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To Study The Correlation Between Foramen Magnum Index And Cranial Index In Indian Population

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ABSTRACT

Purpose: The cranium base is complex, as well as extremely attractive. The foramen magnum is an important characteristic of cranium base. A transcondylar surgical method requires knowledge of the anatomical features of this region. Foramen magnum index and cranial index were evaluated to establish a correlation, if any, between the dimensions of skull and foramen magnum and an attempt was made to provide a baseline data for better surgical approach in this region so that overall morbidity and mortality could be minimized.

Material and Methods: Various diameters of foramen magnum and of cranium were examined to calculate the two index using an electronic digital sliding caliper in 120 adult North Indian dry skulls of unknown age and gender.

Results: The mean Foramen Magnum Index (FMI) was 78.71±5.94. The mean cranial index was found to be 73.82±7.06.The p-value is >0.05, r = 0.004 (Weak correlation) indicating a weak correlation between two parameters.

Conclusion: The results primarily help the anatomists and a medico-legal expert to find out the cranial index from the Foramen Magnum Index through the provision of base line data. Secondly, it provides an important information to clinicians and neurosurgeons to approach the cranial base with maximum safety and minimal mortality and morbidity.

Key words: Foramen Magnum–Foramen Magnum Index–Variation–Cranial index.

1 INTRODUCTION

The base of the cranium is both complex and extremely attractive [10]. The magnum foramen is a significant feature of the base of the cranium. Anthropology, pathology, forensics and other medical fields are of particular interest [7]. The knowledge of the anatomical features of this region is needed in a trans-condylar surgical method. Therefore, the FM measurements are clinically significant because if there is any pathology in that region, the vital structures that pass through it can suffer compression. It also gives passage to Medulla Oblongata, spinal accessory nerves, vertebral arteries, anterior and posterior spinal arteries, and ligaments such as membrane tectoria and alar ligaments [2, 4]. Condylar resections were contemplated during a variety of surgical procedures to increase sensitivity in this area.

Cephalometry is an important means of identifying race and sex differences for an anthropologist and forensic experts, and is useful to rebuild the contested identity facially. One of the most significant cephalometric metrics is the cephalic index. [13].

Dolichocephalic (≤74.9),

Mesocephalic (75-79.9)

Brachycephalic (≥80)

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2 AIMS AND OBJECTIVES

- To study the anatomic metric values of Foramen magnum (FM)
- To study the metric values of Cranium
- To calculate the foramen magnum index and cephalic index and their correlation.
- To compare the observed metric parameters with those of previous studies.
- This study was an attempt to find out the possible correlations between the parameters in order to provide a baseline data for better surgical approach in this region.

3 MATERIALS AND METHODS

The study was conducted in the Department of Anatomy, Maharshi Vashisht Autonomous State Medical College & Hospital and the Department of Anatomy, KGMU on 120 adult non-pathological dry human skulls of uncertain age and sex. Both parameters were collected by one observer with a visual sliding caliper up to the nearest 0.1 mm only to prevent inter-observer error. Measured parameters were 1. The **head length** (maximum diameter of AP) from the glabella to the inion (Fig.1) and 2. Head breadth as the maximum transverse diameter between two parietal eminences. 3. The Cranial Index was calculated by using the formula as below:

Cranial Index = Maximum Transverse Diameter × 100 /Maximum AP Diameter

4. The maximum antero-posterior and transverse diameters of the FM were measured. **{Fig.2-(a)and (b)}.**

5. FM index was calculated by using the following formula:

Foramen Magnum Index= Maximum Transverse Diameter × 100/Maximum AP Diameter

4 OBSERVATIONS AND RESULTS

Table 1 shows the mean Foramen Magnum Index (FMI) was 78.71±5.94.The minimum and maximum values for FMI were 65.29 and 92.3 respectively. The mean cranial index was found to be 73.82±7.06. The minimum and maximum cranial index were calculated as 62.12 and 91.13 respectively. **Table 2** shows that the p-value is > 0.05, however correlation coefficient (r) was noted as 0.004, indicating a weak correlation between two parameters.

