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Morphometric analysis of bregma and lambda and presence of any Wormian bone in bregma in north Indian population

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> **Abstract**---Determination of sex from the skeletal remains is of medico legal importance for establishing the identity of an individual. The determination of deceased sex is first step in skeletal analysis since estimation of age at death, race, and stature depends on sex of the deceased. Total 100 adult dry skull were of unknown sex available in Santosh medical college the Department of Anatomy and Government Institute hospital,Gaziabad and of Medical Sciences, Greater Noida, were studied. Distance between bregma and lambda were obtained and presence of any sutural bone was observed in bregma. The results were compared with the present literature. Still there is a demand for further research to validate the distance from bregma to lambda for anthropometric use for particular race and various other surgical procedures.

*Keywords---*bregma, lambda, bregma-lambda length.

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Introduction

In neuroanatomy, bregma and lambda are two locations on the surface of the skull that allows for stereotactic identification of parts of the brain. In neurosurgery or in research, it is important to know where in the brain a surgical intervention will take place. The bregma, an external promontory on the skull, is an important bony landmark for various neurosurgical interventions such as bedside ventriculostomy and various craniotomies[1]. There are two major anatomical markers on the dorsal surface of the brain that are formed when the plates of the skull fuse during development, and these markers are used to identify the location of various anatomical structures of the brain. The anterior most marker is called bregma. Bregma is the spot where three cranial plates, the frontal bone (behind the forehead) and the two parietal bones (the top sides of the head) meet. Bregma is the intersection of the two sutures, the coronal suture and the sagittal suture. The word bregma is of Greek origin, meaning "top of the head." The more posterior marker is called lambda. Lambda is the spot where the three cranial plates, the two parietal bones and the occipital bone (back of the head) meets. Lambda is the upside-down, broad v-shaped point that is indicated by the intersection between the sagittal suture and curved lambdoid suture.

Material and Methods

Present study was done in 100 adult dry skulls of unknown gender, distance between the bregma and lambda (Bregma – Lambda length) was measured using Vernier caliper. Study was done in the Department of Anatomy Santosh medical college and hospital Gaziabad and Government Institute of Medical Sciences,Greater Noida. In the first part of the study distance between Bregma and lambda were obtained. All the values were put in tabulated form and analyzed statistically. The value of range,mean,standard deviation (SD) and calculated range(mean± 3SD) were obtained. In the second part presence of any sutural bone was observed in Bregma.



Figure 1. Lateral view of the skull showing the measurement of Bregma – Lambda length with Vernier Caliper

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Result

The mean bregma-lambda length was found to be 108.67 mm ranging between 101 - 126 mm. The SD was found to be 5.07 mm respectively. The calculated range of mean \pm 3SD was 108.67 \pm 130.32 mm respectively. Presence of any wormian bone over the bregma was not found which was the second objective of the study.

DETAILS OF MEASUREMENT	FINDINGS(mm)
Mean	108.67
Standard deviation	5.07
Range	101 - 126
Calculated range	108.67±130.32

Table 1						
Details	of the	measureme	ent			

Discussion

Formation of wormian bones is associated with insufficient rate of suture closure and regarded as "epigenetic" and "hypostotic" traits (BARBERINI, BRUNER, CARTOLARI et al., 2008). They articulate with the surrounding bones by sutures, the dentations of which are more complex on the external side than on the internal side of the skull. (PARKER, 1905). It was suggested that WBs are not under the direct genetic control, but instead represent secondary sutural characteristics which are brought about by stress (BENNETT, 2005). These bones occur most commonly at the lambdoid sutures and within fontanelles. A great number of measurements of the skull have been proposed and used by different investigators during the past [2]. Martin and Saller used eighty one measures; Howell described seventy; Hrdlicka lists thirty two; Bass gives twenty three[3]. Cotton F in their study of cranial sutures and craniometric points suggests standardizing the distances with regard to age, sex and body size, in order to decrease the variability of the measurement [10].

In the present study, Bregma-lambda length was studied in hundred skulls of unknown sex and the results were statistically significant. Keen et al[1] took the sample size of 50 with a mean for Bregma-lambda length to be 126.5 mm with a range of 112-136 having standard deviation of 6.7 mm. B M Margretts took the sample size of 70 with a mean of 128.39 mm with a range of 114-144 mm having standard deviation 6.76 mm. Hong wei Song with sample size 30 found mean to be 124.4 mm having standard deviation of 9.8 mm. Deshmukh et al studied sample size of 40 with a mean of125 with range of 108-135 mm with standard deviation 7.96 mm.Narsimhamurthy S et al studied 50 skull of known sex and found out the mean to be 124.12 with a range of 112-136 mm having standard deviation of 7.42 mm. For present study we took 100 skull of unknown sex,mean for which came out to be 108.67 mm with a range of 101-126 mm having standard deviation 5.07 mm. The results were compared with those of previousworkers.(Table 2). We studied 100 skulls of unknown sex for presence of

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any wormian bone in bregma and it was found that there is complete absence of any wormian bone in bregma.

S.NO	PREVIOUS	SAMPLE	MEAN(M)	RANGE(R)	STANDARD
	WORKERS	SIZE(N)			DEVIATION(SD)
1.	Keen	50	126.5	112-136	6.7
2.	B M Margretts	70	128.39	114-144	6.76
3.	Hong wei Song	30	124.4		9.8
4.	Deshmukh	40	125	108-135	7.96
5.	Narsimhamurthy	50	124.12	112-136	7.42
6.	Present study	100	108.67	101 - 126	5.07

Table 2 Comparison with the previous authors

Conclusion

Despite the advancements in intraoperative image guided systems, landmarks such as bregma, lambda continue to be indispensable for the neurosurgeon and their information plays a important role. Therefore, localization of the eloquent cortical areas based on superficial landmarks is of utmost importance in cranitomy procedures. Information of measurement of bregma-lambda length will help in achieving the above mentioned procedures for particular race.

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