Research article

Topography and clinical implication of Wormian bones on dry adult human skulls in Telangana region

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(Received: May 2023 Revised: September 2023 Accepted: October 2023)

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ABSTRACT

Introduction and Aim: Wormian bones vary in size, form and quantity and their occurrence is influenced by both genetic and environmental variables. Wormian bones are also seen in foetus ultrasounds during the antenatal period. The occurrence of much more than one sutural bone at the pterion is radiographically significant. The current study aims at the occurrence and topography of Wormian bones in the Telangana region and correlates them to other population groups.

Material and Methods: This study was carried out in 160 dry adult human skulls. Presence of these Wormian bones in sagittal, coronal, and Lambdoid sutures along with bregma, lambda, asterion and pterion were noted. The quantitative data is analyzed, and the images were captured.

Results: Their incidence was 45 % while in 55% skulls they were absent. Their percentage was more in lambdoid suture (16.9%) followed by asterion (12.5%). They were also observed in sutures like coronal (5.6%) and sagittal (1.9%). In pterion their occurrence was 3.12%. In bregma, none of the skull showed Wormian bones.

Conclusion: In the present study, incidence of Wormian bones (Wb's) is 45% with a greater number of Wb's observed in Lambdoid suture (16.9%). In the event of any interventions or investigations on the skull, topography of these bones is to be considered.

Keywords: Wormian bones; pterion; topography; incidence; genetic variables.

INTRODUCTION

The emergence of an extra ossification center that happens in or near the sutures leads to the development of Wormian (sutural) bones. These sutural bones vary in size, form, and quantity (1). The occurrence of Wormian bones (Wb's) is influenced by both genetic and environmental variables. Although Wb's are often found in a small number of people, they have also been linked to numerous autosomal dominant genetic disorders. These are found in the neurocranium of human skulls and have no discernible relationship to their regular ossific centres. Sutures connect Wb's to neighbouring bones, with indentations on the exterior of the skull being more intricate than those on the interior (2). Wb's are also seen in foetus ultrasounds during the antenatal period. The prenatal period, however, was unremarkable, and the infants' growth was normal (3). According to one study, unique bregmatic Wb can be caused by either biomechanically initiated growth or precise nonadaptive genetic change (4). There is no link between stress experienced during the infant stage and Wb's formation in either deformed or ordinary cranium (5).

Wb's do not carry a negative prognosis in and of them, so the prognosis will be determined by the kind and potential consequences of the associated diseases (6). The occurrence of much more than one sutural bone at the pterion is radiographically significant. In the event of pterion area trauma, the sutural bones may be misinterpreted for a skull fracture (7).

The goal of the study is to add to our understanding of Wb's, their prevalence, and their clinical significance. Anthropologists, neurosurgeons, radiologists, and orthopaedic surgeons can all benefit from understanding this variation. The current study aims at the occurrence and topography of Wormian bones in the Telangana region and correlates them to other population groups.

MATERIALS AND METHODS

This study was carried out in the Department of Anatomy on 160 adult dry human bones of Telangana region. Skulls with complete ossification were included while broken and deformed skulls were excluded from our study. In both genders the parameters studied were topography and incidence. Data were tabulated and analysed.

RESULTS

Wb's were observed in 72 skulls (45%) out of 160, while in the remaining 88 skulls (55%) it was absent and is shown in Table 1. More number of Wb's were observed in case of males. Wb's were observed in sagittal (1.9%), pterion (3.12%), lambda (5.0%), coronal (5.6%) and asterion (12.5%). Highest numbers of Wb's were observed in lambdoid suture (16.9%),

while in bregma we didn't observe their presence (Table 2). Topography of Wb's is shown in Fig.1.

Table1: Incidence of Wormian bones

Variables		Gender				Total	
		Male		Female			
		No.	%	No.	%	No.	%
Wormian Bones	Present	51	46.8	21	41.2	72	45
	Absent	58	53.2	30	58.8	88	55
Total		109	100	51	100	160	100

At lambdoid suture

At asterion

at Lambda

Fig.1 : Topography of Wormian bones (from A to C)

Table 2: Percentage and topography of Wormian bones

Variables	Male (n)	Female (n)	Total	%
Lambda	5	3	8	5.0
Lambdoid	21	6	27	16.9
Coronal	7	2	9	5.6
Sagittal	3	0	3	1.9
Asterion	17	3	20	12.5
Pterion	4	1	5	3.12
Bregma	0	0	0	0.0

DISCUSSION

Sutural bones develop because of a disparity among skull developments in their dimensions and forms throughout ontogenesis.

