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COMPLETE METOPIC SUTURE WITH MULTIPLE WORMIAN BONES IN AN ADULT HUMAN SKULL

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<p>Article Info <i>Received 15/08/2015</i> <i>Revised 27/08/2015</i> <i>Accepted 12/09/2015</i></p> <p>Key words: Wormian bones, Metopic suture, Variations in skull sutures.</p>	<p>ABSTRACT Wormian bones are accessory bones found in neurocranium of human skulls. These are formations associated with insufficient rate of suture closure. They vary in size, shape and number. During the routine osteology demonstration class for undergraduate students in Rajarajeswari medical college, Bengaluru, a rare occurrence of multiple Wormian bones were found in an adult Human skull. All together there were 27 Wormian bones extending bilaterally along the sagittal suture and lambdoid suture. The same skull showed the presence of inca bones at lambda and a complete metopic suture. The sagittal suture is the uncommon site for the occurrence of Wormian bone as reported in earlier literature which prompted us to report this case as their presence is important for Radiologists, Neurosurgeons and Orthopedicians as these findings can mislead the diagnosis of fracture in the skull.</p>
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INTRODUCTION

Wormian bones, also known as intrasutural bones, are accessory bones that occur within the cranial suture and fontanelles most commonly within the posterior suture. They occur more frequently in disorders that have reduced cranial ossification, hypotonia or decreased movement there by resulting in deformational brachycephaly [1]. These are irregular isolated bones that appear in addition to the usual centers of ossification [2]. They are frequently seen in the course of the lambdoid suture, which is more tortuous than other sutures. They are occasionally seen within the sagittal & coronal sutures. The large Wormian bone at lambda is often called inca bone (os incae) due to the relatively high frequency of occurrence in Peruvian mummies [3].

The Wormian bones may arise as a consequence of mechanical factors that spread sutures apart affect dural strains within sutures & fontanelles. They seemed to be determined genetically in certain populations and have been linked with rapid cranial expansion as they appear in great number in hydrocephalic skulls.

These bones are marker for many diseases and are important in diagnosis of brittle bone disease, osteogenesis imperfect [4]. Metopic sutures are seen in between the two halves of frontal bone which ossify in membrane from two primary centers which appear by the end of 2nd month of fetal life. This suture usually disappears in childhood by 6yrs of age and if it fails to close results in metopic suture [5]. The incidence of metopic suture varies in different races and can be due to various causes, such as abnormal growth of cranial bones, growth interruption, heredity, sexual, hormonal influence, atavism, cranial malformations and hydrocephalus [6].

Presence of more than ten sutural bones is unusual. It may warrant further investigations to identify an underlying pathology of hereditary disorder that has affected the skull growth at an early stage of development and as they can be easily misunderstood for a fracture of frontal bone or even for sagittal suture in radiological images. It is also important for paleodemography and in forensic medicine.



Case report

During the routine osteology demonstration classes for undergraduate 1st MBBS students, we found a series of Wormian bones at multiple sites bilaterally in an adult human skull. The same skull showed the presence of inca bones and complete metopic suture. All together there were 27 Wormian bones.

6 Wormian bones were situated along the left side of the sagittal suture starting little behind the bregma, on the right side of the sagittal suture are 3 Wormian bones (fig-1), beginning little behind the parietal emissary foramen. The parietal emissary foramen was absent on right side. The sagittal suture was very wavy.

Along the right and left of the lambdoid suture, there were 8 Wormian bones extending from lambda till asterion (fig-2). The largest of these was situated along the sagittal suture measuring about 3cm in length & width. The smallest of these was along the left of lambdoid suture which measured 0.3mm in length & 3cm in width. They were irregular in shape.

Two separate interparietal bones (inca bone) were seen at lambda. The same skull showed the presence of metopic suture which was complete extending from bregma to nasion (fig-3). There were no other notable abnormalities in the skull.

Figure 1. Skull showing Wormian bones along the sagittal suture

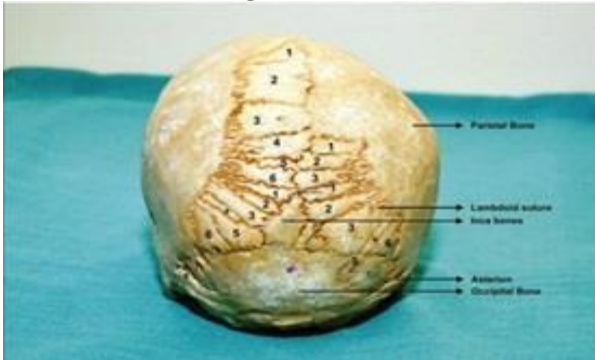


Figure 2. Skull showing Wormian bones along the Lambdoid suture and inca bones at Lambda

