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A Detailed Study of Sutural Bones in South Indian Skulls.

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ABSTRACT

Sutural bones are reported in earlier works. The detailed work on this in Indian subjects is not available in the literature. Around 180 dry skulls were studied in this work for the presence of sutural bones, metopic suture and various fontanelle sites were all noted and the cranial capacity and cephalic index were also calculated. A correlation was established between them. An additional feature of occurrence sutural bones in asterion not reported elsewhere is also reported in this paper. The percentage of each sutural bone at each site was calculated and was found to be more than the previous works especially at asterion. A new feature ,ie. downward projecting bony growth at external occipital protuberance of occipital bone was a new feature and is not documented so far. The study on the presence of sutural bones is very important as in many cases they might be mistaken for bone fractures and they also serve as indicators for various clinical syndromes like hydrocephalus, hypothyroidism etc.

Keywords: wormian bones, metopic suture, os inca , sutural bones.

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INTRODUCTION

Sutural or wormian bones are extra bone pieces seen normally in the sutures of skull at the junction of 2 or 3 suturesand also within sutures. Most commonly they are present at the lambda or at the lambdoid suture (Grey Henry-1918)[1] Here they are called Inca bone or Os Inca or Gothe's ossicle. (parente—et al 2001,[2] Saxena et al -1986) [3] Multiple wormian bones [10] in lambdoid suture in an Indian skull was described by Satheesha B.Nayak(2008) [4] They are also known as wormian bones named after Prof.Ole Worm in 1558 [5].According to Bergman et al nearly 40% of skulls contain sutural bones in lambdoid suture.The next most common sutural bone is the epipteric bone (pterion ossicle)found near the anterolateral fontenelle. This 1 or more are reported to be located in the pterion, called the pteion ossicles or epipteric bones(Khan AA et al2011 [6], Saxena et al-1986) [3]. The number of sutural bones in each skull varies from 1,3 to many. They are formed by some additional centers of ossification appearing in or near the sutures(Grey Henry) [1]. While studying the skulls in the department of Anatmy,of Sree Balaji Medical College SBMC & H, many sutural bones were found in them , contrary to the existing reports which state they are usually only few in number .Their occurrence is due to the rapidy expanding cranium and so are seen in hydrocephalic skulls(Glorieux FH-2008) [7].A study of sutural bones in Anatolian and Ottoman skulls,302 skulls were used and classified into three morphological forms(dolicocephalic,meso cephalic and brachycephalic.(Gurusburun et al—1997) [8]. Tewari et al [9] in their study of 1500 skulls found the pre interparietal bone in 6 cases .(0.4%).Murlimanju et al studied 78 dry human of Indian population and found the presence of sutural bones in 57 skulls(73%)(2011) [10].El Najjar and Dawson viewed that the occurrence of these bones are due to genetic factors (1977) [11].Das et al observed that the os inca was associated with cranial deformities(2005) [12]. Pal .GP studied the variations in interparietal bones in man(2005) [12].Some studies showed, the presence of sutural bones is associated with certain cranial and CNS abnormalities (Pryle et al 1979) [13]. Jeanty et al have reported the presence of wormian bones in some fetal groups. [14] In view of all the above mentioned importance, this study is designed to see their number, size and percentage of their occurrence in each suture and also the association between their size, number etc with metopism and cephalic index and cranial capacity etc.

MATERIAL AND METHODS

180 adult dry skulls without any deformity were chosen for this study. They were examined for the following features.

- Location of sutural bones at bregma, lambda, petrion and asterion.
- Their number at each.
- Unilateral or bilateral
- Any other feature like metopic suture, extra bone growth etc
- Calculation of cephalic index(CI) and cranial capacity(CC) by measuring breadth,lengthand height of skull susing digital vernier callipers and counter checked using an inch tape.
- The incidence of sutural bones and the association between them and skulls with different CI and CC

The formula used for calculating cephalic index is

$$B/L \times 100$$

Formula for Cranial capacity is

$$CC\text{-}0.00337(L\text{-}11)(B\text{-}11)(H\text{-}11)+406.1$$

- Correlation of ratio between sutural bones
- The number, % of each sutural bone at each suture and the total % of its occurrence out of 180 skulls

All the above data were calculated, tabulated and recorded

Observations

Total number of sutural bones---88

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% out of 180 skulls ---49%

Metopic suture

This rare feature was observed in 5 out of 180 skulls (fig—1)

In these 5 skulls, the presence of metopic suture was associated with the presence of very large sutural bones at lambda .

Figure 1: Metopic suture

The number of sutural bones

Most of the skulls had only few sutural bones except in one where 10 small ossicles were observed.Few had 2 large sutural bones at lambda(Fig—2)

