

WORMIAN BONES: STUDY ON DRY HUMAN SKULLS IN NORTH KARNATAKA REGION

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ABSTRACT

Aims and Objectives: Wormian bones are the accessory bones which are usually not present in all normal skulls. This study mainly aiming at the number, location of these accessory bones on human dry skulls. These bones should not be confused with fractures of skull.

Material and Methods: 200 dry skulls were examined with a naked eye. These skulls were collected from department of Anatomy, Students of 1st MBBS and Dental Students. All the skull were cleaned, dried properly and were looked for the presence of wormian bones in respect to its location, number. The data collected was tabulated and statistically analysed.

Results: In the present study, the incidence of wormian bones was seen in 113[56.5%] out of 200 skulls. We found maximum no. of wormian bones at lambdoid suture [64 skulls, 56.63%]. We also found such bones at Pterion[5.30%], Asterion[40.70%], ParietoTemporal suture[4.42%] and Occipitomastoid suture[6.19%] of skulls. In our study, we didn't find any accessory bones at saggital, coronal suture and near bregma.

Conclusion: This study proved that presence of wormian bones is not uncommon. Frequently seen at the lambdoid suture. Such presence of sutural bones should not be confused to fractures. Neurosurgeons should keep in mind about such bones before performing craniotomy surgeries.

KEY WORDS: Cadaveric skulls, Extra bones, Sutures, Fontanella.

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INTRODUCTION

Wormian bones may be defined as those accidental bones which are present in the skull. Such bones do not seem to have any relation with normal bones of the skull [1]. They are more frequently seen with human skulls and/or fill fontanellas of the neonatal skull [2,3]. These wormian bones do not follow a regular pattern and are unnamed as they vary in size shape and number from skull to skull. Literature names such accessory bones as supernumerary ossicles, intercalary, sutural and intrasutural

bones [4]. Such incidence in both sexes and sometimes in both sides of the skull and sometimes seen predominantly symmetrical [5]. The first description was given by Paracelsus [1460 to 1541 CE] but actually the word Wormian was coined after Danish Anatomist Olaus Worm who described in his studies and wrote a letter to his teacher Thomas Bartholin. Bartholin named such bones as Ossa Wormiana in 1643. Hence such name came into existence [6,7].

According to Jeanty et al [7] the number of wormian bones increases with the capacity of

the skull regardless of the cause of enlargement. A similar relationship exists with the total length of sutures, greater the length greater the number of wormian bones and also suggested that sutural diastasis induces the formation of ectopic ossification centres [7]. In 16th century, the Anatomist Andernach and Vesale were the first to associate wormian bones with cerebral disorders [8]. Wormian bones are the markers for various metabolic diseases like Rickets, Kinky Hair Menkes Syndrome, Cleidocranial Dysostosis, Hypothyroidism, Otopalatodigital Syndrome, Primary Acroosteolysis [Hajducheney Syndrome] and Down's Syndrome [9]. When the wormian bones occur as a normal variant, they tend to be smaller and lesser in number than when they are associated with skeletal dysplasia [10].

It is a very important point to be noted that it can mislead the fractures of skull and radiologist; neurosurgeons should keep in mind about such occurrence of accessory bones before doing craniotomy surgeries. The present study is also aimed at identifying such supernumerary bones of the skull and reports them timely for further interest in the literature.

MATERIALS AND METHODS

Totally 200 skulls were collected for the study. 50 skulls from the Department of Anatomy, 150 skulls from the students of 1st MBBS and 1st BDS of Navodaya Medical and Dental College, Raichur, Karnataka. These skulls were cleaned properly and meticulously observed for the presence of wormian bones. The place of occurrence and no. of wormian bones were also looked for. Any deformed irregularly cut skulls were excluded from the study. The data was tabulated and compared with earlier authors.

