

MORPHOLOGICAL STUDY OF WORMIAN BONES IN DRIED ADULT HUMAN SKULLS IN TELANGANA

Tallapaneni Sreekanth ^{*1}, Niveditha Samala ².

^{*1} MD, Associate Professor, Department of Anatomy, Shadan Institute of Medical Sciences, Teaching Hospital & Research Center, Peerancheeruvu, Near Arramaisamma Temple, Hyderabad, Telangana, India.

² MD, Assistant Professor, Department of Anatomy, Shadan Institute of Medical Sciences, Teaching Hospital & Research Center, Peerancheeruvu, Near Arramaisamma Temple, Hyderabad, Telangana, India.

ABSTRACT

Aims and Objective: The Wormian bones/Sutural bones are defined as those accidental or intercalated bones found among the sutures of the neurocranium having no regular relation to their normal ossific centers. The present study mainly aims at the number, location of these wormian bones in the adult human skulls of Telangana. The knowledge of Sutural bones is essential for the radiologists and neuro surgeons in their clinical practice.

Materials and Methods: About 40 dry human skulls were collected from the department of Anatomy. 71 dry human skulls were collected from the MBBS Students. Total of 111 dry adult human skulls were examined meticulously for the presence of wormian bones. In respect to their location and number. After the collection of the data it was tabulated and statistically analysed.

Results: According to the present study the incidence of wormian bones was 59 out of 111 adult skulls. The maximum number of wormian bones at lambdoid suture 59 [25 right, 34 left; 53.15%]. The wormian bones were also seen at lambda 9 [8.10%], Pterion 2 [2 right, 0 left; 1.80%], Asterion 3 [1 right, 2 left; 2.7.%], Parieto Temporal suture 5 [3 right, 2 left; 4.5%], Occipitomastoid suture 1 [0 right, 1 left; 0.90%], sagittal suture 1 [0.90%], bregma 1 [0.90%]. In the present study we could not find any wormian bones near Coronal suture.

Conclusion: The present study proves the occurrence of wormian bones in the human skulls is common at the lambdoid suture. Also they may occur in combination at different sites and at different sutures. The knowledge of their existence is essential to the radiologists during the reporting radiographs in head injuries of skull involving fractures and neuro surgeons while performing craniotomies.

KEY WORDS: Sutures, Bregma, Asterion, Pterion, Inca bone.

Address for Correspondence: Dr. Tallapaneni Sreekanth, Associate Professor, Department of Anatomy, Shadan Institute of Medical Sciences, Teaching Hospital & Research Center, Peerancheeruvu, Near Arramaisamma Temple, Hyderabad, Telangana, India.

Mobile No: 70934 49309, 91006 83056. **E-Mail:** anatomysreekanth18@yahoo.com

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INTRODUCTION

Wormian Bones/Sutural Bones are defined as those accidental or intercalated bones found in

the neurocranium of human skulls having no regular relation to their normal ossific centers. Their occurrence in humans is frequent along

the sutures or fontanelles (neonatal Skulls) [1-2]. The very first description of them was by Olaus Worm (Danish Anatomist) in a letter which he wrote to Thomas Bartholin. The word Wormian came into existence after Thomas Bartholin, used the term Ossa Wormiana for these bones described by Olaus Worm [3]. The wormian bones are also called as supernumerary ossicles, intrasutural bones, sutural, intercalary bones [4]. They are found in both sexes in almost similar percentages. They can be found on both halves of the skulls being mostly symmetrical [5]. The wormian bones are of different shapes ranging from round, oval, oblong, triangular, quadrilateral and polygonal. They can vary from 1 mm in diameter to 5x9 cm. They articulate with the neighboring bones by sutures with complex indentations which are more prominent and complex on the outer surface of the skull than on the inner aspect [6]. The capacity of the skull increases with the increase in the number of wormian bones was proposed by Jeanty et al. Also the sutural diastasis induces the formation of ectopic ossification centres [7]. The wormian bones are considered to be markers for various metabolic diseases like Kinky Hair Menkes Syndrome, Cleidocranial Dysostosis, Otopalatodigital Syndrome, Rickets, Primary Acroosteolysis [8]. The wormian bones tend to be lesser in number and smaller in size when they occur as a normal variant. If associated with any skeletal dysplasia they may be bigger in size and larger in number [9].

