJV is however preferred because of its direct opening into the superior vena cava avoiding any damage to the thoracic duct. The technical complications such as thrombosis or accidental puncture during the procedure may be as high as 15%<sup>2</sup>.

Chronic cerebrospinal venous insufficiency (CCSVI) is a condition that affects the IJV and azygos veins and is usually characterized by different congenital malformations<sup>3</sup>. Magnetic resonance venography and echo color doppler have been used to study the IJV where upon an asymmetry of the size of internal jugular vein has been reported not only in disease but also among normal individuals<sup>4,5</sup>.

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Since safe and appropriate catheterization of the IJV whether guided by ultrasound or otherwise depends upon external anatomical landmarks and the size of these veins the prime question is: which vein, right or left? The purpose of this study was to record the diameter of the internal jugular veins in adult on both sides and in each gender.

## MATERIAL AND METHODS

The study was conducted on a total of 28 formalin-fixed cadavers: 16 male and 12 female. The age range was between 46 and 74 years. The study was in accordance with the rules as stipulated by the ethical committee of the university. It was checked from the record that the subjects had no history of surgery or extensive disease involving the area under study. The internal jugular veins were exposed by dissection during regular dissection sessions of the students at the department of human anatomy. Observations on the IJVs were taken on both sides using a sliding vernier caliper (General Tools Mfg. Co. LLC New York, NY 10013) to the nearest millimeter at three arbitrary points: superior most point of thyroid gland, middle of the thyroid gland and inferior most point of the thyroid gland; an average of the three measurements was then recorded. All measurements were taken by the same person. The data were organized and statistically analyzed.

## RESULTS

The mean diameter of the IJV was generally larger in the males (1.91 ±0.37 to 1.43 ± 0.81 cm) than in the females (0.84 ±0.17 to 0.63 ± 0.12 cm). The maximum diameter (2.16 cm) was observed in the male and on the right side. Also the diameter was found to be larger on the right side (81.25% in males and 66.6% in the females) than on the left side in both genders Table 1. Comparisons between the two sides and genders were statistically significant at  $p < 0.05$ . We did not find equal sized IJVs on both sides neither in the males nor in the females Table 2.

## DISCUSSION

Although central venous catheterization is a routine procedure in clinical practice complication such as accidental puncture of the artery, hematoma and pneumothorax are no less commonly associated with the procedure<sup>6</sup>. To avoid or reduce the incidence and morbidity of such hazards not only demands training of physicians to perform the puncture but also sound knowledge and understanding of the regional anatomy. The anatomy however is variable not only in location but also in size and an external landmark guided can-

ulation is prone to lead to complications. Failure of IJV cannulation in general has been reported to be as high as 17.6% while the rate of complications may be up to 14.3%<sup>7,8</sup>.

Although catheterization of the IJV has been performed following anatomical landmarks for long time, more recently ultrasound guidance has been adopted for the procedure. The opinion of physicians and their preference is not uniform and a study done to assess the same found no advantage of one over the other in this regard<sup>9</sup>. Practitioners consider it a common and simple procedure and may not use ultrasound assistance either because it is considered of little value or may not be available<sup>10</sup>. The size of the IJV is germane in making a choice whether to cannulate on the right or the left side.

Furukawa S et al in a similar study have described the same features although the percentages are different from our study<sup>11</sup>; we found larger size of IJV and more often on the right side in both male and female subjects. This may be because Furukawa S et al took a general average and did not consider the two genders separately. Lobato EB et al in their study reported a larger IJV on the right side in 80% cases<sup>12</sup>. Asymmetry was also observed in another study in intensive care patients where right side IJV was either larger or equal (62.5%) to the left side<sup>13</sup>. These two studies were based on ultrasound observations and precise diameter was not mentioned. Tartièrè D et al in their ultrasound study also described the diameter of the right IJV to be larger than on the left and concluded that the right IJV diameter was equal or more by + 1 to 2 mm in 71% of patients<sup>14</sup>.

These ultrasound studies<sup>12-14</sup> provide figures close to our observations. Our data, however, is more precise in that it is based on actual measurements on human cadavers and makes a gender distinction.