RESULTS

In the present study, the incidence of wormian bones was seen in 113 [56.5%] out of 200 skulls. We also found maximum no. of wormian bones at lambdoid suture [64 skulls, 56.63%]. We also found such bones at Pterion [5.30%], Asterion [40.70%], Parietotemporal suture [4.42%] and Occipitomastoid suture [6.19%] of skulls. In our study we didn't find any accessory bones at Saggital, Coronal suture and near Bregma. So in our study, occurrence of wormian bones is seen more at lambdoid suture and asterion when

compared with other regions of skull.

Fig. 1: Showing Pterion and presence of wormian bone.

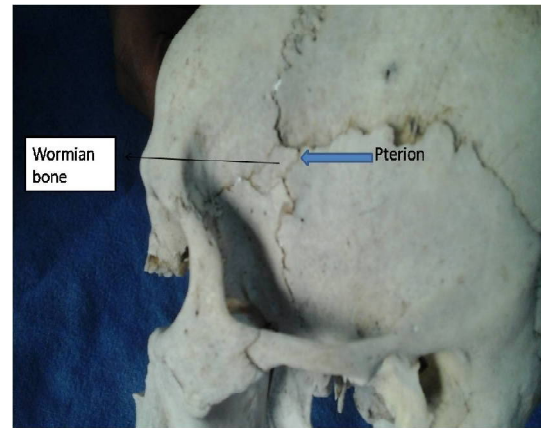


Fig. 2: Showing Lambda with wormian bones. Also showing lambdoid suture with wormian bones.

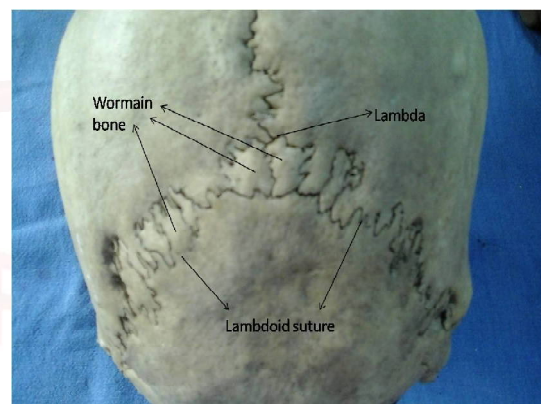


Fig. 3: Showing Asterion with wormian bones.

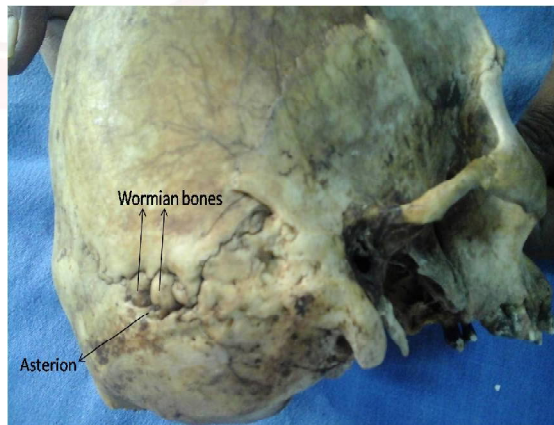


Fig. 4: Showing Lambdoid suture with Inca bone.

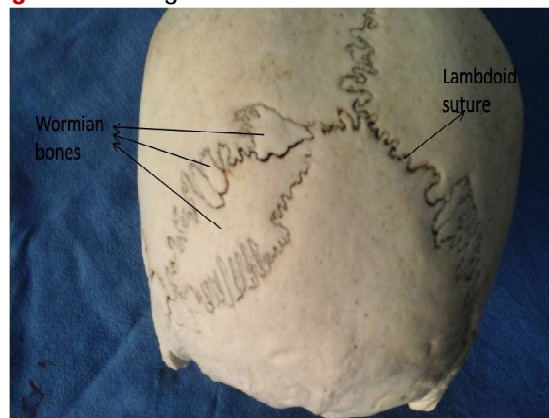


Fig. 5: Showing wormian bone at Occipitomastoid suture.