MATERIALS AND METHODS

In the present study a total number of 111 dry adult human skulls were observed. About 40 dry human skulls were collected from the department of Anatomy. 71 dry human skulls were collected from the MBBS Students of different academic years of Shadan Institute of Medical Sciences, Teaching Hospital and Research Center. After cleaning properly all the 111 dry adult human skulls were examined meticulously for the presence of wormian bones in respect to their location and number. After the collection of the data it was tabulated and statistically analysed. All the deformed skulls were excluded from the study.

RESULTS

The incidence of wormian bones in the present

study is 59 [53.15%] out of 111 skulls. The wormian bones seen at different regions of the human adult skulls are listed in the tables given below. The maximum number of wormian bones occurred at lambdoid suture 59 [53.15%; 25 Right and 34 Left] FIG 1 to 7 and 10, 13. Wormian bones seen at lambda were 9 [8.10%] FIG 4-9. Wormian bones were found at right petrion were 2 [1.80%; 2 Right and 0 Left] FIG 11 and 14 and at asterion were 3 [2.70%; 1 Right and 2 Left] FIG 15-17. Along the Parieto Temporal Suture 5 [4.5%; 3 Right and 2 Left] FIG 11-13] and at occipito mastoid suture 1 [0.9% ; 0 Right and 1 Left] FIG 7 wormian bones were seen. 1 [0.9%] FIG 18 wormian bone was seen at Bregma. Along the Sagittal Suture 1 [0.9%] FIG 10 was seen. The internal surface of the skull showed the margins of the the wormian bones as faint lines when compared to the outer surface FIG 19. In the present study no wormian bone was seen at coronal suture. About 52 [46.84%] skulls did not show any wormian bones.

Table 1: Total incidence of Wormian Bones in the present study. (Total number of dry adult human skulls – 111).

WORMIAN BONES	NUMBER [%]
Present	59 [53.15%]
Absent	52 [46.84%]

Table 2: Incidence of Wormian Bones at different areas of skull.

LOCATION	RIGHT	LEFT	TOTAL [%]
Lambdoid Suture	25	34	59 [53.15%]
Parieto Temporal Suture	3	2	5 [4.50%]
Occipito Mastoid Suture	0	1	1 [0.90%]
Asterion	1	2	3 [2.70%]
Pterion	2	0	2 [1.80%]
Bregma	1		1 [0.90%]
Lambda	9		9 [8.10%]
Coronal Suture	0		0 [0%]
Sagittal Suture	1		1 [0.90%]

Fig. 1, 2 & 3: Wormian Bones [Indicated By Black Arrows] At Lambdoid Suture [Indicated By White Arrows].

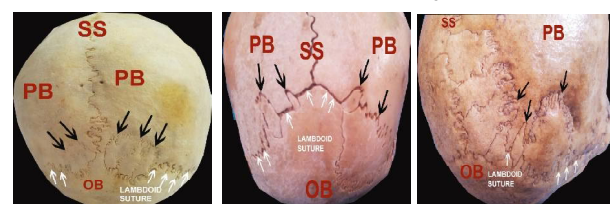


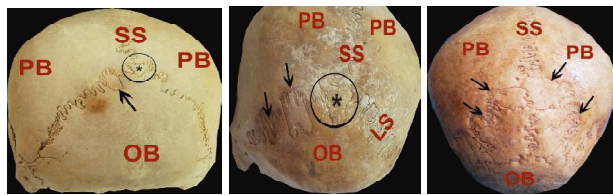
Fig. 1

Fig. 2

Fig. 3

PB – PARIETAL BONE
SS – SAGITTAL SUTURE
OB – OCCIPITAL BONE

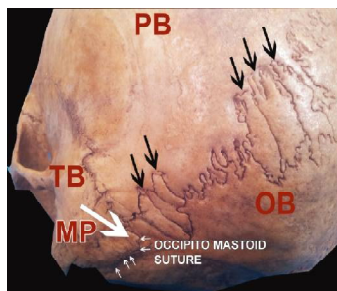
Fig. 4, 5 & 6: Wormian bones [indicated by black arrows]at lambdoid suture and lambda [indicated by asterisk in a circle].



