IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 11 Ver. VI (Nov. 2015), PP 37-40
www.iosrjournals.org

A Study of Interparietal Bones in Adult Human Skulls

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Abstract:
Introduction: *The squamous part of the occipital bone consists of an upper membranous or interparietal part and a lower cartilaginous or suboccipital part. Controversy exists regarding the ossification of these two parts. Failure of fusion of ossification centers gives rise to various anomalies of the interparietal bone.* ***Aims & Objects:*** *To study the human dry skulls for the presence of the interparietal bones and to note its incidence.* ***Materials & Methods****: 74 dry adult human skulls were collected from the Departments of Anatomy, Regional Institute of Medical Sciences (RIMS), Imphal and J.N. Institute of Medical Sciences (JNIMS), Imphal, Manipur and examined for the presence of interparietal bones, incidence was noted, photographs taken and compared with previous observations.*
Results & Observation: *Interparietal bones were present in 6 out of the 74 (8.1%) skulls examined.* ***Conclusion:*** *Interparietal bone can appear in various forms and position. Knowledge of interparietal bone is important for the radiologists, neurosurgeons, anthropologists, orthopedicians and forensic experts.*
Key words*: Interparietal bone, Skull, Incidence, Occipital bone*

I. Introduction

The squamous parts of the occipital bone above and below the highest nuchal lines show different mode of ossification. There is controversy regarding the ossification of these two parts. Part above the highest nuchal line is developed in a fibrous membrane and ossified from two centres, one on each side from about 2nd month of gestation. Part below the highest nuchal line ossifies in cartilage. These two regions of the squamous parts of the occipital bone unite in 3rd postnatal month but line of fusion is recognizable at birth.[1,2] However, according Srivastava HC[3], membranous part above the highest nuchal lines consists of interparietal and pre-parietal parts, interparietal part comprising of two lateral plates and a central piece. A pair of intra-membranous centre is proposed for each of these parts. Failure of fusion, partly or completely, between any of these elements, gives rise to variation such as a separate inter-parietal bone. This may be sub-divided by presence of additional longitudinal or transverse sutures leading to bipartite, tripartite or multipartite inter-parietal bone. Occurance is rare and considered as variant.[4]Tschudi termed it as Inca bone. Saint Hilaire first described it as Interparietal bone. These bones may confuse the radiologists as fractures in skull, also may complicate neurological interventions like burr-hole surgeries.[5] These may be used as identification features in medicolegal cases.[6]

II. Aims And Objects

The present study was undertaken to examine the adult human dry skulls of unknown age and sex for the presence of the interparietal bones, to note its incidence and to compare with previous studies.

III. Materials And Methods

Seventy foue dry human skulls of unknown age and sex, without any gross anomaly, were collected from the Department of Anatomy, Regional Institute of Medical Sciences, Imphal and Jawaharlal Nehru Institute of Medical Sciences, Imphal. Bones were studied for the presence, number and fragmentation of interparietal bones. Sutural bones confirming their position in the sutures were not taken into consideration. Photographs were taken. Incidence of interparietal bones was noted and compared with previous studies.

IV. Results And Observation

In the present study, a series of 74 skulls was examined for the presence of interparietal bone in the squamous part of the occipital bone. 6 out of these 74 skulls showed presence of interparietal bones. Incidence was calculated as 8.1%

Out of the six skulls with interparietal bones, tripartite interparietal bone was observed in three shulls, whereas other three skulls showed single piece interparietal bone. Amongst the fragmented category, one skull showed almost symmetrical tripartite interparietal bone (fig. 1) and two skulls showed asymmetrical tripartite bone (fig.2 & fig.3). Two skulls showed almost diamond shaped single midline interparietal bone (fig.4 & fig.5). One skull was having a very small midline fragment (fig.6). There were associated wormian bones in almost all the skulls.

