DOI: 10.5958/j.2319-5886.2.3.077

International Journal of Medical Research & Health Sciences

www.ijmrhs.com Volume 2 Issue 3 July - Sep Coden: IJMRHS Copyright @2013 ISSN: 2319-5886

Received: 1st May 2013 Revised: 29th May 2013 Accepted: 1st Jun 2013

Research article

MORPHOMETRY OF JUGULAR FORAMEN AND DETERMINATION OF STANDARD TECHNIQUE FOR OSTEOLOGICAL STUDIES

*Delhi raj U, Janaki CS, Vijayaraghavan. V, Praveen Kumar Doni R

Department of Anatomy, Meenakshi Medical College & Research Institute, Enathur, Kanchipuram, Tamilnadu, India

*Corresponding author email: delhirajphysio@gmail.com

ABSTRACT

The Jugular foramen is large openings which are placed above and lateral to the foramen magnum in the posterior end of the petro-occipital fissure and the anterior part of jugular foramen is allows the cranial nerves IXth, X^{th,} XIth the direction of the nerves from behind forwards within the jugular foramen and sometimes jugular tubercle it has acted as a groove and later it becomes enter of the foramen. They lie between the inferior petrosal sinus and the sigmoid sinus. **Methods:** The Antero-Posterior Diameter and Transverse Diameter of the jugular foramen were analysed exocranially for both right and left sides. All the parameters were examined by two methods, Method.1: Mitutoyo Vernier Calliper, Method.2: Image J Software. **Results:** The present study showed the measurement is statistically significant between the Mitutoyo Vernier Calliper and Image J – Software. **Conclusion:** The Image J software value is more precise than the Mitutoyo Vernier Calliper values.

Key words: Jugular Foramen, Exocranial measurement, Image J software, Mitutoyo Vernier Calliper

INTRODUCTION

The Jugular formen it consists two borders upper border is irregular it allows the glosspharyngeal nerve through the notch. Lower border is smooth it allows posterior sigmoid sinus and which continuous has an internal jugular foramen. Jugular foramen is large openings which are placed above and lateral to the foramen magnum in the posterior end of the petro-occipital fissure and the anterior part of jugular foramen is allows the cranial nerves IXth , Xth, XIth the direction of the nerves from behind forwards within the jugular foramen and sometimes jugular tubercle it has acted as a groove and later it becomes enter of the foramen. Sometimes inferior petrosal sinus might have been accompanied by meningeal branch of ascending pharyngeal arteries simultaneously sigmoid sinus accompanied by meningeal branch of occipital arteries and the posterior part of jugular foramen allows occipital and ascending pharyngeal arteries.[1] According to imaging based jugular foramen have bony ridge which is known as jugular spine this spine divides in to anterior and posterior parts and jugular foramen acted as a main route of venous outflow from the skull sometimes it his dominated each sides. Ligation of the internal

jugular vein it may causes risk of venous infraction.[9] jugular canal was placed deeply and surrounded by the vital structures with related to the internal carotid artery anteriorly, hypoglossal nerve medially, facial nerve laterally, vertebral artery inferiorly.[8] Sometimes intracranial and extracranial lesion are responsible to produce intrinsic abnormalities and also it produces pathologically intracranial meningiomas, paragangliomas, metastatic lesions and occasionally it reaches middle ear also and jugular lesions are prevented by using micro surgical techniques.[9]

MATERIALS AND METHODS

A total number of 100 Jugular foramens were examined from 50 skulls (Right & Left). The skulls were obtained from the osteological collections of the dry skulls in the Department of Anatomy at Meenakshi Medical College and Research Institute, Enathur, Kanchipuram and Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research, Melmaruvathur were used for this study.

All the parameters were examined by two methods, Method.1: **Mitutoyo Vernier Calliper**, Method.2: **Image J – Software**

Method 1: **(Mitutoyo Vernier Calliper):** The Antero-Posterior Diameter and Transverse Diameter of the jugular foramen were analysed exocranially for both right and left sides. This was done by measuring Mitutoyo Vernier Calliper.

Method 2: **(Image J – Software):** The Antero-Posterior Diameter and Transverse Diameter of the jugular foramen were analysed exocranially for both right and left sides. This was done by taking Photographs of jugular foramen for all 50skulls exocranially. These images were taken, and images were saved. The digitally saved images were opened and measured with the software Image J (software offered by the National Institute of Health USA (NIH), and Antero-posterior Diameter and Transverse Diameter were calculated and recorded.

RESULTS

We have done the examination of length and width of 50 skills exocranially by two methods. The obtained data analysis was performed with SPSS version 11software. According to previous studies they have used Mitutoyo Vernier Calliper. In our present study I have done the measurements with Mitutoyo Vernier Calliper and Image J software.

Table 1: Comparison of Antero-posterior diameter of jugular foramen with Mitutoyo Vernier Calliper and Image J software

Jugular Foramen	**Right side**		**Left side**	
Antero-posterior Diameter	**Mitutoyo Vernier Calliper**	**Image J Software**	**Mitutoyo Vernier Calliper**	**Image J Software**
Mean	8.92	9.508	7	7.651
Standard Deviation	1.893	2.015	1.457	1.441
P Value	0.0156		0.0001	

Table: 2 Comparison of Transverse diameter of jugular foramen with Mitutoyo Vernier Calliper and Image J software

Jugular Foramen	Right side		Left side	
Transverse Diameter	**Mitutoyo Vernier Calliper**	**Image J Software**	**Mitutoyo Vernier Calliper**	**Image J Software**
Mean	13.54	14.14	11.8	12.9
Standard Deviation	2.012	1.998	2.611	2.482
P Value	0.0001		0.0001	

Table.3: Comparison of largeness of antero-posterior diameter and transverse diameter on each side of jugular foramen with Mitutoyo Vernier Calliper

Jugular foramen	Right side	Left side
Antero-Posterior Diameter	88%	12%
Transverse Diameter	80%	20%

DISCUSSION

Internal jugular vein depends on the size and shape of the jugular foramen, Right jugular foramen is larger than the left jugular foramen.

