



MORPHOMETRIC EVALUATION OF SHAPE AND DIMENSIONS OF FORAMEN MAGNUM-A STUDY ON HUMAN DRIED SKULL

Anatomy

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ABSTRACT

Introduction: Foramen magnum is an important land mark present in the base of the skull. It is an oval aperture of the occipital bone in an anteromedian position and leads into the posterior cranial fossa. It contains the lower end of medulla oblongata, meninges, cerebrospinal fluid and vertebral arteries and veins and the accessory nerves, the apical ligament of dens and tectorial membrane. Foramen magnum is in close relationship to vital structures such as brain and spinal cord and acts as a transition area between skull and spine. Configuration and size of foramen magnum is important for assessing craniovertebral relations. Knowledge of normal anatomy and basic craniometric measurements for assessing craniovertebral relations is important to the surgeons operating in this region. Thus, the present study was carried out to provide the morphology and morphometry of foramen magnum of dry human skulls.

Materials and methods: The study was conducted in the department of anatomy at Apollo medical college, Hyderabad. Various parameters are assessed, Shape: by visual assessment. Anteroposterior diameter— from basion to opisthion in midsagittal plane. Transverse diameter— maximum width perpendicular to Anteroposterior diameter

Results:

Morphometry of foramen magnum was studied using 40 dry human skulls from department of anatomy, Apollo medical college, Hyderabad. All the measured parameters were tabulated in Ms-Excel sheet. The mean for Anteroposterior diameter was 3.1cm and for Transverse diameter was 2.51 cm. **Shape:** Majority of foramen magnum were observed to be oval(50%) in shape followed by tetrahedral(22.5%), hexagonal (15%)and pentagonal

Conclusion:

The knowledge of morphology of foramen magnum and its dimensions provide data to the clinicians to understand clinical presentations and planning surgeries for foramen magnum meningiomas and Arnold chiari malformations.

KEYWORDS

INTRODUCTION:

Foramen magnum is an important land mark present in the base of the skull. It is an oval aperture of the occipital bone in an anteromedian position and leads into the posterior cranial fossa. It is oval and wider behind with its greater diameter being anteroposterior. It contains the lower end of medulla oblongata, meninges, cerebrospinal fluid and vertebral arteries and veins and the accessory nerves, the apical ligament of dens and tectorial membrane¹. Foramen magnum articulates with the superior articular facets on the lateral masses of the atlas².

Foramen magnum is in close relationship to vital structures such as brain and spinal cord and acts as a transition area between skull and spine. Configuration and size of foramen magnum is important for assessing craniovertebral relations. Knowledge of normal anatomy and basic craniometric measurements for assessing craniovertebral relations is important to the surgeons operating in this region. The commonest shape of foramen magnum is oval. Shape and dimensions of foramen magnum should be considered during surgery involving craniovertebral junction³. Compression of vital structures that pass through them in case of foramen magnum meningioma, foramen magnum achondroplasia and foramen magnum herniation, should be taken into consideration as the dimensions of foramen magnum vary. Morphometry of foramen magnum helps in determining the gender and consequent identification of a person⁴.

Developmental and acquired craniocervical junction disorders can be determined by knowledge of foramen magnum morphometry. Achondroplasia is a autosomal dominant genetic disorder that causes disproportionate dwarfism and abnormal endochondral bone formation at the cranial base, leads to a narrow cervical spinal canal and a stenotic foramen magnum. Clinical appearances of constant brainstem compression by stenosis of the foramen magnum and related structures are respiratory complications, lower cranial nerve dysfunctions, upper and lower extremity paresis, hypotonia or hypertonia and general motor development delay.

Thus, the present study was carried out to provide the morphology and morphometry of foramen magnum of dry human skulls.

MATERIALS AND METHODS:

Dry skulls of unknown gender were studied. The study was conducted in the department of anatomy at Apollo medical college, Hyderabad. All the skulls which were broken and deformed were excluded from the study. Anteroposterior and transverse diameters of foramen magnum were calculated using vernier caliper and shapes were visually assessed. Foramen index was calculated. Various parameters are assessed.

