

## Cranial Capacity: A Useful Parameter in Sexing of Crania

Ruta N. Ramteerthakar\*, B.N. Umarji\*\*

### Abstract

The cranial capacity of 310 dried crania (155 males and 155 females) was measured using the Breitingner's mustard seeds technique. The mean cranial capacity for male crania was 1285cc and for female crania it was 1176cc. The sex difference in the mean values of cranial capacity of male and female crania was statistically significant. The knowledge of the cranial capacity is important because it indicates indirectly the brain volume.

**Keywords:** Cranial capacity; Breitingner's; Sex difference.

### Introduction

The correct sex determination of skeleton is a critical requirement in physical anthropology and forensic medicine. Anatomists are often called to give an expert opinion in medico-legal cases pertaining to sex from the available skeleton of the deceased. For this purpose the cranial capacity was studied.

Knowledge of the cranial capacity is important to study and to compare crania of populations with various fundamental differences like racial, geographic, ethnic, and dietary etc.[1] Medically an analysis of cranial capacity exposes another aspect of growth and development which permits critical evolution of unusually large, small or misshapen crania.[2] It is necessary as it indicates indirectly the brain volume and it is important

investigation used for reconstruction of brain or skull in forensic or anthropological studies.[3,4]

### Material and Methods

For the present study Breitingner's (1936) mustard seeds technique was used to measure cranial capacity.

In this technique to begin with all the foramina of the skull were plugged with cotton. Then, the cavity was filled through the foramen magnum with mustard seeds of uniform size by the help of a funnel. The skull was shaken intermittently to fill the cavity entirely. When the skull cavity was filled upto the brim, the seeds were pressed gently with the right thumb at the foramen magnum. Then the seeds were poured into a volumetric jar through a funnel. Reading on the jar was taken. Breitingner (1936) had devised a cylinder with a graduated piston. The reading was taken after gently placing the piston on the seeds in the cylinder. There is increased probability of personal error in taking the measurement by this technique but with proper precautions and controls the error can be reduced to 10cc.[5]

An overview of the methodologies available in the literature has been studied by

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**Authors affiliation:** \*Assistant Lecturer, Dept Of Anatomy, Pad Dr. D Y Patil Medical College, Nerul, Navi Mumbai, \*\*Principal, Krishna Institute of Medical Sciences, Karad.

**Reprints requests:** Ruta N. Ramteerthakar, G- 1, Ganesh Apt., Near Londhe Colony, Pandharpur Road, Miraj - 416410.

E-mail: ruta2262@gmail.com

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Manjunath KY.[6]

**Observations**

Range, mean and standard deviation of the cranial capacity of adult, fully ossified crania was calculated. The identification point was calculated from the range of each measurement. From this percentage of identified bones was calculated. But when nearly 100% accuracy of sexing is required e.g. in medico-legal cases, it is advisable to calculate the maximum and minimum limits by adding  $\pm 3S.D$  to the mean value. This gives the calculated range. It covers 99.75% of the sample from this zone and will be useful also for any other sample from this zone. Demarking points were worked out from calculated range.[7] The percentage of bones identified by each demarking point in both sexes was estimated. The demarking points identify sex with 100% accuracy.[8] The difference observed between means of male and female to know whether it is statistically significant, that is value of 'P' is calculated by

applying 'Z' test.

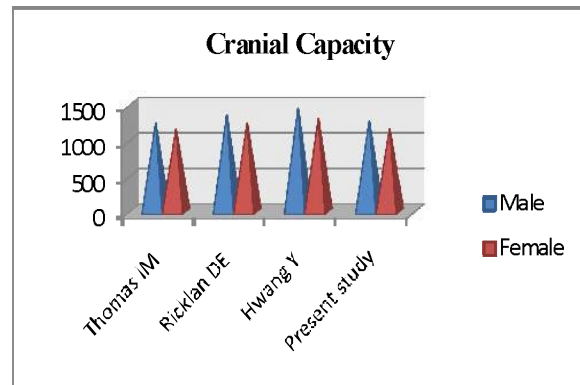
**Discussion**

The present study is compared with the

**Table 2: Discussion table for cranial capacity**

Investigators Side	No. Of Bones		Mean	
	M	F	M	F
Thomas IM <sup>9</sup>	172	173	1257.6	1167.87
Ricklan DE <sup>10</sup>	50	50	1373.3	1251.2
Hwang Y <sup>11</sup>	64	23	1470	1317
Present study	155	155	1285	1176