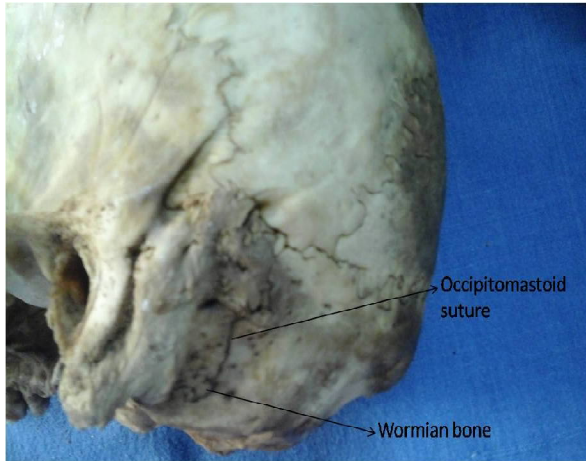
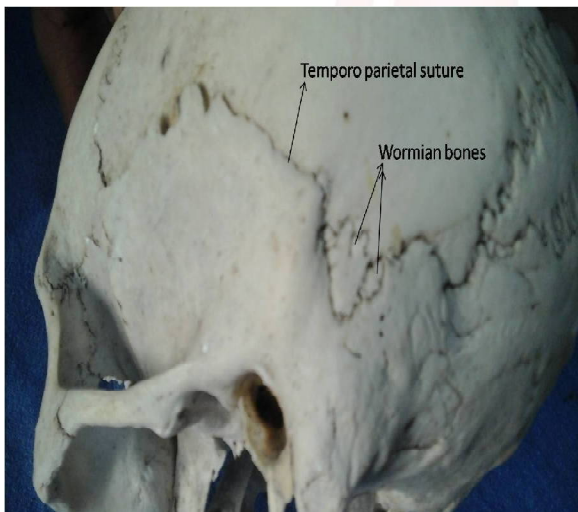


Fig. 6: Showing parietoTemporal suture and wormian bones at this suture.



DISCUSSION

Wormian bones are the normal variant present in the skull. The location of wormian bones at different location has different importance. In the present study, overall incidence of wormian bones was seen in 113 skulls [56.65%] [Table 1]. Pryles CV and Khan AJ [8] reported the prevalence of cerebral abnormalities in a population with wormian bones in a random group of infants and children. The occurrence varied from 93% to 100% in a random group and 100% in mentally retarded patients. Barberini F et al [11] found that formation and distribution of wormian bones are caused by different stress factors [tension, pressure etc] acting on the cranial vault during prenatal and early postnatal periods of bone growth. According to him [11] the formation of such bones might be under control of no. of genes with additive action [polygenic complex] and their phenotypic expression is conditioned by developmental

thresholds. Hess L [12] reported in his studies that wormian bones are inherited as a dominant trait with incomplete penetrance [50%] and with variable expression. In another study done by Hess L [22] proposed the formation of such bones could be the result from metabolic disorders of mesoderm.

A wormian bone at Pterion is called as Pterion ossicle or Epipteric bone or Flowers bone. Incidence of such bones is high in Indians [11.79%] shown in studies done by Nayak B et al [13]. Presence of Pterion ossicles may create a extra fractures while performing the burr hole neuro surgeries. Studies done by Manjula Patil et al [14] and Mwachaka PM et al [15] showed Pterion bones in 12.27% and 6.7% of skulls respectively. Here in our study [Table 3], the incidence of Pterion ossicle was seen only in 6 [5.3%] of skulls [Fig 1], which is comparable to Mwachaka PM et al [15] but Manjula Patil et al [14] showed little higher incidence than our study.

The reason for the presence of wormian bones at Lambda may be that the interparietal part of the squamous occipital bone and the highest nuchal lines develops in membrane, usually from two pairs of ossification centres [16]. Brasilli P et al [17] reported such incidence at Lambda to be more in male skulls, but studies done by manjula patil et al [14] showed incidence more in female skulls. In another studies done by Divyesh P et al [18] showed 0.07% of incidence of wormian bones at Lambda, but in our study since there the determination of sex was not done, but the incidence of wormian bones at lambda region [Table 3] was seen in 22 skulls [Fig 2] which accounts to be 19.46%, this is more on higher side when compared with earlier author.