Shape: by visual assessment

Anteroposterior diameter— from basion to opisthion in midsagittal plane

Transverse diameter—

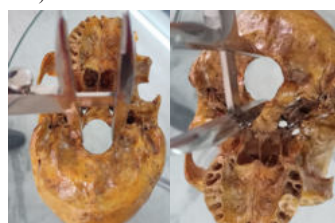
maximum width perpendicular to Anteroposterior diameter

RESULTS:

Morphometry of foramen magnum was studied using 40 dry human skulls from department of anatomy, Apollo medical college, Hyderabad. All the measured parameters were tabulated in Ms-Excel sheet.

The mean for Anteroposterior diameter was 3.1cm and for Transverse diameter was 2.51 cm.

Shape: Majority of foramen magnum were observed to be oval(50%) in shape followed by tetrahedral(22.5%), hexagonal (15%)and pentagonal(12.5%)



**Fig-1 Measuring transverse diameter
fig-2 Measuring Anteroposterior diameter**

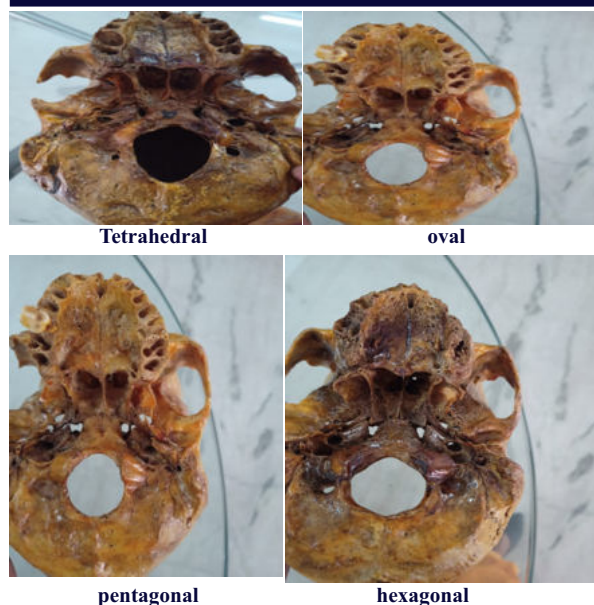


Fig-3 showing different shapes of foramen magnum

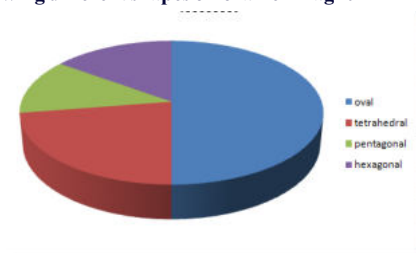


Fig-4 Chart showing different shapes of foramen magnum

DISCUSSION

Morphometry of foramen magnum is important for neurosurgical procedures, forensic, radiological interventions and for evolutionary studies. The variation in the FM shape should be taken into consideration during the clinical and radiological diagnostic procedures and the surgical approach. In the present study also oval shape was most common shape of foramen magnum (50%). Many other studies also reported oval shaped foramen magnum

Comparison of shape of foramen magnum with other studies

Author	Oval	Tetrahedral	Pentagonal	hexagonal	Egg	irregular
Present study	50%	22.5%	12.5%	15%	-	-
Suresh Sharma	35.48%	11.29%	1.61%	9.68%	19.35%	4.84%
Singh et.al	33.33%	16.6%	13.3%	16.6%	13.3%	-
Sampad a pk et.al	58%	8%	1%	3%		10%

Comparison Of Ap and transverse diameters of foramen magnum

Author	Ap diameter(cm)	Transverse diameter(cm)
Present study	3.1	2.51
Suresh sharma et.al	3.4	2.8
Singh et al	3.37	2.82
Raj kumar et al	3.39	2.81

CONCLUSION

The knowledge of morphology of foramen magnum and its dimensions provide data to the clinicians to understand clinical presentations and planning surgeries for foramen magnum meningiomas and Arnold chiari malformations.

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