Fig.1. Tripartite symmetrical interparietal bone

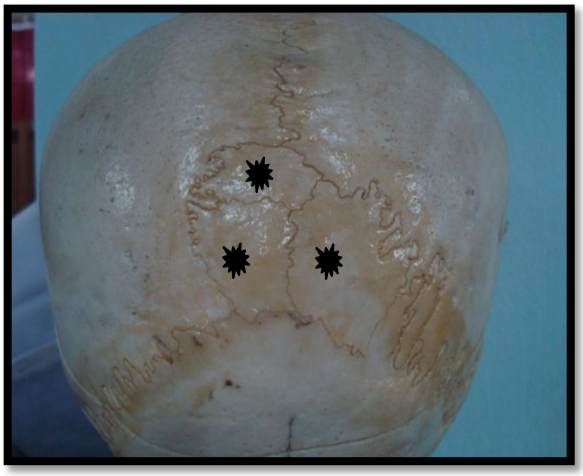

Fig. 2. Tripartite asymmetrical interparietal bone

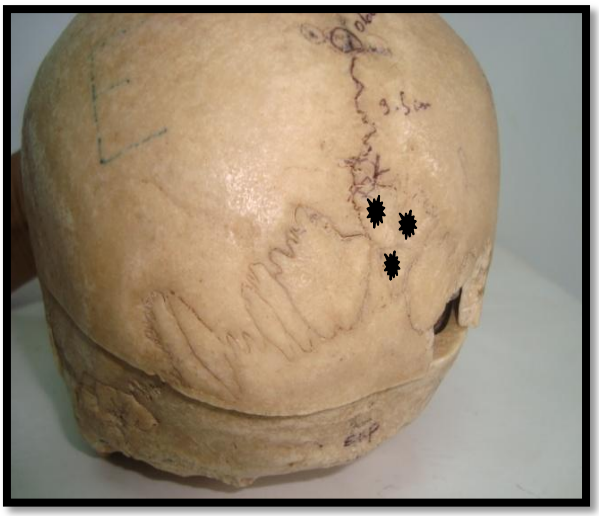

Fig. 3. Tripartite interparietal bone

Fig. 4. A single diamond-shaped Interparietal bone

Fig. 5. A single diamond-shaped interparietal bone

Fig. 6. Single small Interparietal bone

V. Discussion

A faulty ossification in the interparietal part of the occipital squama leads to various anomalies. Large number of variations are seen in this bone. There have been many investigations on the anomalies in this region, especially on the separated interparietal bones.

The incidence of interparietal bone was reported as 4% by Srivastava HC[3], 3.8% by Shah MP et al[4]and Murlimanju BV et al[10], 1.3% by Marathe RR et al[5], 2.6% by Pal GP et al[7], 4.6% by Matsumara G et al[8], 0.99% by Zambare BR[9]. Yucel F,Egilmez H, Akgun Z [11] calculated the incidence to be 2.8% whereas according to K Gopinathan[12], Kumud D[13], Goyal N et al [14] and Shah K et al[15] the incidence was 0.8%, 2.6%, 7.33% and 5% respectively. In the present study the incidence of interparietal bone was calculated as 8.1% which was high as compared to other studies (Table 1). This might be due to smaller sample size or different population.

Table 1. Comparison of incidence of interparietal bone among various studies

AUTHORS	NO. OF SKULL STUDIED	NO. OF INTERPARIETAL BONES	INCIDENCE(%)
Srivastava HC[3]	620	25	4
Shah MP, Desai SG, Gupta S[4]	105	4	3.81
Marathe RR et al[5]	380	5	1.3
Pal GP et al[7]	348	9	2.6
Matsumara G et al[8]	455	21	4.6
Zambare BR[9]	310	3	0.99
Murlimanju BV et al[10]	78	3	3.8
Yucel F,Egilmez H, Akgun Z [11]	544	15	2.8
K Gopinathan[12]	125	1	0.8
Kumud D[13]	150	4	2.6
Goyal N, Gupta M, Aggarwal B[14]	150	11	7.33
Shah K, Shah P, Shah S[15]	100	5	5
PRESENT STUDY	74	6	8.1

VI. Conclusion

A meticulous knowledge regarding the incidence and number of interparietal bones in human skulls is useful to radiologists, neurosurgeons, anthroplologists and forensic experts. Recognition of this structure and possible variations will help in differentiating normal from the abnormal. It can be misinterpretated by radiologists and clinicians as a fracture of skull leading to unwarranted surgical interventions. The presence of interparietal bone may complicate neurosurgical interventions like burr-hole surgeries as their extensions may lead to continuation of fracture lines. Its presence may be related to conditions like defects in ossification, metabolic disorder, hydrocephalus or as part of certain syndromes. From the medicolegal perspective , it may be used as a identification feature of a deceased, also a suture simulating a fracture line can change a non-grievous injury to a grievous one.

Conflict of Interest: There is no conflict of interest or financial relationship to disclose.

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