

ORIGINAL ARTICLE

MORPHOLOGICAL STUDY OF WORMIAN BONES IN DRIED HUMAN SKULLS

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ABSTRACT

Background: Wormian bones may be defined as those accidental bones found in the cranium having no regular relation to their normal ossification centre. They are associated with cranial and central nervous system abnormalities. Knowledge of these bones is important for anthropologists, forensic experts, radiologists, orthopedic and neurosurgeons to avoid misleading for multiple fractures of the skull.

Materials and Methods: Adult dry human skulls (n= 27) of unknown age and sex available in the Department of Anatomy, Govt. Medical College, Surat were included in the study.

Result: Overall incidence of wormian bone was 44.4%. They occurred more frequently at lambdoid suture (48.14%). Wormian bones were also present at asterion (18.5%), along the coronal suture (0.03%), along the parieto-temporal suture (0.07%), along the occipito-mastoid suture (0.03%), and at pterion (0.03%). Wormian bones were found 48.1% on left half of skull and 37.03% on right half of skull.

Conclusion: The Wormian bones were more frequent at the lambdoid suture. The clinical importances of these variant bones were emphasized with relevant review of literature.

Key words: Skull, Wormian bone, Sutural bone, Coronal suture, Lambdoid suture, Asterion, Pterion.

INTRODUCTION

Wormian bones may be defined as those accidental or intercalated bones found in the cranium having no regular relation to their normal ossification centres. They are frequently occur in man and generally occupy the sutures and/or fill fontanelles of the neonatal skull^{1,2}. The alternative names of wormian bones include Schaltknochen (Leichner-Weil, 1964), Supernumerary ossicles, Intercalary, and Sutural & Intrasutural bones³. They are unnamed bones because they vary from person to person in number and shape. Wormian bones are found in both sexes in similar percentages as well as in both sides of the skull, being predominantly symmetrical⁴. They are formed as a result of alterations in the normal formation of the flat bones of the skull and are usually regarded as normal variants. The first description of wormian bones is attributed to Paracelsus (1460 to 1541 CE [Common Era]); However, "Wormian

bone" is named after Olaus Worm, a Danish anatomist who described them in a letter to Thomas Bartholin in 1643. In turn Bartholin named them Ossa Wormiana, their present name^{5,6}.

Significance of Wormian Bones

In the 16th century, the anatomists Andernach and Vesale were the first to associate wormian bones with cerebral disorders⁷. Wormian bones are the markers for various diseases and are important in the primary diagnosis of brittle bone disease, osteogenesis imperfecta⁸. Wormian bones also seen in Pyknodysostosis, Rickets, "Kinky hair" Menke's syndrome, Cleidocranial dysostosis, Hypothyroidism, & Hypophosphatasia, Otopalatodigital syndrome, Primary acro-osteolysis (Hajdu-Cheney syndrome) and Down's syndrome⁹. Knowledge of these bones is important for anthropologists, forensic experts,

radiologists, orthopedic and neurosurgeons to avoid misleading for multiple fractures of the skull.

Aim of the study was to study morphology and to determine the incidence of wormian bone in dry adult human skull.

MATERIALS AND METHODS

Well preserved 27 dry human adult skulls of the Department of Anatomy, Govt. Medical College, Surat were included in the study. The various sutures were examined systematically for the presence or absence of wormian bones. The number of wormian bones per skull and also the location of the wormian bones along the coronal, sagittal, lambdoid, occipito-mastoid, parito-temporal suture and at bregma, lambda, pterion, asterion were noted. The findings were documented and the photographs of relevant wormian bones were taken using a digital camera.

RESULT

As per table no.1 in present study we found wormian bones in 12 skulls out of total 27 skulls. So overall incidence of wormian bones is 44.40% and also wormian bones were present on left half of the skull in 13 skulls out of 27 skulls that is in 48.10% and over right half of skull in 10 skulls out of 27 skulls that is in 37.03%.

Table1: Overall Incidence of Wormian Bone (N=27)

Wormian Bone	No. (%)
Present	12 (44.40)
Absent	15 (55.60)
Right Half	10 (37.03)
Left Half	13 (48.10)

As per the table no.2 we found >5 wormian bones in 1 skull(0.03%), 3 wormian bones in 2 skulls(0.07%), 2 wormian bones in 3 skulls.