**Table 1: Diameters of the internal jugular vein in cadavers**

Diameter (cm)	Male subjects n= 16		Female subjects n = 12	
	Right side	Left side	Right side	Left side
Maximum	2.16	1.86	1.72	0.83
Minimum	1.10	0.93	0.76	0.66
Mean	1.91 ± 0.37*	1.43 ± 0.81*	0.84 ±0.17*	0.63 ± 0.12*

\*significant at  $p < 0.05$

**Table 2: Percentage distribution of the larger, smaller and equal diameters of the internal jugular veins**

Diameter (cm)	Male subjects n= 16		Female subjects n = 12	
	Right side	Left side	Right side	Left side
Larger	13 (*81.25%)	3 (18.75%)	8 (*66.6%)	4 (33.3%)
Smaller	5 (31.25%)	11 (*68.75%)	3 (25%)	9 (*75%)
Equal	0 (0%)	0 (0%)	0 (0%)	0 (0%)

\*significant at  $p < 0.05$

## LIMITATIONS

It was conducted on formalin fixed cadaver and may not reflect the real size of IJV in the living.

## CONCLUSION

Right side Internal Jugular Vein (IJV) should be the choice for cannulation and catheterization. This is also more suitable because most physicians performing the procedure are right-handed.

## REFERENCES

- Stanford TJ. Internal jugular vein cannulation versus subclavian cannulation: an anesthesiologists view. The right internal jugular vein. J Clin Monit. 1995; 1: 58-61.

2. Kopmann D. Ultrasound-guided central venous catheter placement: the new standard of care? *Crit Care Med.* 2005; 33: 1885-77.
3. Lee BB, Laredo J, Neville R: Embryological background of truncular venous malformation in the extracranial venous pathways as the cause of chronic cerebrospinal venous insufficiency. *Int Angiol* 2010, 29(2): 95-108.
4. Werner JD, Siskin GP, Mandato K, Englander M, Herr A: Review of venous anatomy for venographic interpretation in chronic cerebrospinal venous insufficiency. *J Vasc Interv Radiol* 2011, 22(12): 1681-90.
5. Lorchirachoonkul T, Ti LK, Manohara S, Lye ST, Tan SA, Shen L, Kang DS et al. Anatomical variations of the internal jugular vein: implications for successful cannulation and risk of carotid artery puncture. *Singapore Med J* 2012, 53(5): 325-28.
6. Domino K, Bowdle T, Posner K. Injuries and liability related to central vascular catheters: A closed claims analysis. *Anesthesiology.* 2004; 100: 1411-18.
7. Jobs DR, Schwartz AJ, Greenhow E, Stephenson LW, Ellison N. Safer jugular vein cannulation: recognition of arterial puncture and preferential use of the external jugular route. *Anesthesiology* 1983; 59: 353-55.
8. Sznajder JI, Zveibil FR, Bitterman H, Weiner P, Bursztein S. Central vein catheterization, failure and complication rates by three percutaneous approaches. *Arch Intern Med* 1986; 146: 259-61.
9. Hayashi H, Amano M: Does ultrasound imaging before puncture facilitate internal jugular vein cannulation? Prospective randomized comparison with landmark-guided puncture in ventilated patients. *J Cardiothorac Vasc Anesth* 2002; 16: 572-75.
10. Bailey PL, Glance LG, Eaton MP, Parshall B, McIntosh S: A survey of the use of ultrasound during central venous catheterization. *Anesth Analg* 2007, 104: 491-97.
11. Furukawa S, Nakagawa T, Sakaguchi I and Nishi K. The diameter of the internal jugular vein studied by autopsy. *Rom J Leg Med* 2010; 2: 125-28.
12. Lobato EB, Sulek CA, Moody RL, Morey TE: Cross-sectional area of the right and left internal jugular veins. *J Cardiothorac Vasc Anesth* 1999, 13: 136-38.
13. Lichtenstein D, Saifi R, Augarde R, Prin S, Schmitt JM, Page B, Pipien I, Jardin F et al. The Internal jugular veins are asymmetric. Usefulness of ultrasound before catheterization. *Intensive Care Med* 2001, 27: 301-5.
14. Tartière, D., Seguin, P., Juhel, C., Laviolle, B., Mallédant, Y. Estimation of the diameter and cross-sectional area of the internal jugular veins in adult patients. *Crit Care.* 2009; 13: 197-202.

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#### **AUTHOR'S CONTRIBUTION**

Following authors have made substantial contributions to the manuscript as under:

**Khan MA:** Conception and design, data collection and analysis, interpretation, manuscript.

**Altat FM:** Data collection and analysis, interpretation, critical review of the manuscript and final approval.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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