



A STUDY OF MORPHOMETRY AND SEXUAL DIMORPHISM IN FORAMEN MAGNUM IN ADULT HUMAN SKULLS

Anatomy

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ABSTRACT

Introduction: Foramen magnum is the largest foramen in the skull. It lies in anteroposterior position in posterior cranial fossa. **Material and Methods:** The study sample comprised of 50 adult human skull bones (32 males and 18 females) of confirmed sex available in the Department of Anatomy, ASRAM medical college, Eluru. Each FM shape was classified into 6 types: oval, egg, round, tetragonal, pentagonal, and hexagonal. The APD, TD and circumference (C) were measured with vernier sliding calipers. **Results:** The observations of number and percentages of types of FM, comparisons of anteroposterior diameter, transverse diameter and circumference (C) of FM in male and female skull bones were noted. **Conclusion:** Oval shape was the most common type and pentagonal shape was the least common type in overall skull bones. The mean of APD, TD and Circumference of FM in male and female skull bones were measured.

KEYWORDS

Foramen magnum, APD, TD, Circumference, morphometry, dimorphism.

INTRODUCTION

The foramen magnum is a fundamental component in the interaction of bony, ligamentous and muscular structures composing the craniovertebral junction. Few reports on variations in shape of foramen magnum are available. Different shapes noted are oval, egg, round, tetragonal, pentagonal, and hexagonal.

The study of diameters and importance of variations in shape of the foramen magnum its effects on the vital structures passing through it and also plays an important role in various surgical approaches it may suffer compression.

Various studies have reported that there is a significant difference in the width of the foramen magnum in the different sexes with the predominance of males over females. Also morphological differences of foramen magnum are noticed in different population and this depends on genetic, environment and socio-economic factors.

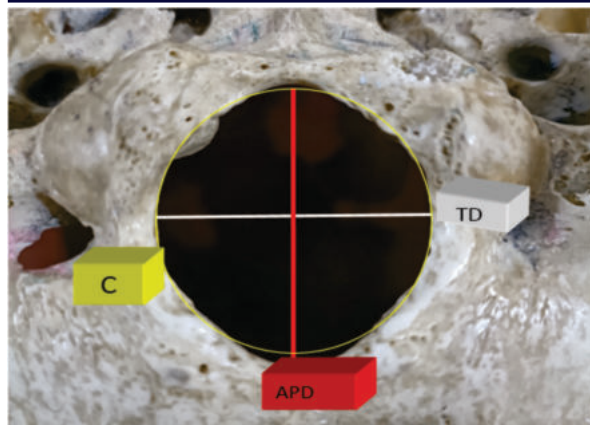
MATERIAL AND METHODS

The study sample comprised of 50 adult human skull bones (32 males and 18 females) of confirmed sex available in the Department of Anatomy, ASRAM medical college, Eluru. The individuals were accepted as "adult" at an age of 18 years and older.



All 50 cranial bases were visually assessed for FM shape classification. Each FM shape was classified into 6 types: oval, egg, round, tetragonal, pentagonal, and hexagonal.

The maximum anteroposterior diameter (APD) was measured from the basion (the midpoint of the anterior margin of the FM) to the opisthion (the midpoint of the posterior margin of the FM). The maximum transverse diameter (TD) was measured between the lateral margins of the FM at the point of greatest lateral curvature. The APD and TD were measured with vernier sliding calipers. The circumference (C) was measured by pressing a narrow strip of paper along the inner margin of the FM the paper strip was then unrolled and measured with sliding calipers.



RESULTS

The no. and percentages of various shapes of the FM in male and female skulls

In male skull bones, oval shape (37.5%) was the most common type and hexagonal (3.1%) was the least common type. In female skull bones, oval shape (33.3%) was the most common type and tetragonal (5.5%) was the least common type.

The number and Percentages of various shapes of FM are shown in the table I.

Types of shapes	Male skulls		Female skulls	
	No	%	No	%
Oval	12	37.5	6	33.3
Egg-shaped	8	25.2	4	22.3
Round	6	18.7	3	16.7
Tetragonal	3	9.3	1	5.5
Pentagonal	2	6.2	2	11.1
Hexagonal	1	3.1	2	11.1
Total	32	100	18	100

The mean APD of FM in male skull bones was found to be 5.33 mm where as in case of female skull bones, it was 3.0 mm. When the two were compared the t- value was found to be 2.3088, which was highly significant ($P < 0.012$).

Comparison of anteroposterior diameter of FM in male and female skull bones

Gender	Mean (mm)	S.D	S.E of Mean	t	P value
Male	5.33	3.81	0.67	2.308	<0.012
Female	3.0	2.58	0.60		

The mean TD of FM in male skull bones was found to be 3.33 mm, where as in case of female skull bones, it was 2.51 mm. When the two were compared the t- value was found to be 1.137, which was highly significant ($P < 0.013$).

Comparison of transverse diameter of FM in male and female skull bones

Gender	Mean (mm)	S.D	S.E of Mean	t	P value
Male	3.33	2.81	0.49	1.137	<0.013
Female	2.51	1.58	0.37		

The mean circumference of FM in male skull bones was found to be 10.05 mm, where as in case of female skull bones 7.54 mm. When then two were compared the t- value was found to be 1.188, which was highly significant ($P < 0.032$).

Comparison of circumference of FM in male and female skull bones

Gender	Mean (mm)	S.D	S.E of Mean	t	P value
Male	10.05	5.12	1.76	1.188	<0.032
Female	7.54	3.15	0.85		

DISCUSSION

Foramen magnum is of particular interest to many fields of medicine. Variations of the shape of FM have got diagnostic, clinical and radiological importance. The dimensions of FM have clinical importance because the vital structures passing through it may suffer compression as in cases of achondroplasia. Oval shape (37.5%) in males and (33.3%) in females was the most common type in the present

study. This was almost similar to the study by Galdames (34.3%). In the present study, the significant sex differences ($P < 0.012$) obtained in the APD of skull bones indicate that the APD of FM is larger in males than in females. In the present study, the significant sex differences ($P < 0.013$) obtained in the TD of skull bones indicate that the TD of FM is larger in males than females. In the present study, the significant sex differences ($P < 0.032$) obtain in the circumference of skull bones indicate that the circumference of FM is larger in males than females. This was almost similar to the study by Radhakrishna SK, Shivarama (43.3%).

CONCLUSION

The present study was undertaken to determine the morphometry and sexual dimorphism of foramen magnum both in human skull bones. Oval shape was the most common type and hexagonal and tetragonal shape was the least common type in overall skull bones. The mean APD of FM in overall, male and female skull bones were found to be 5.33 mm and 3.0 mm respectively. The mean TD of FM in male and female skull bones were found to be 3.33 mm and 2.51 mm respectively. The mean circumference of FM in overall, male and female skull bones were found to be 10.05 mm and 7.54 mm respectively. From the above results concluded that significant sex differences ($P < 0.001$) obtained for all the parameters both in case of skull bones is larger in males when compared to females.

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