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THE FREQUENCY AND TOPOGRAPHICAL DISTRIBUTION OF SUTURAL BONES IN ADULT DRY SKULLS

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ABSTRACT

Introduction: Sutural bones are accessory bones found within or near cranial sutures. They are mostly found in the Lambdoid suture and can be either one or more than one in the same suture. **Aim:** This study aims to examine the frequency and topographical distribution of sutural bones in dry cadaveric skulls. **Materials and Methods**: In this study, 34 adult human dry skulls were examined for the presence, number and locations of sutural bones. **Result:** Sutural bones were present in 55.9% (19) of the skull most of which are found in the lambdoid suture while 44.1% (15) of the skulls had no sutural bone. Two (5.9%) skulls presented single coronal sutural bones, 3(8.8%) skulls presented single sagittal sutural bones. Lambdoid suture was observed to be the common site for sutural bone with 5 (14.7%) skulls presenting single lambdoid sutural bone while 6(17.6%) skulls presented multiple lambdoid sutural bones. We also observed 3(8.8%) skulls with Inca bone. However, bregmatic, pteric and squamosal sutural bones were absent in all the dry skulls examined in this study. **Conclusion:** Knowledge of the incidence of sutural bones and their structural distribution as described in this study is essentially useful to the anatomists, radiologists and surgeons in their daily practice.

KEYWORDS: Accessory bones, Inca, Lambdoid, Coronal, Distribution, Sagittal, knowledge.

INTRODUCTION

The anthropologists and forensic experts are faced with challenges in identifying the skeletal remains. The human skull is made of different bones that are fused after birth besides the regular centre of ossification of the skull. Accessory bones appear along with the regular centre of ossification of cranium.[1] Sutural bones are gnomish bones found in the cranium in proximity to the sutures of skull vault. They are varied in size, shape, number in different sites. Normally, they are present in or near the suture or occupy fontanelles of a new born skull and commonly present in man.[2,3]

The precise mechanism for sutural bone formation is unknown. However, there exist two widely used hypotheses in explaining their origin. The 1st hypothesis states that sutural bones are under genetic influence.[4] Bennett[5] stated that sutural bones are inherited as a dominant trait, Finkel[4] speculated that the expression of a single gene result is responsible formation of sutural bone and Mao et al.[6] mentioned that their formation is under the epigenetic control of traits. The 2nd hypothesis looked at mechanical stress such as: artificial cranial deformation or craniosynostosis, as the main reason for sutural bones formation.[4,7,8] Another hypothesis[6,8,9] suggests that genetic factors influence sutural bones appearance, while the mechanical stress has an impact on their number.

Evidence from a study shows that individuals having sutural bones are mostly showing cranial and central nervous system (CNS) abnormalities.[10] They are also present in normal individuals and various abnormalities, down syndrome, kinky hair Menke's syndrome, otopalatodigital syndrome, congenital disorders such as osteogenesis imperfecta, cretinism, cleidocranial dysostosis, enlarge parietal foramina[11,12,13], pycnodysostosis, primary acro-osteolysis, rickets, hypothyroidism and hypophosphatasia. Consequently, may guide in the diagnosis and treatment of children that are affected.[14] This study aims to examine the frequency and topographical distribution of sutural bones in dry cadaveric skulls.

MATERIALS AND METHODS

A total of 34 dry human adult male skulls from the osteological collection of the Department of Human Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, Niger Delta University, Bayelsa State, Nigeria, were used in this study. Skulls were examined for frequency and topographic distribution of the sutural bones.

RESULTS

A total number of 34 skull bones were examined, all of these bones are from the adult male. Out of these number, sutural bones are present in 19(55.9%) and absent in 15(44.1%) [table1] fig. 1A. In this study, 2(5.9%) skulls presented single coronal sutural bone fig. 1B, meanwhile 3(8.8%) skulls showed single sagittal sutural bone fig. 2A. Three (8.8%) skulls showed inca bone fig. 3A and fig. 3B. Lambdoid suture presented the highest incidence of sutural bones in this study with the following: a total of 11 skulls showed an incidence of 32.4% of lambdoid sutural bones meanwhile 5(14.7%) skulls presented single sutural bones fig. 2B and 6(17.6%) skulls showed multiple sutural bones fig. 2C and fig. 2D. Though, bregmatic, pteric and squamosal sutural bones were absent in all the dry skulls examined [table1].

