DETERMINATION OF SEX USING MORPHOMETRY OF FORAMEN MAGNUM IN SOUTH INDIAN POPULATION

Nijagunappa[1], Suresh Bidarkotimath[2]

[1]Professor, Department of Anatomy, KMCT, Kozhikode, Kerala.
[2]Associate Professor, Department of Anatomy, Faculty of Medicine, Jazan University, Saudi Arabia.

ABSTRACT

Skull morphometry is one of the most important ways to establish a sound base on determination of sex in medicolegal cases. In most of the scenarios the complete set of skeleton is unavailable, so it largely depends on the skull which in a way avoids putrefaction as the vault is strong enough to withstand; 200 skulls (110 males and 90 females) from the Department of Anatomy, KMCT, Kozhikode KUHS University were used for the study.

The skulls were differentiated into males and females based on a standard characteristics mentioned in the text book of Anatomy.

The results demonstrated that sexual dimorphism exists and creates an important area to further study and understand the differences and thus lay a foundation for further researches.

KEYWORDS
Skull, Morphometry, Medicolegal, Putrefaction.

HOW TO CITE THIS ARTICLE: Nijagunappa, Bidarkotimath S. Determination of sex using morphometry of foramen magnum in South Indian population. J Evid Based Med Healthc 2016; 3(5), 147-149. DOI: 10.18410/jebmh/2016/35

INTRODUCTION: Skull morphometry is one of the most important ways to establish a sound base on determination of sex in medicolegal cases. In most of the scenarios the complete set of skeleton is unavailable, so it largely depends on the skull which in a way avoids putrefaction as the vault is strong enough to withstand.

The Foramen Magnum (FM) is one of the primary centers of ossification on the cranial base during growth and development and is located inferior to the sagittal suture, on the cranial base. Characteristics of FM and cranial base have identifying features for sexing.[1-3] Significant craniometry differences exist in the FM between the two sexes within a restricted geographical region and historical period. The FM measurements in males are greater, because they tend to have larger heads than females.[4] Using Computed Tomography scans, it is reported that all dimensions of FM were larger in males than females with the length and width of the right occipital condyle and the width of the FM reflecting the greatest differences.[5] Oval, egg, round, tetragonal, pentagonal, hexagonal, irregular A and irregular B are the different shapes that has been described. Updating temporal changes of skull morphometry is essential for forensic study and anthropologists. Hence, the focus of this research was to evaluate the morphological differences of foramen magnum for sex determination in human skulls of South India.

Submission 02-01-2016, Peer Review 04-01-2016,
Acceptance 14-01-2016, Published 18-01-2016.
Corresponding Author:
Dr. Suresh Bidarkotimath,
Associate Professor, Department of Anatomy,
Faculty of Medicine, Jazan University, Saudi Arabia.
E-mail: 9448347424suresh@yahoo.com
DOI: 10.18410/jebmh/2016/35

AIMS AND OBJECTIVES: To determine the morphometry of foramen magnum in South Indian population and check whether it can help in the determination of sex.

MATERIALS AND METHODS: Two hundred skulls (110 males and 90 females), from the Department of Anatomy, KMCT, Kozhikode KUHS University were used for the study.

The skulls were differentiated into males and females based on a standard characteristics mentioned in the text book of Anatomy.

All the 200 cranial bases were visually assessed for foramen magnum shape classification. Each foramen magnum was classified into one of the four shapes, oval, round, tetragonal, pentagonal (Fig. 1).

Morphometry: Anteroposterior Length (APL) and Transverse Length (TL) of the foramen magnum was measured using digital Vernier Caliper.

APL of the foramen magnum is the distance between opisthion to basion along the mid-sagittal plane.

TL is the maximum distance along the transverse plane. Differences in length and width of foramen magnum between males and females were assessed by t-test.