Figure 2: large sutural bones at lambdoid suture

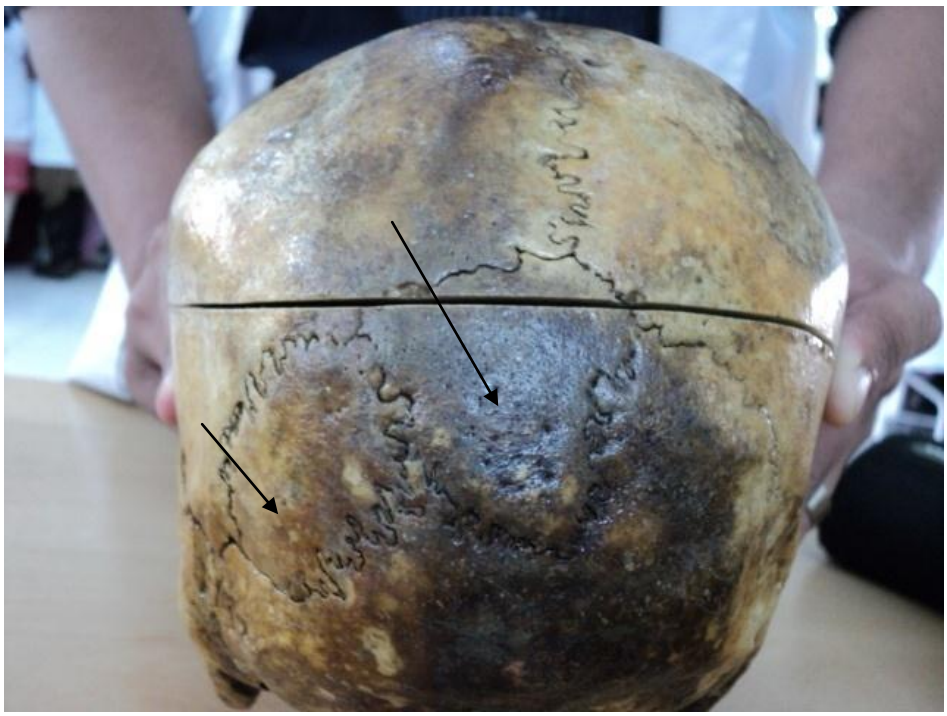

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Figure 3: Single large sutural bone at lambda–OS INCA

In one skull a single large sutural bone at the lambda was seen and due to this single large piece the occipital bone looked having 2 pieces and there were 2 lambdoid sutures seen one below the other.(Fig—3).

At lambda 51 skulls had sutural bones ,pterion had them in 22 skulls and in asterion 15 of them showed sutural bones (not reported so far) and the Sagittal suture displayed them in 7 skulls which is the least number.

Total number of sutural bones out of 180 skulls seen in the present study was 95 and the percentage was 52.77 (table no.1)

Table 1: The number and percentage of sutural bones

	No of SB	%of each
Bregma	--	0
Pterion	22	12.2
Asterion	15	8.3
Lambda	51	28.3
Sagittal suture	7	3.8

Table-2: correlation between cephalic index, cranial capacity and presence of large sutural bones

	Average CI	Average CC
Skulls with large SB	40	1489.48
Skulls without SB	36.o6	1278

The CI and CC showed marked increase in skulls with large sutural bones.(table-2)

New extra bony growth at external occipital protuberance

An additional feature observed in 3 out of 180 skulls was a big downward facing bony projection which is nothing but the external occipital protuberance itself (fig—4).

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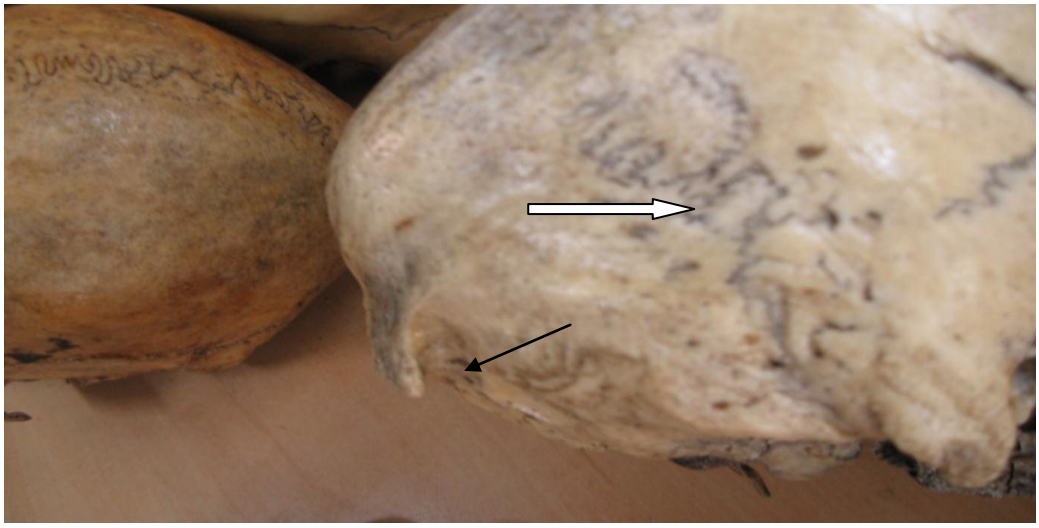
Figure 4: New bony growth at the external occipital protuberance (Black arrow pointing extra bone growth) (white arrow pointing the asterion ossicle)



DISCUSSION

Presence of metopic suture:out of 180 skulls studied metopic suture was seen in only 5 and its percentage was 7.36 and a correlation could be established between skulls with very large sutural bone and the presence of metopic suture. In skulls with very large sutural bones and large number of small sutural bones showed any significant rise in CI and CC. The percentage of sutural bone given in earlier data is much less than ours. Reported data shows in Caucasians 10%,Indians 40% and in Chinese 80%.

Following are some of the new features observed:-

Sutural bone at asterion is 22% out of total and in asterion their presence is not reported so far.In all other sutures its presence is proved.((Akram et al -2009). .
A downward directed bony projection was observed in 3 out of 180 skulls in our study and this is a new feature not recorded till today.

In previous work CI was reported to be correlated to SB and in ours we found in addition CC also was much more in skulls with large sutural bone than seen in normal ones(table—2).This feature indicates they are associated with defective ossification and hydrocephalic skulls.

CONCLUSION

As the sutural bones can be mistaken for fractures of skull the knowledge of them is very important. In addition in certain conditions like hypo parathyroidism, os imperfecta, Down's syndrome, hypothyroidism and hydrocephalus, their number increases and so might be helpful in diagnosing these conditions earlier if spotted in normal x-rays.

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