EVALUATION OF FORAMEN MAGNUM IN DRY HUMAN SKULLS OF DAKSHINA KANNADA DISTRICT

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ABSTRACT

Background: Foramen magnum is situated in the posterior cranial fossa in anteromedian position. It is of great importance in anthropology, forensic medicine and skull base surgeries.

Objective: Calculate anteroposterior (AP), transverse diameter(TD), area of foramen magnum and to observe its various shapes.

Materials and Methods: 50 dry human skull bones of unknown sex was obtained from anatomy department. Measurements were taken by vernier calipers .SPSS 16 was used to calculate mean and standard deviation.

Results: Mean AP diameter was found to be 33.64±0.228 mm, mean TD was 27.040±0.214 mm and Mean area was 714.99±0.844 mm². Oval shaped foramen magnum was the most common variety (46%). 20% was tetrahedral,16% round ,14% egg shaped 2% hexagonal and 2% irregular .

Conclusion: Present study focuses on morphometric and morphological variation in foramen magnum. This will be useful for anatomists , forensic experts , radiologists and neurosurgeons .

KEY WORDS: Foramen magnum, Anteroposterior, Transverse, Diameter, Area.

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Access this Article online					
Quick Response code	Web site: International Journal of Anatomy and Research ISSN 2321-4287 www.ijmhr.org/ijar.htm				
DOI: 10.16965/ijar.2017.381	Received: 3 <mark>1 Ju</mark> l 2017 Peer Review: 31 Jul 2017 Revised: None	Accepted: 05 Sep 2017 Published (O): 01 Oct 2017 Published (P): 01 Oct 2017			

INTRODUCTION

Foramen magnum is situated in the posterior cranial fossa in anteromedian position . It is oval, being wider behind having anteroposterior diameter as its greatest [1]. It is encroached anterolaterally by occipital condyles and its posterior part is thin and semicircular [2].

It contains the lower end of medulla oblongata, meninges, vertebral arteries, spinal accessory nerves, membrana tectoria and apical ligament of dens [1]. Foramen magnum in latin means large aperture in skull. It is of great importance in anthropology, forensic medicine and skull base surgeries [3].

Transcondylar approach is being used frequently to access lesions of cervicomedullary junction and those ventral to brainstem [4]. Vital structures that pass through foramen magnum can undergo compression such as in cases of achondroplasia [5] and brain herniation [6]. Thus variations in dimensions and shape of foramen magnum is of great clinical significance.

MATERIALS AND METHODS

The study was conducted on 50 dry skulls of unknown sex and age obtained from department of anatomy and students studying in K.S Hedge Medical Academy, Mangalore, Karnataka, India.

Fig. 1: Measurement of AP and TD of foramen magnum.



Fig. 2: Various shapes of foramen magnum in present study.



The parameters measured included:

Anteroposterior(AP) diameter of Foramen magnum: Distance between basion and opisthion.

Transverse diameter (TD) of foramen magnum: Maximum diameter at the lateral margins.

All measurements were recorded using vernier callipers to an accuracy of 0.1mm. Two measurements were taken and average of two values were considered as final .

Area of foramen magnum was calculated by the formula [7].

Area(A)= ¼ x 3.14x AP x TD

Mean AP ,TD ,area was calculated .

Mean and standard deviation were calculated using SPSS 16.

The various shapes of foramen magnum was observed by naked eye and were classified as oval ,round tetrahedral, egg shaped.

RESULTS

Dimensions of foramen magnum in the present study is mentioned in Table 1. In the present study we found oval shaped foramen magnum to be the most common variety (46%). 20% was tetrahedral ,16% round ,14% egg shaped 2% hexagonal and 2% irregular.

Table	1:	Dimensi	ons of	foramen	magnum.

N=50	Minimum	Maximum	Mean ± SD
AP (mm)	30	37	33.64 ±0.228
TD (mm)	22	32	27.040±0.214
A (mm ²)	588.7	904.3	714.99±0.844

Table 2: Comparison between present study and other studies regarding commonest variety of shape of foramen magnum.

Study	Shape of foramen magnum	Percentage
Aragao et al [20]	Pear shaped	37.30%
Radhika PM [21]	Oval	40%
Chetan et al [22]	Round	22.60%
Espinoza et al [23]	oval	58%
Present study	oval	46%

DISCUSSION

Due to protected position of foramen magnum and relative more thickness of base of skull it is well preserved in most specimen [8]. Also it is least likely to undergo morphological changes Hence it is used frequently in anthropometry.

In the present study mean AP diameter was found to be 33.64±0.228 mm which is similar to study done by Muralidhar in 2014 (33.4mm) [9], Ganapathy in 2014(33.9mm)[10] and Patel and Mehta in 2014 (33.7mm) [11].

The mean AP diameter in the present study was found to be less than that by Anil Kumar in 2015(36.78mm)[12] Jain D in 2014 (36.2mm) [13] and Burdan in 2012 (37.06mm)[14]. In the present study mean TD was 27.040±0.214 mm which is similar to study conducted by Singh and Talwar in 2013 (27.77mm)[15], Kanchan in 2013 (27.36mm) [16] and Mahajhan D et al in 2013 (27.47mm)[17].

TD in present study was less than that of study by Radhika P.M (29.4mm)[21] and by Ganapathy (28.7mm) [10].

Mean area in our study was found to be 714.99±0.844 mm² which is closer to study done by Singh and Talwar in 2013 (733mm²)[15] ,Muralidhar in 2014(748.6mm²)[9] and Patel and Mehta in 2014 (755.37mm²)[11] Studies which recorded more area than ours were Sampada PK 803.8 mm² [18] and Anil kumar 876 mm² [12].

Foramen magnum presents many important structures passing through it. Variations in shape and size of foramen magnum is thus important for surgeons incase they have to approach this region. Also foramen magnum compressions are noted in conditions such as achondroplasia and cerebral herniation [19].

Various types of shape of foramen magnum is quoted in literature .Various studies show disparity in the frequency of occurrence of different types of shape of foramen magnum. The various shapes described are oval, round, tetragonal, pentagonal, biconvex, hexagonal. Irregular etc. [20].

In the present study we found oval shape of foramen magnum to be the most commonest variety(46%). 20% was tetrahedral ,16% round, 14% egg shaped 2% hexagonal and 2% irregular. We did not come across pentagonal and biconvex varieties. Comparison between present study and other studies regarding commonest variety of shape of foramen magnum is shown in Table 2.

CONCLUSION

Present study focuses on morphometric and morphological variation in foramen magnum. This will be useful for anatomists, forensic experts, radiologists and neurosurgeons. Further studies on the same can be done using CT scan and Magnetic resonance imaging technique using more samples.

Conflicts of Interests: None

ABBREVIATIONS

- **AP** Anteroposterior
- TD Transverse diameter

A - Area

Mm - Millimetre

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How to cite this article:

Remya K, Pretty Rathnakar, Swathi. EVALUATION OF FORAMEN MAGNUM IN DRY HUMAN SKULLS OF DAKSHINA KANNADA DISTRICT. Int J Anat Res 2017;5(4.1):4488-4491. **DOI:** 10.16965/ ijar.2017.381