A study of incidence of interparietal bones in adult human dry skulls

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ABSTRACT

Introduction: The inter-parietal part of squamous occipital bone which lies above the highest nuchal line develops from membranous ossification. The failure of fusion of ossification centres in this region leads to the development of interparietal bones. These bones are very rare in occurrence as compared to the other sutural bones. In this study, the **objectives** were to find the incidence of interparietal bones in adult human dry skull of Gujarat region.

Materials and method: The study included a total number of 250 human adult dried skulls from various medical colleges and dental colleges of Gujarat region. The skulls were studied for the gross incidence, number, size, shape, position and number of fragments of the interparietal bones. **Observation and Results:** in present study Out of 250 skulls were examined by us, 24 skulls show the presence of interparietal bone. The incidence of interparietal bones in present study was 9.6%. **Conclusion:** The study has provided information on the squamous part of occipital bone, the interparietal bones, their incidence, and morphology. The knowledge of these variants is of importance to the neurosurgeons, radiologists and morphologists and forensic expert for comparison of skull bone.

Keywords: Centre, human skull, interparietal bone, occipital bone, ossification

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INTRODUCTION

Most of the occipital bone is ossify in endochondral ossification except the part of squamous part of occipital bone above the highest nuchal line is ossify / develop in membrane[1].A variety of sutural bones (ossicles) may occur at or near lambda, e.g. interparietal bone (Inca bone or ossicles of Goethe) is a dermal bone situated between the parietal and supraoccipital bone. Above the highest nuchal line the squamous part of occipital bone is developed in fibrous membrane and is ossify from two centre (one on each side), from about 2nd month of intrauterine life. This part of occipital bone may remain separate as the interparietal bone. The remainder of occipital bone is

preformed in cartilage. Below highest nuchal line ossify from two centre appearing in about 7th week and soon unite. The two components of the squamous part unite in third post natal month but the line of union is recognized at birth. The remainder of cartilage of the occipital is ossified from five centre, two each for lateral part during 8th week and one for basilar part of commencing around 6th week[2]. The frontal & squamous temporal bones are of neural crest origin, the parietal are of mesodermal origin; the interparietal bone is mixed[3]. The squamous portion of the occipital bone consists of two different parts: the upper, interparietal part, which is a membrane bone, and the lower, supraoccipital part, which is a cartilage bone. According to some researchers, the boundary between these parts is the highest nuchal line [4-9]. Others, however, have identified the boundary to be the superior nuchal line [10-11]. In many other mammals, this bone is completely fused to the supraoccipital as in humans. However in some mammals (for example, rodents, rabbits, and artiodactyls), this bone remains separate from the supraoccipital bone. Classic comparative anatomy have regarded the interparietal as being lost in various mammalian lineages since the interparietal and supraoccipital fuse with each other in early ontogenetic period in many mammals, but recent study has shown that its presence is confirmed in all extant mammalian orders, particularly in embryonic period (Koyabu and others,2012)[12]. Inca bones in humans were first found in the skulls of contemporary indigenous peoples of the southern Andes as well as in those of mummies of the Inca civilization.

MATERIAL & METHODS:

The present study was conducted on 250 adult human dry skulls. With prior permission the skull were collected from department of anatomy, various medical colleges, dental colleges of Gujarat including department of anatomy, Govt medical college, Bhavnagar. We observed 250 dry human skulls of unknown age and sex for the presence of interparietal bone. The skull were macroscopically observed with naked eye and with magnifying glass and photographed for further analysis. Their number, size, shape & position were noted. There are no signs of injury or any pathological condition was seen in the squamous portion of the occipital bone in any skull. The interparietal bones were found in twenty four (24) skulls during this study.

OBSERVATION AND RESULTS

Out of 250 skulls were examined by us, 24 skulls shows the presence of interparietal bone. The incidence of interparietal bones in present study was 9.6%. On examination we observed that the three (3) skulls have large separate triangular shape interparietal bone at junction of lambdoid suture and sagittal suture (Figure1). One of them is completely divided into two parts by a vertical suture (Figure 2).

Figure 1 Skull showing Triangular shape Interparietal bone

Figure 2 Inter-parietal bone divided into Two parts by vertical suture.

