



PRESENCE OF MULTIPLE WORMIAN BONES AT THE LAMBDOID SUTURE

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ABSTRACT

Sutural bones are usually small, irregularly shaped ossicles, often found in the sutures of the cranium, especially those in relation with the parietal bones. Their size, shape and number vary from skull to skull. A sutural bone is occasionally present at the pterion or junction of the parietal, frontal, greater wing of the sphenoid, and squamous portion of the temporal bones. Wormian bones of the cranial vault are formations associated with insufficient rate of suture closure, and regarded as epigenetic and hypostotic traits. These bones rest along sutures and/or fill fontanelles of the neonatal skull. These bones might lead to confusions in reading the radiographs in the case of head injuries. The Wormian bones like this may be mistaken for multiple fractures. We found eight Wormian bones in the lambdoid suture in an adult Indian skull. Knowledge of these variations is very important for anthropologists, radiologists and neuro-surgeons.

KEYWORDS: Wormian bone, sutural bone, lambdoid suture, lambda.

INTRODUCTION

Wormian bones or sutural bones are a subset of the small intrasutural bones that lie at the sutures of the skull vault. They are formed due to additional ossification centres in or near sutures. They are usually considered as normal variants and seem to be determined genetically in certain populations. They have been linked with rapid cranial expansion as they appear in great number in hydrocephalic skulls. It is widely believed that rapid growth of the human brain generates tensile strain in cranial sutures, and that this strain influences the rate of bone deposition at the sutural margins during development. They are commonly found in the lambdoid suture and fontanelles but are occasionally seen in other sutures especially the coronal, squamosal, and sagittal

sutures. We saw a series of Wormian bones in the lambdoid suture.

CASE REPORT

During the routine osteology demonstration classes for medical and dental undergraduate students, we found a series of Wormian bones in the lambdoid suture (Figure 1). These sutural bones were found in an adult Indian skull. All together there were eight sutural bones. The largest among them was at the lambda and the size of rest of the bones reduced progressively from lambda to asterion and they were irregular in shape. Four sutural bones were on the left side of lambda and the rest were on the right side. There were no other abnormalities in the skull.

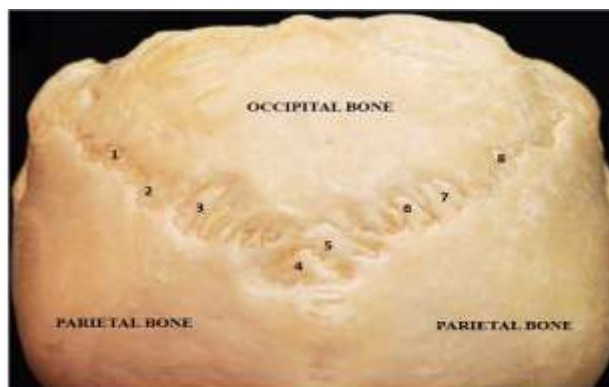


FIGURE:1 Posterior view of the skull showing 8 sutural bones in the lambdoid suture



DISCUSSION

Wormian bones /supernumerary ossicles/sutural 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 of frequent occurrence in man, and generally occupy the sutures and/or fill fontanelles of the neonatal skull. Generally when there are sutural bone present there are two or three, but they may also be present in greater number in skulls of hydrocephalus. The mechanism of formation of sutural bones is not been entirely known. Some authors claim that the bones are developed from external influences and others believed that sutural bones derive from normal development processes and genetically determine. The size, shape and number of wormian bones vary from skull to skull.^[1]

The sutural bones are small, irregularly shaped ossicles, often found in the sutures of the cranium, especially those in relation with the parietal bones. They sometimes occur in great numbers; as many as 100 have been counted in skull. They are rarely present in the sutures of the face.^[2]

Sutural bones or Wormian bones are small irregular shaped bones found at the cranial sutures. Their size, shape and number vary from skull to skull. A sutural bone is occasionally present at the pterion or junction of the parietal, frontal, greater wing of the sphenoid, and squamous portion of the temporal bones. This bone is called “pterion ossicle” or “epipteric bone” or Flower’s bone. During the routine osteology demonstration class for undergraduate medical students, three Wormian bones were noted at the pterion in an Indian adult skull. The abnormal bones were found only on the right pterion region.^[3]