Despite the reason of augmentation, the percentage of Wormian bones accelerates with skull volume. Typically, the proportion of Wormian bones in a normal skull does not surpass two or three, yet they are abundant in hydrocephalus.

Sutural bones articulate with neighboring bones via su tures, and their dentations are more complicated on the exterior of the skull compared to the inside. Less number of sutural bones was in female skulls when compared to that of males. Incidence of Wb's along with sample size in various regions of Indian population is shown in Table3. Our findings coincide with the findings of Durge (8) and close to observations of Shivaleela *et al.,* (12) where the incidence was 45 % and 43.52% respectively. Our findings are lower than a similar study done in the same region by Reddy where incidence was 68% (13). Highest numbers were observed in lambdoid suture in our study similar to findings of Uchewa (16), Asharani (9) and Vijay *et al.,* (7). In our study we did not observe any Wb in bregma and least occurrence was observed in pterion.

Table 3: Comparison of incidence of Wormian bones in the present study with different regions of Indian population

Sl. no	Authors (ref.)	Region	Sample size	Incidence
1	Vijay *et al.,* (7)	Karnataka	200	61.5%
2	Durge (8)	Andhra Pradesh	160	45.0%
3	Asharani (9)	Karnataka	95	25.26%
4	Shankar *et al.,* (10)	Haryana	130	20.78%
5	Rajni *et al.,* (11)	Uttar Pradesh	55	51.0 %
6	Shivaleela *et al.,* (12)	Karnataka	108	43.52%
7	Reddy (13)	Telangana	100	68.0%
8	Kumar *et al.,* (14)	Madhya Pradesh	50	32.0%
9	Goyal *et al.,* (15)	Haryana	147	35.37%
10	Present study	Telangana	160	45.0%

The existence of Wb's at Lambda may be attributed to the growth of the interparietal part of the squamous occipital bone and the highest nuchal lines in membrane, typically from two pairs of ossification centres (17). The appearance of Wb's at the pterion has been reported to cause complications when making burr holes at the pterion (18). The inclusion of such Wb's (intracultural) acts as a safety framework, shielding the brain from injury when the skull is struck (19). Cremin *et al.,* (20) observed significant Wb's in osteogenesis imperfecta and other bone dysplasia. A mismatch of sutural bones between outer and inner table of bone on the same suture has been reported by Natsis *et al.,* (21) in their study. These bones are linked to aberrant central nervous system growth which could be a sign of early identification and therapy in the impacted paediatric population. Reid *et al.,* in their study revealed the possible correlation between Wb's, midline abdominal defects and facial dysmorphism (22). The medical-legal issues involved are in determining the precise mode and nature of the fatality, and thus in analysing vital, perimortal bumps and bruises to develop a diagnostic evaluation between the erstwhile trauma emerged and prompted by combustion (23). Marti *et al.,* observed 445 Wb's among children with signs of focal neurology, convulsive seizures, neurological defects, and headache. They also reported 73 and 96 Wb's in hydrocephalus and skull bone abnormalities respectively (24).

Limitations

We did not evaluate the shape and morphometry of Wb's. Impact of their occurrence was not investigated.

CONCLUSION

In present study, incidence of Wb's is 45% coinciding with the findings of several authors. More number of Wb's were observed in Lambdoid suture (16.9%). It is critical that neurosurgeons and radiologists are conscious of the existence of Wb's in these sutures since they could be misdiagnosed as fractures in instances of head injuries. Prior to accomplishment of craniotomy surgeries, neurosurgeons should review the lambdoid region. The existence of Wb's ought to be considered in the event of any interventions or investigations on the skull. The topography of Wb's could help radiologists and forensic experts distinguish between a cranial fracture or injury from normal suture, thereby excluding the possibility of physical assault and fragile bones.

CONFLICT OF INTEREST

The authors have no conflicts of interest.

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