RESULTS:

	Oval	**Round**	**Tetragonal**	**Pentagonal**
Male	52	28	16	14
Female	42	19	17	12
Total	**94**	**47**	**33**	**26**

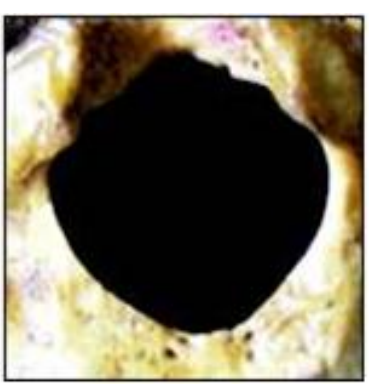
Table 1: Proportions of different shapes in each gender

Gender	APL	TL
Male (110)	35.04±1.36	29.63±0.89
Female (90)	30.28±1.44	27.59±1.61
Correlation significant at p<0.05		

Table 2: Measurements

Anterior Posterior Length (APL), (Transverse Length)

Oval Variety



Round Variety

Tetragonal Variety

Pentagonal Variety

DISCUSSION: The comparison of the morphometric analysis obtained in this study with the results of other studies had the following results: the length (APL) of the foramen magnum of South Indian male skulls (35.04±1.36) was lower than the Brazilian male skulls (35.7±0.29).[6] the Turkish (37.2±3.43).[7] Spanish (36.2±0.3).[8] English populations (35.91±2.41).[9] and the Indian population 21(35.5±2.8).[10]

Similarly APL of the female skulls of the South Indian population was (30.28±1.44) lower than Brazilian population (35.1±0.33) than those of the Turkish (34.6±14 19 213.16), Spanish (34.30±0), Indian (32.0±2.8) and English populations (34.71±1.91).

Regarding the width (TL) of the foramen magnum, the values of the South Indian male skulls (29.63±0.89) was lower than Brazilian 721 male skulls (30.3±0.20), Indians (29.6±1.9), the Turkish 1419 (31.6±2.99), Spanish (31.1±0.3) and English 20 populations (30.51±1.77).

The same measure for the female skulls of the South Indian population (27.59±1.61) was lower than the Brazilian population (29.4±0.23), Indian (27.1±1.6) and Turkish populations (29.3±2.19) and lower than Spanish (29.6±0.3) and English populations (29.36±1.96).

The results demonstrated that sexual dimorphism exists and creates an important area to further study and understand the differences and thus lay a foundation for further researches.

CONCLUSION: Thus it has been proved that there is a sexual dimorphism, which helps in the determination of sex such the need arises. Physical anthropologists may take the study further and determine the regional variations and the fundamental cause of it.

REFERENCES:

1. Holland TD. Race determination of fragmentary crania by analysis of the cranial base. Journal of Forensic Sciences 1986;31(2):719-725.
2. Holland TD. Sex Determination of fragmentary crania by analysis of the cranial base. American Journal of Physical Anthropology 1986;70(2):203-208.
3. Holland TD. Use of the cranial base in the identification of fire victims. Journal of Forensic Sciences 1989;34(2):458-460.
4. Ferreira FV, Rosenberg B, da Luz HP. The foramen magnum index in brazilians. Rev. Fac. Odontol. Sao Paulo 1967;5(4):297-302.

5. Teixeira WRG. Sex identification utilizing the size of the foramen magnum. American Journal of Forensic Medicine and Pathology 1982;3(3):203-206.
6. Manoel C, Prado FB, Caria PHF, et al. Morphometric analysis of the foramen magnum in human skulls of brazilian individuals: its relation to gender. Braz. J. Morphol. Sci 2009;26(2):104-108.
7. Murshed KA, Çiçekçibasi AE, Tuncer I. Morphometric evaluation of the foramen magnum and variations in its shape: a study on computerized tomographic images of normal adults. Turkish Journal of Medical Sciences 2003;33(1):301-306.
8. Herrera CJC. Study of the anatomic metric values of the foramen magnum and its relation to sex. Acta Anatomica 1987;130(4):344-347.
9. Gapert R, Black S, Last J. Sex determination from the foramen magnum: discriminant function analysis in an eighteenth and nineteenth century British sample. International Journal of Legal Medicine 2008;123(1): 25-33.
10. Routal RR, Pal GP, Bhagwat SS. Metrical studies with sexual dimorphism in foramen magnum of human crania. Journal of the Anatomical Society of India 1984;2(33):85-89.