Supernumerary ossicles or sutural bones of the cranial vault are formations associated with insufficient rate of suture closure, and regarded as “epigenetic” and “hypostotic” traits. These bones rest along sutures and/or fill fontanelles of the neonatal skull. In this autptic report of a 66-year-old Caucasian woman, a peculiar supernumerary bone is described, unusual size and shape, filling completely the bregmatic fontanelle. The

bone was pentagonal and remarkably large, more on the exocranial surface than on the endocranial one, involving both tables and diploe of the vault.^[4]

Wormian bones most frequently located in the lambdoid suture or the coronal suture, and have been seen in the fontanelles, particularly the posterior fontanelle. It is unclear at this time exactly how or why they are formed, although genetic as well as environmental factors have been proposed. Their initial formation is thought to be caused by a degree of dural strain and increased sutural width. These conditions can result from mechanically induced stress due to intentional deformation like that practiced in ancient cultures, premature sutural closure, or from reduced skull ossification as seen in metabolic bone diseases. The cause of the malformation can have an influence on the number and location of Wormian bones. Clinically, Wormian bones are used as markers in the diagnoses of many autosomal dominant genetic disorders, namely, craniosynostosis and osteogenesis imperfect.^[5]

Wormian bones are a subset of the small intrasutural bones that lie between the cranial sutures formed by the bones of the skull vault. The presence of sutural bones can lead to confusion in diagnosis in cases of skull fractures. They are studied and reported as ethnic variables, being of interest to human anatomy, physical anthropology, radiology, and forensic medicine. Pathological, mechanical, and genetic factors have been proposed as the primary causal mechanism in the occurrence of Wormian bones. It is still unclear why sutural bones are common in certain races. According some authors the occurrence of Wormian bones is controlled by genetic factors. Some other studies suggest that the presence of Wormian bones is associated with cranial and central nervous system abnormalities. Radiologist Dr. Frank Gaillard and Dr. Amit Tripathi have reported cases of Wormian bones associated with rickets, hypothyroidism, Down syndrome, osteogenesis imperfecta, pycnodysostosis and cleidocranial dysplasia. Conversely, Jeanty et al. have reported the presence of WB in four fetuses, but none of these cases were associated with any anomalies.^[6]

According to the study conducted by Murlimanju BV et al. reported 73.1% as the incidence rate of Wormian bones in Indian skulls. This is slightly higher compared to other reports and may be because racial variations seem to exist. The sutural bones were more frequent at the lambdoid suture and less common at the coronal and sagittal sutures.^[7]

The overall incidence of Wormian bones was 52.22%. Incidence of Wormian bones was more in female skulls (64.80%). Wormian bones occurred more frequently at lambdoid suture 56(60%) with incidence of 22(39.3%) in male skulls and 34 (60.7%) in female skulls. Wormian bones along the coronal suture and at bregma were seen only in male skulls, while intra- orbital ossicles were seen only in female skulls. Wormian bones along the sagittal suture showed sexual dimorphism (27.78%, $p=0.045$) while at lambda and lambdoid suture showed a good discriminating power of 17.65% ($p=0.087$) and 21.43% ($p=0.089$) respectively. Thus, there exists a moderate degree of sexual dimorphism among the Wormian bones with respect to the overall incidence, number and location.^[8]

CONCLUSIONS

Wormian bones are used as markers in the diagnoses of many autosomal dominant genetic disorders, namely, craniosynostosis and osteogenesis imperfecta. The sutural bones may be mistaken for fracture of skull in case of trauma of the pterion region. The presence of series of wormian bones may lead to confusions in reading the radiographs in the case of head injuries. The Wormian bones like this may be mistaken for multiple fractures. The knowledge of sutural bones is enlightening for the neuroanatomists, neurosurgeons, orthopedicians, radiologists, anthropologists and morphologists.

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