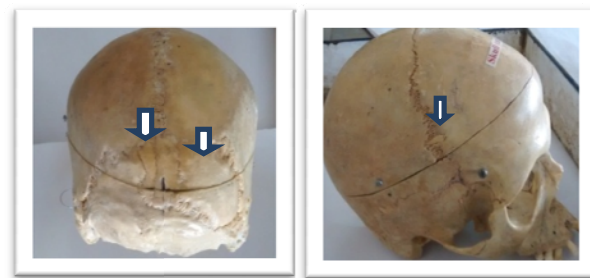
Table 2: Number of Wormian bone (N=27)

Wormian bone No.	No. (%)
0	15 (55.60)
1	6 (22.20)
2	3 (11.10)
3	2 (0.07)
4	0
5	0
>5	1 (0.03)

As per the table no.3, We found maximum no. wormian bones at lambdoid suture that are 13(48.14%) in no. and out of 13 wormian bones 6 are found on left half of skull and 7 are on right half of the skull. We also found wormian bones at asterion 5 in no.(18.50%), at lambda and parito-temporal suture 2 in no.(0.07%) and at occipito-mastoid suture and pterion 1 in no.(0.03%). We don't found any wormian bones at saggital suture and bregma.

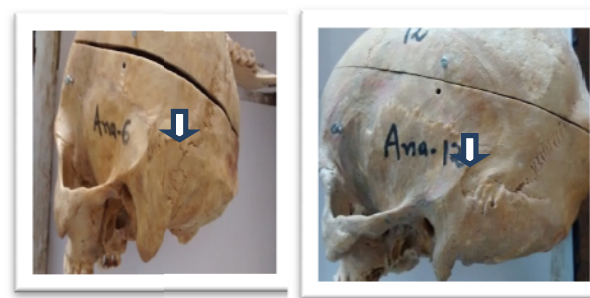
Table 3.Incidence of Wormian Bone At Different Location (N=27)

Location of Wormian Bone	Lt	Rt	Total. (%)
Coronal Suture	0	1	1 (0.03)
Lambdoid Suture	6	7	13 (48.14)
Saggital Suture	0	0	0
Parito-temporal Suture	2	0	2 (0.07)
Occipito-mastoid Suture	1	0	1 (0.03)
Asterion	3	2	5 (18.50)
Pterion	1	0	1 (0.03)
Bregma			0
Lambda			2 (0.07)



Wormian bone at Lamb- Wormian bone at Coronal
doid suture suture

Figure 1: Wormian bone



Wormian bone at Occi- Wormian bone at Parito-
pito-Mastoid suture Temporal suture

Figure 2: Wormian bone



Wormian bone at Asterion Wormian bone at Lambda

Figure 3: Wormian bone

Table 4: Incidence of wormian bones in different populations according Brothwell (1963)

Population	Incidence (%)
Chinese	80.32
German	75
Australian	72.58
Iron Age/Romano-British	71.03
Melanesian	64.15
Lachish	63.41
Anglo-Saxon	55.56
India(Tumkur, Karnataka)	43.52
India(Bangalore, Karnataka)	52.22
India (Gujarat-present study)	44.04

DISCUSSION

Wormian bones are a common occurrence in the human skull. In the present study (100%) reported the prevalence of wormian bones.

In the present study, incidence of wormian bones was found to be 44.4%. They occur most frequently in the lambdoid suture. In our study the most common site of occurrence of wormian bones was at the lambdoid suture 13 in no(48.14%) which correlates with the other studies. The next most common site of wormian bone is the Asterion 5 in no (18.5%), But in other studies, Pterion ossicle, which has a high incidence among Indians. We also observed wormian bones at parieto-temporal suture 2 in no (0.07%) cases, at coronal suture 1 in no (0.03%), at occipito-mastoid 1 in no(0.03%). No wormian bones were noted at sagittal suture in case. Wormian bones were noted at sagittal suture in 1 case (0.92%) case by Sanjay et al¹². A study by Saxena et al. showed that 11.79% of Indian skulls and 5.06% Nigerians skulls had epipteric bone¹². In the present study we observed wormian bones at pterion in 1 cases (0.03%) only. There can be another bone called the preinterparietal bone or inca bone at the lambda 2 in no (0.07%). Other studies in south India done by Shivaleela C. at Sri Siddhartha medical college, Tumkur, Karnataka shows incidence of wormian bones 43.52%¹³. Study done by Manjula Patil at St. John's Medical College, Bangalore, Karnataka shows incidence of wormian bones 52.22%¹⁴. It was reported that the presence of wormian bones at the pterion may lead to complications in making burr holes at the pterion¹⁵. It is problematic if the fracture of skull is misinterpreted as a Wormian bone and the patient may lose the appropriate treatment at a right time. Hence the basic knowledge about these accessory bones is important for the doctors in day to day clinical practice.

LIMITATIONS OF THE STUDY

Our study had limitations that should be acknowledged. As our sample size was small, this may partially account for weak association about occurrence of wormian bones in our study.

CONCLUSION

The present study indicates that wormian bones may be present in the coronal, sagittal sutures and at pterion, asterion in addition to the usual site in the lambdoid suture. It is important for neurosurgeons and radiologists to be aware of the presence of wormian bones in these sutures as they may be mistaken for fractures in cases of head injuries. Therefore, this report may be useful for neurosurgeons, radiologists, and anthropologists.

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