5 DISCUSSION

In the cervical-medullary region the lesions pose a challenge for surgeons and are associated with high mortality and morbidity [3]. Many operational methods and their numerous amendments were developed for a safe and effective approach to those lesions [11]. Janeczek et al in 2011, measured the foramen magnum index as 82.7[9]. As estimated by Deepak S et al, the Foramen magnum index's average value was 84.85 [8]. The average foramen magnum index was 83.81[6], according to Chaturvedi & Harneja. Other authors observed a higher mean values of foramen magnum index than the values noted in this study.

In different ethnic groups, the average cephalic index varies considerably in different areas. Bharati et al. indicated that the head shape is longer (dolichocéphalic) in tropical zones but the head shape is round in temperate zons (mesocephalic or brachycephalic) [5]. The cranial index in the current study showed that the skulls are representing dolicocephalic heads, while, brachycephalic head form has been reported by Adebisi and Oladipo etal.[1,12] in the Ogonis in southern Nigeria. In Deepak S's et al report., the Maharashtrian maximum cranial index was 87.34, minimum 68.42 and the average cranial index as 75.49 [8]. The results were compared to the Shukla A.P study. Who reported an indigenous sequence spectrum of cranial index as 64 to 86 with a mean value of 72.06 [14]. It is in line with the current study where a mean cephalic index of 73.82 was observed. In 2005, the mean cephalic index was found between 75.0-79.9, indicating mesocephalic head as the most typical head shape in both sexes by Raveendranath et al.[13].

In the present study, mean value of Cranial Index was compared with mean value of Foramen Magnum Index. A weak correlation (r= 0.004) was noted between the two parameters and it was not statistically significant (p value $>$ 0.05). Similar findings, i. e., a statistically non-significant correlation was noted between the two parameters in study conducted by Deepak S. et al [8].

Thus, the basis for differences that we observed for various parameters may be contributed to the sample size and racial differences among the different population groups selected by other authors.

If we proceed further with a large sample size, some of the differences that we observed may be better explained.

6 CONCLUSION

This study will help the clinician by providing base line data and to a medico-legal expert to find out the Cranial Index from Foramen Magnum Index.

For cranial volume measurements, the parameters found in this analysis such as cranial width and length can be used to calculate the regression equation, which may be used to recreate the head shape and the scale of a person where only a portion of the head or skull with maximum head breadth is available. Nonetheless, more research works on larger samples will demonstrate the value of this approach for deriving cranial volume and celestial indicators from different ethnic groups.

Table 1. showing the Foramen Magnum Index and Cranial Index (Mean±S.D.)

Parameters	Cranial Index 120	Foramen Magnum Index 120
Minimum	62.12	65.29
Maximum	91.13	92.3
Mean	73.82	78.714
S.D.	7.06	5.94

Table 2. showing Correlation coefficient and p-value Of Cranial Index and Foramen Magnum Index

N= 120	Cranial Index	Foramen Magnum Index
Cranial Index	1	Corr. Coeff (0.004), p- value (0.974)
Foramen Magnum Index	Corr. Coeff (0.004), p- value (0.974)	1

r = 0.004 (Weak correlation)

p> 0.05 not significant

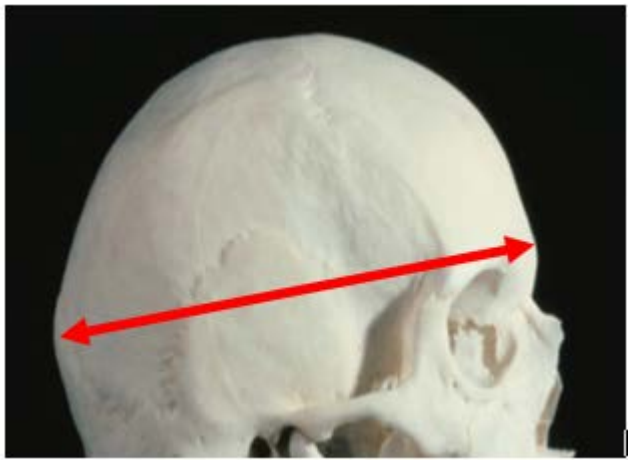

Figure 1. showing line and landmarks for Measurement of Cranial length.