PB – PARIETAL BONE
SS – SAGITTAL SUTURE

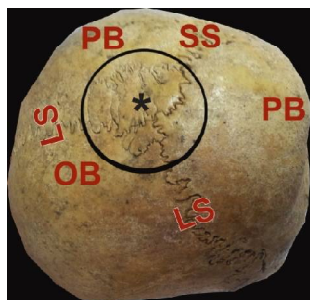
OB – OCCIPITAL BONE
LS – LAMBDROID SUTURE

Fig. 7: Wormian bones [indicated by black arrows, large white arrow]at lambdoid suture and occipito mastoid suture [indicated by white arrows].

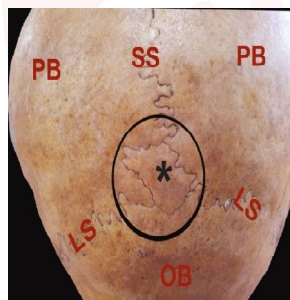


PB – PARIETAL BONE
TB – TEMPORAL BONE
MP – MASTOID PROCESS
OB – OCCIPITAL BONE

Fig. 8 & 9: Wormian bones [indicated by asterisk in the circle]at lambda – inca bone.

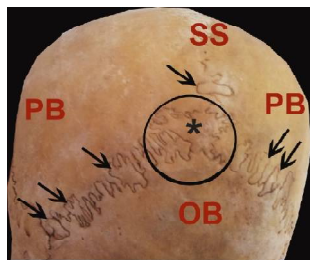


PB – PARIETAL BONE
LS – LAMBDROID SUTURE



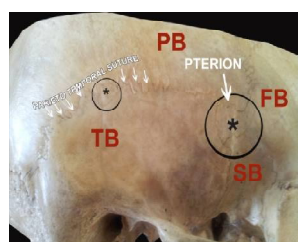
OB – OCCIPITAL BONE
SS – SAGITTAL SUTURE

Fig. 10: Wormian bones [indicated by black arrows]at lambda, lambdoid suture and posterior half of saggital suture.



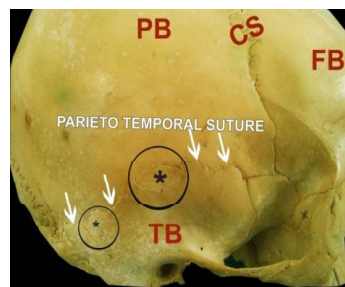
PB – PARIETAL BONE
SS – SAGITTAL SUTURE
OB – OCCIPITAL BONE

Fig. 11: Wormian bones [indicated by large white arrow]at right pterion [indicated by asterisk in circle]and right parieto temporal suture [indicated by small white arrows].



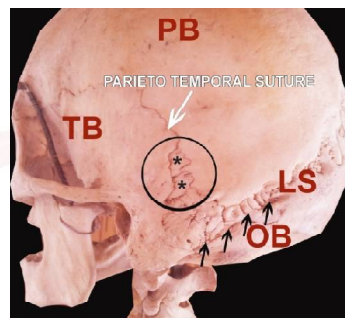
PB – PARIETAL BONE
TB – TEMPORAL BONE
FB – FRONTAL BONE
SB – SPHENOID BONE

Fig. 12: Wormian bones [indicated by asterisk in circle] at right parieto temporal suture [indicated by white arrows].



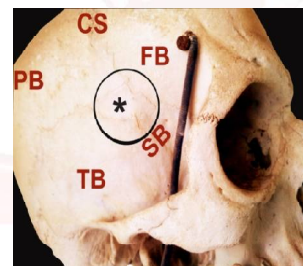
PB – PARIETAL BONE
TB – TEMPORAL BONE
FB – FRONTAL BONE
CS – CORONAL SUTURE

Fig. 13: Wormian bones at left parieto temporal suture [indicated by asterisk in circle] and lambdoid suture [indicated by arrows]. parieto temporal suture [indicated by white arrow].