There are nine (09) skulls shows various shapes of single interparietal bone presents at the junction of lambdoid suture and sagittal suture (Figure 3). There are five (5) skulls showing fragmented interparietal bone (Figure 4).

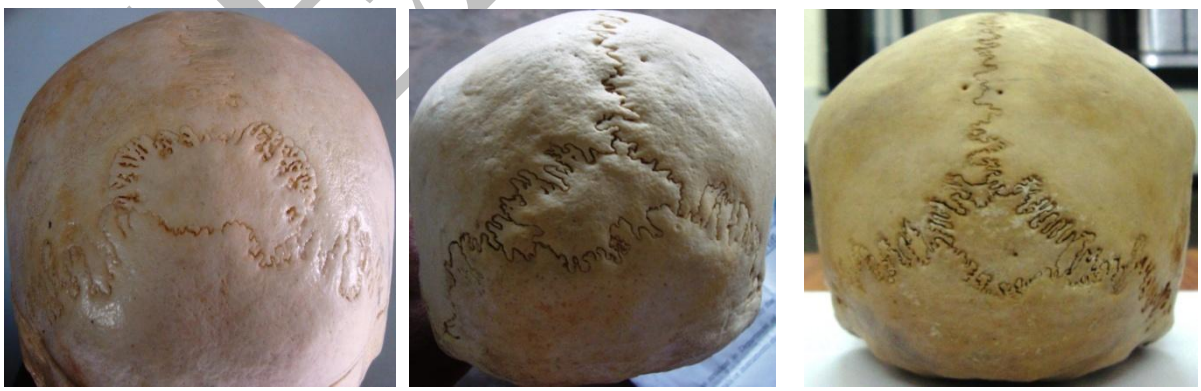

Figure 3 Various shape of Inter-parietal Bone at junction of sagittal & lambdoid suture.

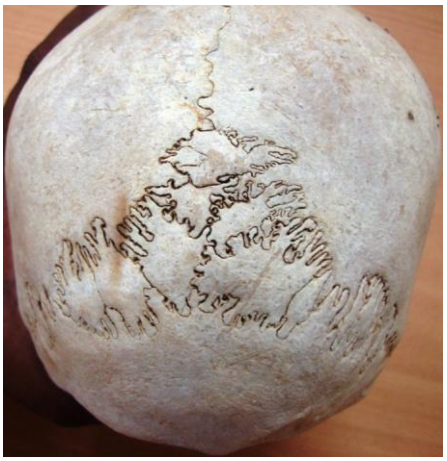

Figure 4 Fragmented inter-parietal bone.

Four (04) skull shows presence of three separate interparietal bone, one on the lambda & one on each side of lambdoid suture (Figure 5). One (01) skull shows presence of two interparietal bone on right side (Figure 6).

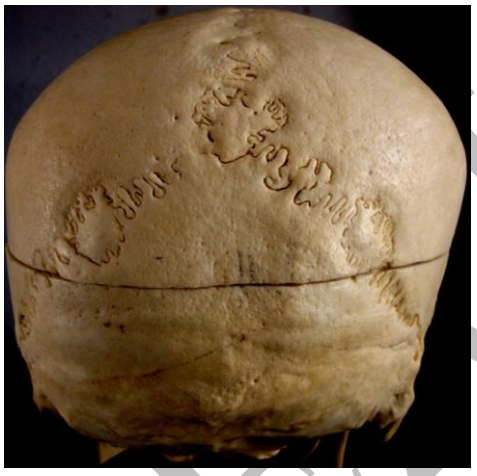

Figure 5 Three separate interparietal bone. **Figure 6** Two interparietal bone on right side.

One (01) skull shows presence of one interparietal bone on right side (Figure 7). One (01) skull shows presence of one interparietal bone on left side (Figure 8).

Figure 7 Inter-parietal bone on right side.

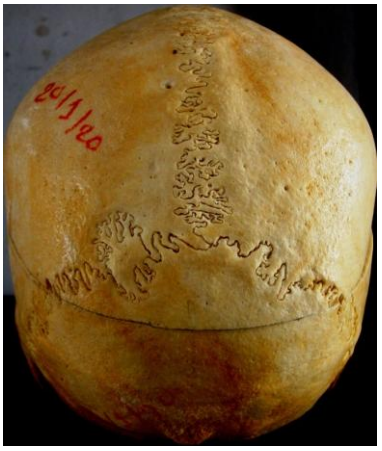

Figure 8 Inter-parietal bone on left side.