Table 1: Frequency and Topographical Distribution of Sutural Bones in Dry Adult Skulls.

Features	Total %
Sutural bones	
Present	19(55.9%)
Absent	15(44.1%)
Coronal sutural bones	
Single	2(5.9%)
Multiple	0(0%)
Sagittal sutural bones	
Single	3(8.8%)
Multiple	0(0%)
Lambdoid sutural bones	
Single	5(14.7%)
Multiple	6(17.6%)
Bregmatic sutural bones	
Single	0(0%)
Multiple	0(0%)
Inca	
Single	3(8.8%)
Multiple	0(0%)
Pteric	0(0%)
Squamosal	0(0%)

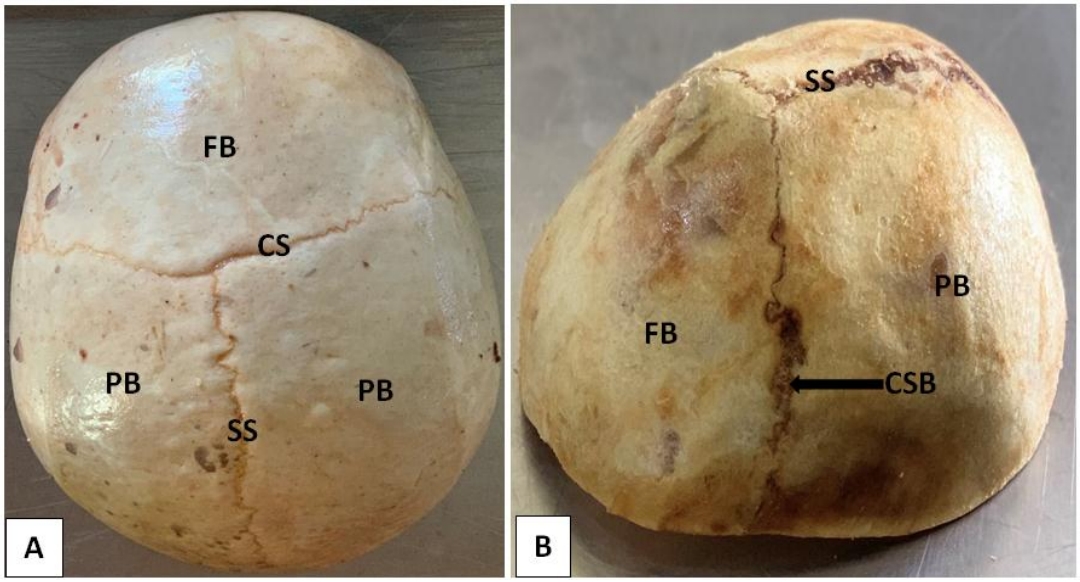

Figure 1: A) Skull showing coronal suture (CS), sagittal suture (SS), frontal bone (FB) and parietal bones (PB)with no sutural bones. B) Skull showing coronal sutural bone (CSB), Frontal bone (FB), parietal bone (PB) ans sagital suture (SS).