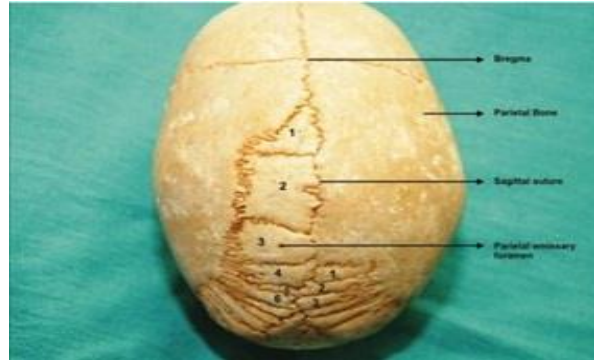


Figure 3. Skull showing complete metopic suture



DISCUSSION

Wormian bones are named for Ole worm, professor of Anatomy at Copenhagen, 1588-1654. He taught Latin, Greek, Physics and Medicine. His description of extrasutural bones contributed to the science of embryology. Wormian bones are formative associated with insufficient rate of suture closure and regarded as epigenetic and hypostotic traits. According to Bergman et al, sutural bones were present in 40% of skulls in the vicinity of lambdoid suture. The next most common sutural bone is in epipteris bone near the anterolateral fontanelle [7]. Wormian bones occur most frequently in disorders that have reduced cranial ossification, hypotonia or decreased movement thereby resulting in deformational brachycephaly.

The frequency and location of Wormian bones varies with the type and severity of cranial deformation practiced by ancient cultures. Midline synostosis, specifically metopic or sagittal synostosis have more Wormian bones in midline, whereas unilateral lambdoidal or coronal synostosis more often show Wormian bones on the contralateral side. Taken together this suggest that Wormian bones may arise as a consequence of mechanical factors that spread sutures apart and affect dural strain with in sutures and fontanelles [8]. According to Parker, the number of Wormian bones increases with the capacity of the skull and a similar relationship exists with the total length of sutures, greater the sutural length greater the number of Wormian bones and he also said that the



Wormian bones articulate with the surrounding bones by sutures with indentations more complex on the outer surface of the skull than on the inner aspect and are found in both sexes in similar percentages as well as in both sides of the skull, being predominantly symmetrical. They can have different shapes (round, oval, oblong, triangular, quadrilateral and polygonal have all been reported) and can vary from under 1mm in diameter to 5x9cm or 1-2 inches in diameter [9].

Earlier studies have shown that the presence of sutural bones associated with other cranial and central nervous system abnormalities. Occurrence of the Wormian bones is controlled by genetic factor [10]. Although they are more common along the lambdoid and occipito mastoid sutures, they can occur in any cranial sutures and fontanelles. They develop either from independent ossification centres or by their separation from primary centres. El. Najjar & Danson suggested that the incidence is lower in foetuses (11.3%) than in adults (62.1% - 76.2%) [11]. The occurrence of preinterparietal bone or inca bone at the lambda has been reported by previous workers. According to Shrivastava, preinterparietal bone develops as a result of failure of fusion between upper and lower nuclei of the medial plate. He claims that all bones developing in the region of lambda and lambdoid suture outside the limits of interparietal area are sutural or Wormian bones with separate ossification centers [12].

According to the study by Bryce metopic suture was present in 9.55 of Scottish skulls, 8.7% of European crania, 5.1% of Mongolian subjects, 1.2% of Negroes and 1% of Australian skulls [13].

Earlier studies revealed that the metopic suture was associated with the Wormian bones. Hussain Saheb S et al has reported the metopism in 125 Indian skulls, according to them the complete metopic suture was found in 3.2% of cases and incomplete metopic suture in 26.4% of the skulls [14].

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Study by Baaten et al., proves that metopism is more in males than in females, and in people who live in rural areas compared to people living in urban areas with ratios of 4:1 and 4:2 respectively in Lebanese population [15].

Although the mechanism of formation of Wormian bones is unknown some studies have shown that their presence may serve as a marker for the identification of anomalies of the CNS. Wormian bones when occur as a normal variant they tend to be smaller and less numerous than when they are associated with skeletal dysplasia. But most authors opine that they are not pathognomones as they occur in normal individuals.

One should be aware of the occurrence of Wormian bones for better clinical approach hence the present report.

CONCLUSION

The Anatomical knowledge of Wormian bones is clinically important as they are marker for some diseases and important in the primary diagnosis of brittle bone disease like osteogenesis imperfecta. The present case report reveals the presence of multiple Wormian bones along the sagittal and lambdoid sutures and in the posterior fontanelle which may lead to problems in posterior approach to the cranial cavity. Added to the study is the presence of complete metopic suture in the same skull. This will help radiologists and neurosurgeons to rule out fractures in case of head injuries in these regions.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.



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