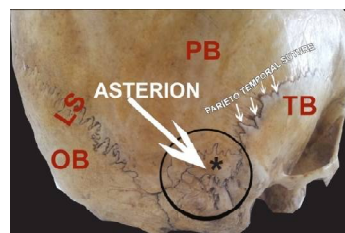
PB – PARIETAL BONE
TB – TEMPORAL BONE
LS – LAMBDROID SUTURE
OB – OCCIPITAL BONE

Fig. 14: Wormian bone [indicated by asterisk in circle] at right pterion.



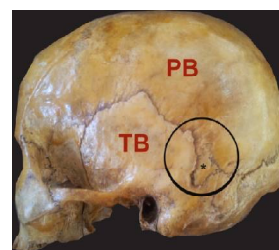
PB – PARIETAL BONE
TB – TEMPORAL BONE
CS – CORONAL SUTURE
SB – SPHENOID BONE
FB – FRONTAL BONE

Fig 15: Wormian bone [indicated by asterisk in circle] at right asterion [indicated by large white arrow].

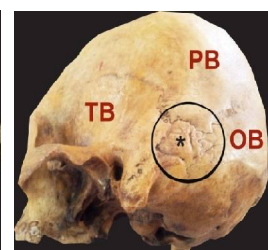


PB – PARIETAL BONE
TB – TEMPORAL BONE
LS – LAMBDROID SUTURE
OB – OCCIPITAL BONE

Fig. 16 & 17: Wormian bones [indicated by asterisk in circle] at Left asterion.



PB – PARIETAL BONE
TB – TEMPORAL BONE



TB – TEMPORAL BONE
OB – OCCIPITAL BONE

Fig. 18: wormian bone [indicated by asterisk in circle] at bregma [indicated by large white arrow].

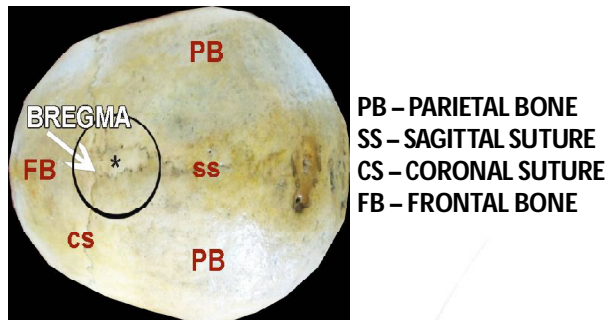
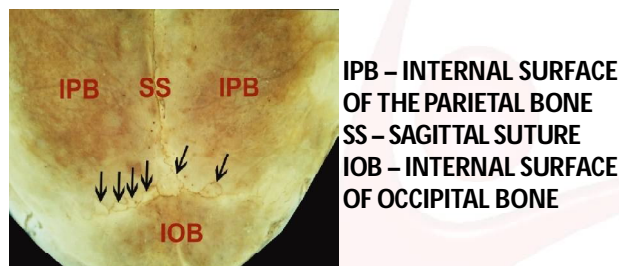


Fig. 19: Internal surface of calvarium showing faint margins of the wormian bones [indicated by black arrows] at lambda and lambdoid suture.



DISCUSSION

In the present study which was conducted on 111 human skulls, the wormian bones were seen in 59 skulls, at almost all the different regions of the skull except at the coronal suture. The incidence of the wormian bones was maximum 53.15% at the lambdoid suture of the skull. Uday kumar [9] Shivaleela C [10] Brasilli P [11], Manjula Patil [12] have reported the incidence of wormian bones to be 56.63%, 33.33%, 50.55% and 60% respectively. The results of the present study coincides with the studies conducted by uday kumar. However, the reported incidence of the wormian bones at the lambdoid suture is much higher than reported by Shivaleela C. The radiologists interpreting the skull radiographs or C.T. Scans can be misled by presence of so many wormian bones. The head and neck surgeons can be confused while performing posterior craniotomies due to these numerous wormian bones which can mimic a fracture.