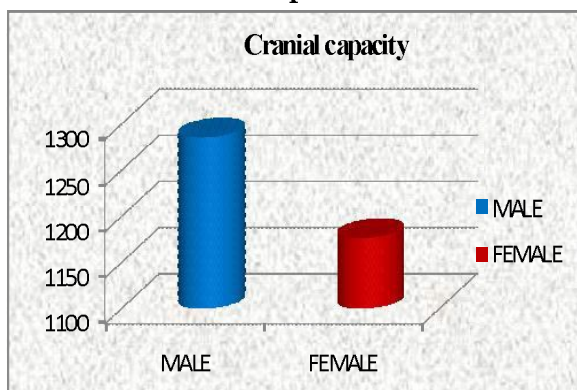
**Graph 2**



**Table 1: Observation table of cranial capacity**

Sr. No.	Details of measurements	Male	Female
1.	No. of bones	155	155
2	Range	1040 - 1600	1000-1440
3	Mean	1285	1176
4	Standard deviation	84.96	71.78
5	Statistical significance	P<0.01	
6	Identification point	>1440	<1040
7	Percentage of identified bones	5.16	1.94
8	Calculated range	1030-1541	961-1392
9	Demarking point	>1392	<1030
10	Percentage beyond demarking point	9.68	0.65

**Graph 1**



studies by Thomas IM. Ricklan DE, Hwang Y. The cranial capacity of the present study in male and female crania is comparable with the study of Thomas IM. While all the other studies by Ricklan DE, Hwang Y showing that the mean values of the cranial capacity are higher in male and female crania than the present study.

## Conclusion

The statistical significant sex difference was found in the mean of cranial capacity in male and female crania. This data will be helpful for opinions in the medico-legal cases regarding the determination of sex.

## References

1. Haack DC And Meiohoff EC. A method of estimation of cranial capacity from cephalometric Roentgenograms. *Am J Phys Anthropol.* 1971; 34: 447-452.
2. Dekaban A and Lieberman JE. Calculation of cranial capacity from linear dimensions. *Anat Record.* 2005; 150: 215-220.
3. Shukla AP. A study of cranial capacity and cranial index of Indian skulls. *J Anat Soc India.* 1966; 15(1) : 31-33.
4. Manjunath KY. Correlation between the cross sectional area of skull base with existing formulae to determine skull volume. *J Anat Soc India.* 2005; 54(2): 51-54.
5. Breitingner E. Zur Messung der Schadelkapazität mit Senkornerm. *Anthrop Anz.* 1936; 13: 140-148.
6. Manjunath KY. Estimation of cranial volume-an overview of Methodologies. *Journal Of Anat Soc of India.* 2002; 51(1).
7. Jit I and Singh S. Sexing of the adult clavicle. *Ind Jr Med Res.* 1966; 54: 557-561.
8. Singh S and Butchi RP. Greater sciatic notch in sex determination. *J Anat.* 1978; 125(3): 619-624.
9. Thomas IM, Janakiram S, Rajangam and Dara SA. Cranial capacity of crania from Karnataka. *J Anat Soc India.* 1980; 12: 135-137.
10. Ricklan DE and Tobias PV. Unusually low sexual dimorphism of endocranial capacity in Zulu cranial series. *Am J Phys Anthropol.* 1986; 71: 285-293.
11. Hwang Y *et al.* Study on the Korean adult cranial capacity. *Journal of Korean Medical Science.* 1995; 10(4): 239-242.

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