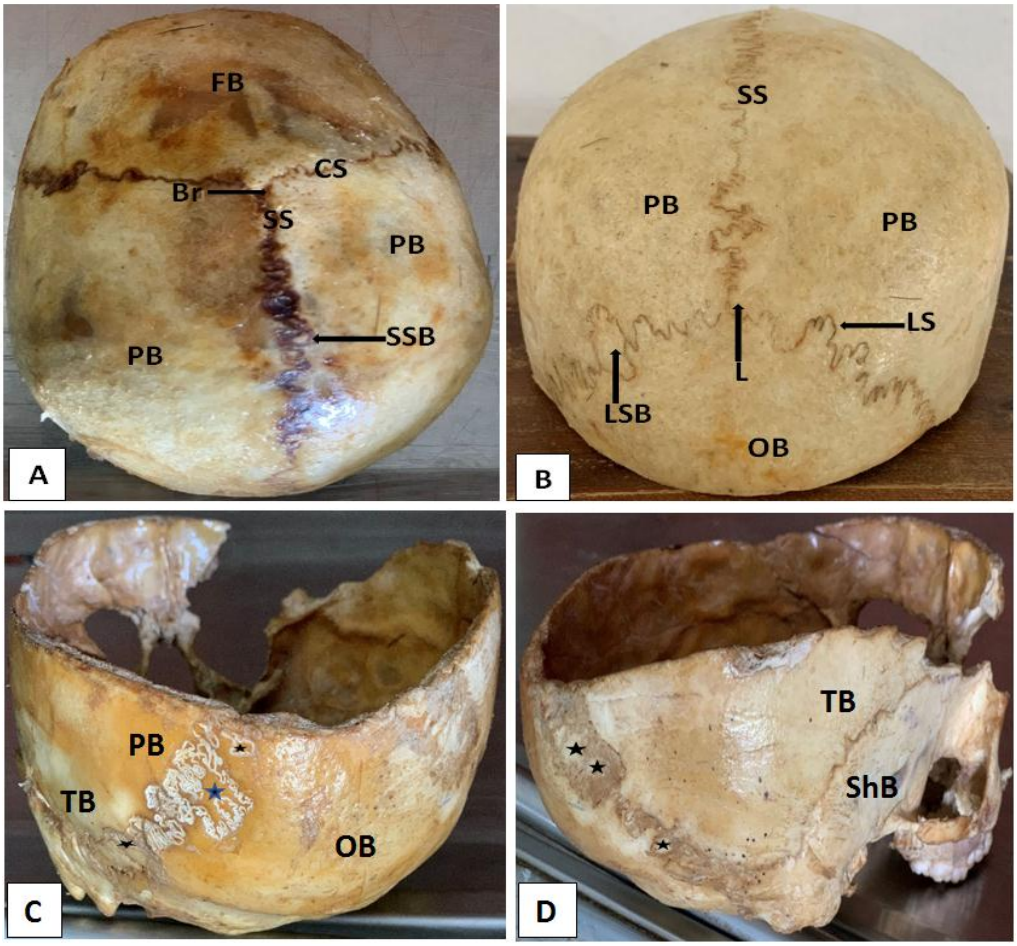

Figure 2. A) Skull showing sagittal sutural bone (SSB), frontal bone (FB), parietal bone (PB), coronal suture (CS), sagittal suture (SS) and bregma (Br). B) Skull showing Lambdoid sutural bone (LSB), lambda (L), lambdoid suture (LS), sagittal suture (SS), parietal bone (PB) and occipital bone (OB). C) Skull showing temporal bone (TB), parietal bone (PB), occipital bone (OB) and multiple lambdoid sutural bone (tagged as Asterix) on the left side. D) Same skull showing sphenoid bone (ShB), temporal bone (TB) and multiple lambdoid sutural bone (tagged as Asterix) on its right side.