Comparison of Length of Jugular foramen with other study: OE Idowu measured the length of jugular foramen on the right as ranging from 11.6 mm to 17mm and the mean length was 13.9mm, and on left it was 9.2mm to 20.2mm and the mean length was 14.11mm.[9] Hussain Saheb found the minimum length of jugular foramen 19.4mm and maximum 29.3mm on right side and the mean was 23.62mm, on the left side the length was 12mm to 27.4mm and the mean length being 22.86mm.[8] The present study of 50 skulls the length of jugular foramen on right side ranging from 10.00mm – 19.00mm and the mean was 13.54mm, on the left side ranging from 8.00mm – 19.00mm and the mean was 11.8mm which is slight closer to the O.E. Idowu's value and much lower than the values of Hussain Saheb

Comparison of width of Jugular foramen with other study : O.E. Idowu (2004) measured the width of jugular foramen on the right as ranging from 6.80mm to 14.40mm and the mean was 10.22mm, and on left side it was 7.40mm to 12.80mm and the mean was 9.57mm.[9] Hussain Saheb (2010) found the minimum width of right side jugular foramen as 3mm and maximum as 11.4mm, and the mean being 7.83mm, on the left side the width was 4mm to 11mm and the mean being 6.83mm.[8] The present study of 50 skulls the width of jugular foramen ranging as 4.0mm – 14.00mm and the mean was 8.92mm on right side, on the left side ranging from 4.0mm – 10.00mm and the mean was 7.0mm which is slightly higher than the values of Hussain's Seheb's study but the values is slightly lower than the values of Idouw's study.

Statistical comparison of variables with others study: The present study the length and width of the jugular foramen higher significance than the Idouw's study and Hussain's study.

Merit and Demerit of Mitutoyo Vernier Calliper

Merits**:** Mitutoyo Vernier Calliper is anyone can handle this instrument, Easy measurement.

Demerits: Have to prevent Inter – Intra observer difference, "Reading error" of ± 0.02.

Merit and Demerit of Image J Software:

Merits**:** Image J Software is free software available from the internet, more precise, No "reading error"

Demerits**:** Image J Software is Knowledge about basic computers is needed, Accessories like camera are needed, Photo – magnification error should be avoided.

CONCLUSION

The bony growth from jugular fossa which converted the foramen into a slit like appearance It produces some neuro vascular diseases, glomus, jugular meningiomas, Jugular tumors and even a nodule reducing size of jugular foramen in Varicella -Zoster virus infection. The involvement of IX^{th}, X^{th} and XI^{th} cranial nerves at jugular foramen is known as Vernet's Syndrome, which might occur in this case due to narrowing of the jugular foramen. As jugular foramen is a large deeply placed aperture. The need for familiarity with detailed anatomy of this region becomes greater importance for a neurosurgeon to approach this region. The Image J software value is more precise than the Mitutoyo Vernier Calliper values.

ACKNOWLEDGEMENT

I would like to thanks the Dr.M. Chandrasekhar, Dean, Dr. V.Vijayaraghavan, Professor & Head, Dr. Janaki CS, Assistant professor, Department of Anatomy, Meenakshi Medical College & Research Institute. For valuable support, guidance and provided to me in the department to work prodigiously to achieve great height with plenary knowledge

REFERENCES

1. Gray's Anatomy, Intracranial Region – posterior cranial fossa.40th Edition. chapter 27, 424-425
2. Chong VFH, Fan YF. Radiology of the jugular foramen. Clinical Radiology. 1998:53: 405-16.
3. Chong VFH, Fan YF. Jugular foramen involvement in naso-pharyngeal carcinoma. J Larynx Otology. 1996:110:897-900.
4. Daniels DL, Williams AL, Haughton VM. Jugular foramen: anatomic and computed tomographic study. Am J Radiology. 1984: 142: 153-158.
5. Di Chiro G , Fisher RL , Nelson KB. The jugular foramen. J Neurosurgery. 1964:21: 447-52.
6. Dodo Y. Observations on the bony bridging of the jugular foramen in man. J Anat.1986:144:153-65.
7. Hatiboglu MT. Structural variations in the jugular foramen of the human skull. J Anat.1992: 180:191-96.
8. Hussain Saheb S, Thomas ST, Prassana LC, Muralidhar P. Morphological variations of jugular foramen in South Indian adult skulls. Biomedical Research 2010; 21 (4): 349-350
9. Idowu OE. The jugular foraman- a morphometric study. Folia Morphol.2004: 63:419-22.
10. Sturrock RR. Variation in the structure of the jugular foramen of the human skull. J Anat. 1988;180:227-30.
11. Navsa N, Kramer B. A quantitative assessment of the jugular foramen. Anatomischer Anzeiger. 1998: 180: 269-73.
12. Nayak S. Partial obstruction of jugular foramen by abnormal bone growth at jugular fossa. Internet J Biol Anthrapol.2007:1.2: 10
13. Patel and Singel. Variations in the structure of jugular foramen of the human skulls in saurashtra region. J Anat Soci India. 2007:56(2):34-37.
14. Patridge EJ. The relation of the glossopharyngeal nerve at its exit from the cranial cavity. J Anat, 1918: 52: 332-334.
15. Pereira, GAM, Lopes PTC, Santos AMPV, Krebs WD. The morphometric study of the jugular foramen in Southern Brazil human Dry skulls. J.Morphol Sci. 2010:27:3-5.