After reviewing the table 3 the present study is in acceptance that the presence of wormian bones is very rare at Bregma which correlates with the studies done by Brasilli P et al [17] and Manjula patil et al [14]. Brasilli P et al [17], Hanihara et al [5], manjula patil et al [14] showed the incidence of wormian bones at Asterion to be more in male skulls than in female skulls and studies done by Divyesh P et al [18] showed 18.50% of skulls studied, Our present study showed 40.70% [Table 3] of skulls [Fig 3] which is very high incidence when compared

with studies done by Divyesh P et al [18].

Near the sutures, in our present study, no wormian bones were seen at coronal, saggital suture [Table 3] but studies done by Brasilli P et al [17], hanihara et al [5] and manjula patil et al [14] showed few incidence. Literature says that Wormian bones along the lambdoid suture are more common than any suture on skull. The sutural bone at lambdoid suture is also termed as pre-interparietal bone or Inca bone. If there are more than two or three Inca bones, it may lead to complications while performing craniotomy surgeries when done by posterior approach. Such bones may also create confusion among radiologist to misdiagnose it as skull fractures during the severe head injuries. Brasilli P et al [17] and Manjula patil et al [14] showed the incidence of 50.55% and 60% respectively, our study also showed incidence of Inca bone [Table 3] to be 56.63% [Fig 4] of total 113 skulls which is close to the studies done by earlier studies and after seeing the table no 2 proves and totally agree to the point that lambdoid suture is most common area of occurrence of wormian bones in skull. Studies done by Manjula patil et al [14] showed incidence of wormian bones at occipitomastoid suture and parietotemporal suture to be 7.22% and 2.7% respectively but in our study 6.19% and 4.42% [Table 3] at occipitomastoid [Fig 5] and parietotemporal suture [Fig 6] which is at higher incidence. The wormian bones are seen more on the left half of skull than right half of skull.

Table 1: Showing Overall Incidence of Wormian Bones in Present Study.

WORMIAN BONES	NUMBER [%]
Present	113 [56.5%]
Absent	87 [43.5%]

Table 2: Showing Incidence of Wormian Bones in Present Study and Compared with other Authors [Studied In Different Regions of the World According to Brothwell 1963].

S NO.	POPULATION	INCIDENCE [%]
1	Chinese	80.32
2	German	75
3	Australian	72.58
4	Romano-British	71.03
5	Melanesian	64.15
6	Lachish	63.41
7	Anglo-Saxon	55.56
8	India[Tumkur, Karnataka] [19]	43.52
9	India[Bangalore, Karnataka] [14]	52.22
10	India[Gujurat] [18]	44.04
11	India [North Karnataka], Present study	56.5

Table 3: Showing Incidence of Wormian Bones at Different Areas of Skull.

LOCATION	LEFT	RIGHT	TOTAL [%]
Lambdoid Suture	43	21	64 [56.63 %]
Parieto Temporal Suture	5	0	5 [4.42%]
Occipito Mastoid Suture	6	1	7 [6.19%]
Asterion	28	18	46 [40.70%]
Pterion	5	1	6 [5.30%]
Bregma	0	0	0
Lambda	52	0	52 [46%]
Coronal Suture	0	0	0
Saggital Suture	0	0	0

CONCLUSION

The present study also confirmed that wormian bones are not uncommon. The radiologists should keep in mind of such appearances on skull radiographs. The neurosurgeons should check before performing craniotomy surgeries especially at lambdoid region. This study also adds to the literature that wormian bones incidence is more common at lambdoid suture which is in correlation with earlier authors. This study also showed that left half is showing more no. of wormian bones than right half.

Conflicts of Interests: None

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