DISCUSSION

The study included a total number of 250 human adult dried skulls from various medical colleges and dental colleges of Gujarat region. The skulls were studied for the gross incidence, number, size, shape, position and number of fragments of the interparietal bones. In present study Out of 250 skulls were examined by us, 24 skulls show the presence of interparietal bone. The incidence of interparietal bones in present study was 9.6%.

The knowledge of these variants is of importance to the neurosurgeons and radiologists to avoid missed diagnosis of fractures of the skull in cases of head injuries. Presence of interparietal bone may cause difficulty in surgery of occipital and parietal bone. Forensic expert can use interparietal bone for personal identification and medicolegal application.

Table-1: Incidence of Interparietal bone

Author	Site	Number	Percentage
Shrivastava HC(1977)[9]	India	620	0.8%
Singh et al (1979)[7]	India	500	1.6%
Pal GP et al (1984)[13]	India	348	3.16%
Saxena et al (1986)[6]	Nigerian	40	2.5%
Magdan & Muftuoglu (1990)[15]	-	420	1.6%
Gopinathan(1991)[14]	India	125	0.8%
Aycan (1993)[16]	-	91	6.6%
Yucel F,Egilmez H,Akgun Z(1998)[17]	Turkey	544	2.8%
Zambare B.R.(2001)[18]	India	310	0.99%
Marathe et al (2010)[19]	India	380	1.3%
Joao Roberto da Mata et al (2010)[20]	Brazilian	104	1.92%
Hussain Saheb S et al (2010)[21]	India	125	4.8%
Murlimanju B.V et al (2010)[22]	India	78	3.8%
Dharwal K (2011)[23]	India	150	2.7%
Neeru Goyal wt al (2012)[24]	India	150	7.33
Dr.Kanan Shah et al (2013)[25]	India	100	5%
Khan A A et al (2013)[26]	Malasia	25	24%
Present study (2014)	India	250	9.6%

The interparietal bone or inca bones have been named so, because of their abundance in mummies from the inca civilization which was found in Peru. The incidence of the interparietal bones varies among different populations. It is 15% in Nigerians, 1.2% in Europeans, 0.8% in Australians, 4.8% in north Americans and 2.8% in Turkish, but it has been reported to be as high as 27.71% in Peruvian skulls. Phylogenetically, while it ascended the hierarchy of evolution, the interparietal bone which was a part of the parietal bone in ruminants, ungulates and carnivores, shifted to the occipital bone in rodents onwards to the primates[23]. The incidence of interparietal bone (Table-1) was reported as 0.8% by Shrivastava (1977)[9],

1.6% by Singh et al (1979)[7], 2.6% by Pal et al (1984)[13], 2.5% by Saxena et al (1986)[6],1.6% by Maden Muftuoglu (1990)[15],0.8% by Gopinathan(1991)[14], 6.6% by Aycan (1993)[16], 2.8% by Yucel F,Egilmez H,Akgun Z(1998)[17,]0.99% by Zambare B.R.(2001)[18], 1.3% by Marathe et al (2010)[19], 1.92% by Joao Roberto da Mata et al (2010)[20],4.8% by Hussain Saheb S et al (2010)[21],3.8% by Murlimanju B.V et al (2010)[22], 2.7% by Dharwal K (2011)[23],7.33% by Neeru Goyal wt al (2012)[24], 5% by Dr.Kanan Shah et al (2013)[25],24% by Khan A A et al (2013)[26] In our study the incidence of 9.6% was found. Incidence in present study is high compare to other studies. May be due to different population or sample size is small.

CONCLUSION

The incidence of interparietal bones in present study was 9.6%. There are some relations between congenital disease and anomalies with presence of interparietal bone or sutural bone. It is concluded that the inter-parietal bones can appear in various forms and shapes depending on the failure of fusion of ossification centre. Knowledge of interparietal bone is useful for neurosurgeons and radiologist to avoid missed diagnosis of skull fracture. Presence of interparietal bone causes difficulty in surgery of occipital bone and parietal bone. Forensic expert can use the interparietal bone for personal identification. It is also useful for study of classic comparative anatomy.

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