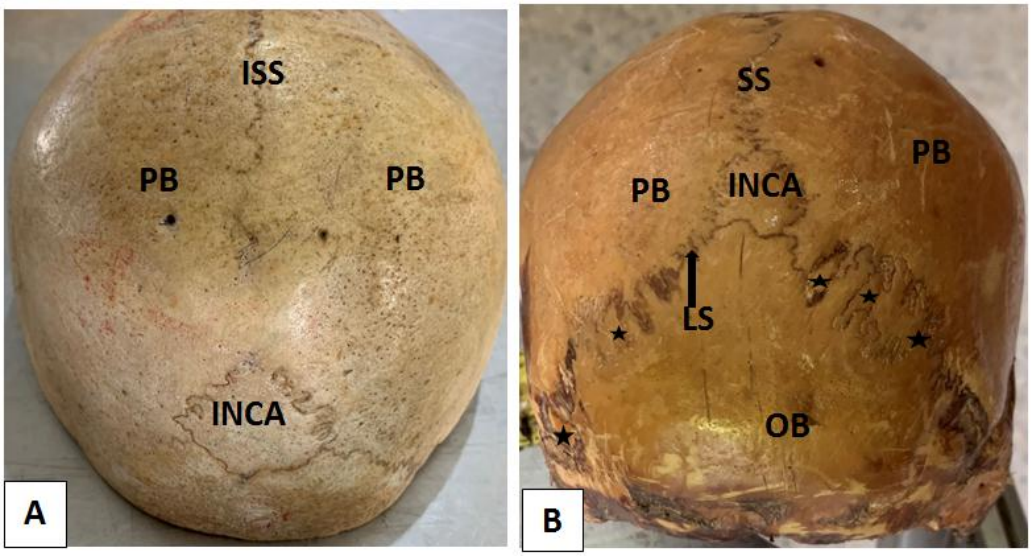

Figure 3. A) Skull showing incomplete sagittal suture (ISS), parietal bone (PB) and Inca bone (INCA). B) Skull showing parietal bone (PB), occipital bone (OB) sagittal suture (SS) lambdoid suture (LS), Inca bone (INCA) and multiple lambdoid sutural bone (tagged as Asterix).

DISCUSSION

Sutural bones are present in normal and pathological skulls. The reason behind their formation is poorly understood, although it is believed that their formation is as a result of an interplay between genetic factor and external forces such as stress conditions.[15] An imbalance between the cranial changes in size and shape, during the process of bone development, can also lead to the formation of sutural bone.[16] The number of sutural bones does not depend on the cause of enlargement, instead it increases with the capacity of the skull.[17] Healthy individuals have also been diagnosed with sutural bones as a normal variant.[18] The size and number of sutural bones are the main factors that differentiate normal variant sutural bones from pathological sutural bones.[19] Different researchers still believe that sutural bones are not always pathognomonic, as they can be seen among healthy subjects as well. Although sutural bones occurring beyond ten (10) in number in a single individual is considered unusual.

The incidence of sutural bones in our study is 55.9%. This is a higher incidence than that of a previous study done in the eastern part of Nigeria.[20], having 45.46% of sutural bones. However, the incidence rate of sutural bones in the present study is in tandem with Brothwell's[21] study that the percentage frequency of sutural bones in various population groups ranged between 55.56% and 80.32%. Lambdoid suture is the most common site for sutural bones occurrence[22,23] and it agrees with our study that shows an incidence of 32.4% figs. 2B, C and D and occur both singly and in multiple [Table 1]. Uchewa et al.[20] in their study, also reported a high incidence of sutural bones at the lambdoid suture. In our study, Inca appeared singly only figs. 3A and B at a frequency of 3 (Table 1) and sagittal sutural bones also occurred singly only fig. 2A at a frequency of 3 (Table 1) while the coronal sutural bone appeared singly only fig. 1B and least in frequency (Table).

The sutural bones may be mistaken for fractures both by the radiologist and the surgeon.[24] It is worse if a fractured skull is misinterpreted as a sutural bone as the healthcare provider may fail to institute appropriate treatment on the patient. Hence, it is important that radiologists, clinicians and surgeons have knowledge of the incidence and distribution of sutural bones in their daily practice.

CONCLUSION

In conclusion, the current study reports a prevalence of 55.9% for sutural bones in adult male dry skulls in Nigeria. Though slightly higher than a previous study done in eastern Nigeria, however, it falls within the range presented by Brothwell's indicating a possibility of increasing incidence in the existence and distribution of sutural bones. The sutural bones were more frequent at the Lambdoid suture in our study, second highest at Lambda and the sagittal sutures and less common at the coronal suture. The knowledge of sutural bones is relevant to the anthropologist, forensic experts, anatomists and surgeons, during radio-imaging and surgery; hopefully, they will find this information useful in practice.

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Conflict of Interest

There is no conflict of interest among all the authors or between any of the authors and third party or any financial institution concerning this study.

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