The incidence of the wormian bones at lambda is 8.17%. Uday kumar [9] Shivaleela C [10] Divyesh patel [13], reported the incidence to be 19.46%, 8.33%, 0.07%. The results of the present study are coinciding with that of shivaleela C. the incidence of wormian bones at lambda reported by divyesh patel is very less

compared to the present study. Much higher incidence was reported by udaykumar.

The incidence of wormian bones in the present study at pterion was 4.5%. The epipteric bones occur unilaterally at the right pterion. Uday kumar [9] Shivaleela C [10] Manjula Patil [12] and Divyesh patel [13], reported the incidence to be 5.30%, 1.85%, 12.22%, 0.03%, respectively. Nayak SB [14] reported presence of 3 unusual wormian bones at right pterion in a single case report. Raja sekhar Katikireddi [15] reported the incidence of epipteric bones to be 4% where as saxena et.al [16] reported them to be 11.79%. Mwachaka PM et.al [17] reported the incidence of epipteric bones as 6.7% after studying 90 human skulls. The findings of the present study is near to the incidence reported by uday kumar and Rajasekhar. The presence of epipteric bones at pterion can cause complications while performing burr holes by the neuro surgeons.

The incidence of the wormian bones at asterion is 2.70% Uday kumar [9] Shivaleela C [10] and Divyesh patel [13], reported the incidence at asterion to be 40.70%, 11.11% and 18.5%. In the present study the wormian bones the bilateral occurrence at asterion reported is much less compared to the previous authors.

The incidence of the wormian bones at the occipitomastoid suture are 4.5% and 0.9% respectively in the present study. Uday kumar [9] and Divyesh patel [13], reported the incidence of wormian bones at parietotemporal suture and occipitomastoid suture to be 4.42%, 6.19% and 0.07%, 0.03% respectively. Shivaleela C [10] reported the occurrence of wormian bones at parietotemporal suture to be 3.7%. The wormian bones occurring at parietotemporal suture in the present study is coinciding with Uday Kumar. The incidence of the occipitomastoid suture in the present study is different from both the authors. The incidence of wormian bones at sagittal suture is 0.9% and at coronal suture is 0% in the present study. Shivaleela C. [10] reported the incidence to be 0.92% at sagittal and 2.78% at coronal suture respectively. Padmaja Vasi [18] reported the unilateral left-sided wormian bone along the coronal suture. The same skull also had multiple sutural bones at lambdoid suture. According to both Uday kumar [9] there was no wormian

bone seen in the sagittal and coronal suture. and Divyesh patel[13] reported the incidence of a single wormian bone 0.03% at the coronal suture but no wormian bones were reported by him at the sagittal suture

The incidence of wormian bones at bregma is 0.90% in the present study. Abraham Ratna Joseph nayakanati [19] studied 500 skulls and reported the incidence of wormian bone at bregma to be 1%. it is very much coinciding with the present study. Sateesha Nayak reported a rare case where in a wormian bone was seen at bregma along with the metopic suture joining the two halves of the frontal bone. In the present study a single skull with wormian bone at bregma was found but without any metopic sutures.

CONCLUSION

The present study supports the existing literature that the occurrence of wormian bones is more frequent at the lambdoid suture and frequent along the left half of the skulls. Greater the length of sutures, greater the number of wormian bones is proved in this study. The incidence of the wormian bones is much less along the coronal and sagittal sutures. In the present study wormian bones were seen at pterion, asterion and bregma. No metopic sutures were seen in any of the skulls. The knowledge of these wormian bones is essential for radiologists, neurosurgeons, neuro-anatomists. If the fracture of the skull is misinterpreted as a sutural/wormian bone making the patient loose the appropriate treatment on dot in cases of trauma / accidents can lead to iatrogenic injury. The presence of multiple wormian bones along the lambdoid suture can complicate the posterior craniotomies done by the neuro surgeons.

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Conflicts of Interests: None

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