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A Study of Foramen Magnum

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ABSTRACT

The aim is to study the morphological variations and the morphometric details of foramen magnum in dry adult skull of South Indian origin. Materials and method: 50 dry adult human skulls of unknown sex and of South Indian origin were obtained on variations in appearance and numbers of foramen Magnum were noted. The shapes of foramen Magnum of both sides were analyzed. Results: Out of 56 adult skulls the foramen magnum shapes were determined as an oval in 22 %of cases, round shape in 16%, egg 16%, tetragonal in 12%, irregular in 18%, pentagonal & hexagonal in 8% of the cases. Conclusion: This study gives clinical and anatomical significance of medical practitioners in diagnostic detection of tumors. Detailed morphometric analysis will help in the planning of surgical intervention involving the skull base. This study will be useful for the anatomist, neurosurgeon, radiologist and orthopedic surgeon.

KEYWORDS :

Introduction:

The foramen magnum is a large oval opening in the occipital bone of the skull in human. Foramen magnum is situated in an anteromedian position, and is oval, being wider behind with its greatest diameter being anteroposterior.The foramen magnum lies one third in front and two third behind the line formed by joining tips of mastoid processes. Foramen magnum is the most conspicuous feature of the cranial base. The four parts of occipital bones are forming it. The major structures passing through this large foramen are medulla oblongata with the meninges, vertebral arteries, anterior and posterior spinal arteries and accessory nerves. Many authors have classified foramen magnum depending upon its shapes such as oval, egg shaped, round, tetragonal, pentagonal, hexagonal and irregular. Variations in the shape of foramen magnum are immense importance because of its effects on the vital structures which passes through it, can compress these structures. Hence the present study aims to analyze the foramen magnum and its variations in the shape.

Materials and Methods:

Completely ossified 50 adult human dry skulls of unknown age and sex were taken from the Department of Anatomy of A.C.S Medical College, chennai. The skull samples which were deformed were excluded from the study. All the cranial bases were visually assessed for foramen magnum shape classification. Observations made were tabulated .Each foramen magnum was classified into one of the seven shapes oval, egg, round, irregular, tetragonal, pentagonal and hexagonal.

Result:

Shape of foramen magnum of present study were compared with previous studies

Types of foramen magnum	Murshed et.al (110)	Radhakrishnan s.k (100)	p.chetan (53)	Present study (50) No. and (%)
Oval	9(8.1%)	39(39%)	8(15.1)%	11(22%)
Egg	7(6.3%)	-	10(18.9%)	8(16%)
Round	24(21.8%)	28(28%)	12(22.6%)	8(16%)
Tetra gonal	14(12.7%)	19(19%)	10(18.9%)	6(12%)
Pentagonal	15 (13.6%)	14(14%)	2(3.8%)	4(8%)
Hexagonal	19(17.2%)	-	3(5.6%)	4(8%)
irregular	22(19.9%)	-	8(15.1%)	9(18%)

Discussion:

Foramen magnum is a transition zone between spine and skull and forms a fundamental component in the complex interaction of bony, ligamentous and muscular structures composing the cranio vertebral junction. So it plays an important role as a landmark because of its close relationship to key structures such as brain, spinal cord and vertebral arteries. The shape of the foramen magnum is vital parameter for the manifestation of clinical signs and symptoms, also these have been found to be independent risk factors in patients with craniovertebral anomalies. In the present study, there are various types of foramen magnum based on its shape. It can be oval, egg, round, tetragonal, pentagonal, hexagonal and irregular shape. The types of the foramen magnum based on their shapes were compared with the previous studies. In the present study oval shaped foramen magnum were found more frequently, which was similar to the results obtained. Out of 50 skulls 22% exhibited ovoid foramen magnum. Muthukumar et al. determined the shape of foramen magnum using foramen magnum index and found in 46% of specimens foramen

magnum was considered as oval. Kizilanat and colleagues found that foramen magnum index as ovoid in shape. In a study done by Avic et al, 58 % of specimens were showing ovoid foramen magnum. The shape and morphological variations of foramen magnum are important in neurological interpretation. In an ovoid type of the foramen magnum, the surgeon may find it difficult to explore the anterior portion of the foramen magnum.

Conclusion

In the present study, an effort has been made to classify the foramen magnum based on its shape . These parameters should be taken into consideration during posterior and lateral approaches to the craniovertebral junction by the neurosurgeons and orthopaedician. The preoperative radiological evaluation is important for achieving surgical success along with thorough anatomical knowledge and surgical experience. Hence, it can be concluded that careful radiological analysis of foramen magnum is required before craniovertebral junction surgery to prevent complications such as hemorrhage, atlantooccipital instability and injury to major structures passing through foramen magnum. The morphometric analysis of foramen magnum and its variations is important not only anatomists but also to the anesthetist, neurosurgeons, orthopedicians, radiologists. These variations have become significant because of newer imaging techniques such as computed tomography and magnetic resonance imaging in the field of diagnostic medicine.

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