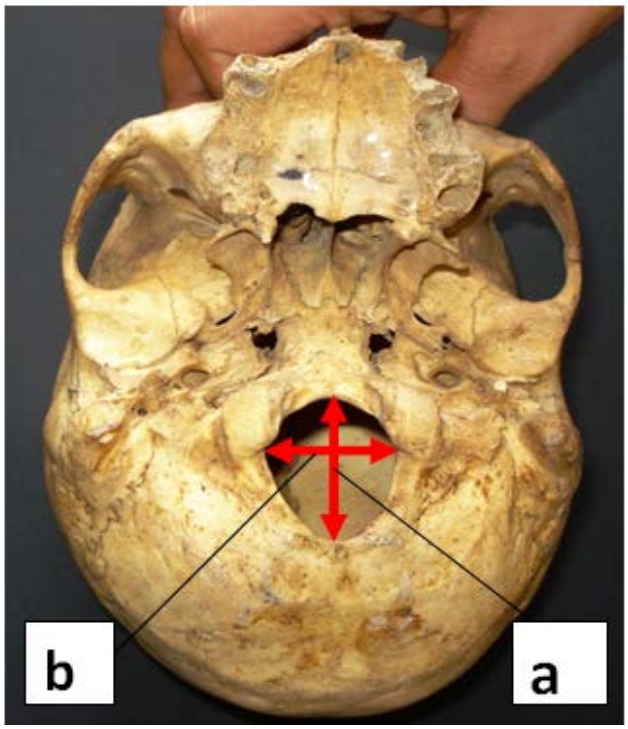

Figure 2. Line(a) showing measurement of max. antero-posterior diameter and line (b) showing measurement of max. transverse diameter.

REFERENCES

[1] Oladipo GS, Paul CW. Anthropometric Comparison Of Cephalic Indices Between The Urhobo And Itsekiri Ethnic Groups Of Nigeria. Global Journal of Pure and Applied Sciences. 2009;15(1):65–67. Available from: https://dx.doi.org/10.4314/gjpas.v15i1.44895.

[2] Natsis K, Piagkou M, Skotsimara G, Piagkos G, Skandalakis P. A morphometric anatomical and comparative study of the foramen magnum region in a Greek population. Surgical and Radiologic Anatomy. 2013;35(10):925–934. Available from: https://dx.doi.org/10.1007/s00276-013-1119-z.

[3] Babu RP, Sekhar LN, Wright DC. Extreme lateral transcondylar approach: technical improvements and lessons learned. Journal of Neurosurgery. 1994;81(1):49–59. Available from: https://dx.doi.org/10.3171/jns.1994.81.1.0049.

[4] Berge RAJ, Bergmann. Variation in size and in symmetry of the foramina of the human skull. Anat Clin. 2001;14:406–413.

[5] Janeczek M, Chrószcz A, Czerski A. Morphological Investigations of the Occipital Area in Adult American Staffordshire Terriers. Anatomia, Histologia, Embryologia. 2011;40(4):278–282. Available from: https://dx.doi.org/10.1111/j.1439-0264.2011.01071.x.

[6] Adejuwon SA, Salawu OT, Eke CC, Odaibo AB, F AW. A Craniometric Study of Adult Humans Skulls from South western Nigeria. The Asian Medical Journal. 2011;3:23–25.

[7] Murshed K. Morphometric evaluation of the foramen magnum and variations in its shape: A Study on Computerized Tomographic Images of Normal Adults. Surg Radiol Anat. 2003;35:925–934.

[8] Shukla AP. A study of cranial capacity and cranial index of Indian skull. Indian Journal of Anatomy. 1966;15:31–35.

[9] Bharati S, Som S, Bharati P, Vasulu TS. Climate and head form in India. American Journal of Human Biology. 2001;13(5):626–634. Available from: https://dx.doi.org/10.1002/ajhb.1101.

[10] Raveendranath V, Manjunath KY. An anthropometric study of correlation between cephalic index, cranial volume and cranial measurements in indian cadavers. Anatomica Karnataka. 2005;1:9–13.

[11] Adebisi SS. Sex identification from the Skull of Hausa / Fulani northern Nigeria. Annal: Afric Med. 2003;2:22–26.

[12] & Nk Rp Chaturvedi, Harneja. A Craniometric Study of Human Skull. Journal of Indian Antomical Society. 1963;12:93–96.

[13] Howale D, Bathija A, Gupta S, Pandit B. Correlation between cranial index and foramen magnum index in dried human skulls. Glob J Anal res. 2014;3:3–6.

[14] Gruber P;.

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