RESEARCH ARTICLE

MORPHOMETRIC STUDY OF INTERPARIETAL BONE IN GUJARAT REGION

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ABSTRACT
Background: The occipital bone develops partly in cartilage and partly in membrane. The squamous part of occipital bone between two parietal bones occasionally presents a separate bones which are termed as inca, pre-interparietal bone or interparietal bone.
Aims & Objective: (1) To determine the incidence of interparietal bone in skulls of Gujarat region. (2) To study different anomalies of interparietal bone and compare it with other studies.
Material and Methods: Total 289 dried macerated skulls from Gujarat region were studied for incidence and type of interparietal bone anomaly.
Results: Out of total 289 skulls interparietal bone was found in 23 bones giving incidence of 7.96%. Eight different varieties of interparietal bone anomalies were found and noted.
Conclusion: Different anomalies of interparietal bone can be easily interpreted using the knowledge of ossification of interparietal part of occipital bone. Pre-interparietal bone is a misnomer and should not be reported separately.
Key-Words: Occipital Bone; Ossification; Interparietal Bone; Morphometric Study

Introduction

The occipital bone develops partly in the membrane and partly in cartilage. The part of the bone above the highest nuchal line is known to ossify in membrane and may not fuse with the rest of the part even in adulthood, creating the interparietal bone.

The upper part of the occipital bone which lies between the two parietal bones is a membranous bone is known as interparietal bone, whereas the lower part (supraoccipital) is a cartilaginous bone. Srivastava[1] concluded the supraoccipital part of occipital bone develops partly in membrane and partly in cartilage. He further stated that the bone between highest and superior nuchal lines develops in membrane, is called the intermediate segment. In total, the membranous upper part of the occipital bone develops by three pairs of centres. The first pair which has one nucleus each forms the intermediate segment. Above the intermediate segment the second pair of ossification centres is made up of two nuclei each, medial and lateral forming the lateral plates of interparietal bone. The lateral portion of this plate is separated from the intermediate segment by a fissure known as lateral fissure. The third pair above all consists of two nuclei on either side of midline namely upper and lower and form the medial plates of interparietal bone. Failure of fusion of these centres or nuclei with one another or with intermediate segment gives rise to various varieties of interparietal bone. In some previous studies pre-interparietal bone has been described but Srivastava[1] in his study considers the pre-interparietal bone is part of interparietal bone. The purpose of this study was to find out the incidence and varieties of interparietal bones in adult skull of Gujarat region.

Materials and Methods

289 adult macerated skulls were examined obtained from the collection of the Anatomy Department at BJ Medical College and Govt. Dental College, Ahmedabad. Overall, the skulls were extremely well preserved and provided information on the external and internal surfaces of occipital squama. These skulls were examined for the presence of the interparietal bone and the incidence of the same was recorded.

Results

Out of total 289 skulls examined, 23 skulls were found to have interparietal bones. Total incidence of interparietal bone was 7.96 percent.

In twelve cases, the interparietal bones were formed by fusion of two nuclei of upper most pair of nuclei (Figure 1). In one case the interparietal bone is formed by two pieces of upper most pair of nuclei which remain separate (Figure 2). In four cases, the interparietal bone shows a central piece, which is formed by the fusion of the upper pair nuclei with medial nuclei of middle pair (Figure 3). In one

case each, the interparietal bone present three separate pieces. In one, the middle piece is formed by fusion of upper pair of nuclei and medial plate of middle pair of nuclei. The other two lateral pieces are formed by separate lateral plate nuclei of middle pair (Figure 4). In other, one piece is formed by fused upper pair nuclei and two pieces by two separate lateral nuclei of middle pair (Figure 5).

Figure-1: Showing interparietal bone formed by fusion of two nuclei of upper most pair of nuclei.

Figure-2: Showing interparietal bone formation by two pieces of upper most pair of nuclei which have remained separate.

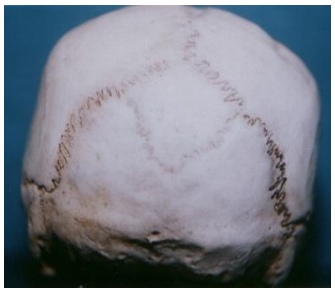

Figure-3: The interparietal bone shows a central piece formed by the fusion of the upper pair nuclei with medial nuclei of middle pair.

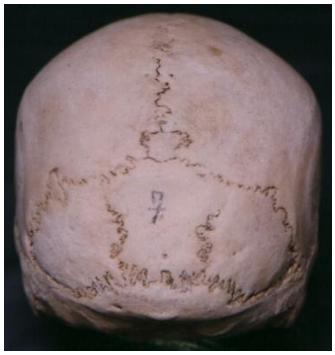

Figure-4: Interparietal bone is in three pieces. The middle piece is formed by fusion of upper pair of nuclei and medial plate of middle pair of nuclei. The two lateral pieces are formed by separate lateral plate nuclei of middle pair.

Figure-5: Interparietal bone shows three pieces. One piece is formed by fused upper pair nuclei and two pieces by two separate lateral nuclei of middle pair.

Figure-6: The interparietal bone presents two pieces. One large piece is formed by fusion of upper pair nuclei, medial nuclei of middle pair and left lateral nucleus of middle pair. The smaller piece is formed by the lateral nucleus of middle pair of right side.

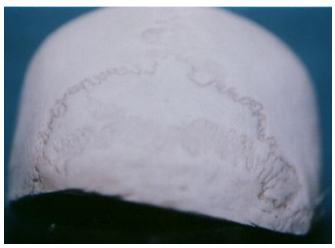

Figure-7: A completely separate interparietal bone is found which sutures the rest of the occipital bone at highest nuchal line.

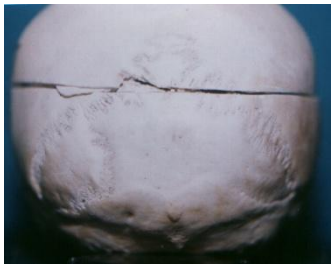

Figure-8: The interparietal bone present two separate pieces of interparietal bones which represent two lateral nuclei of middle pair.

In two cases, the interparietal bone presents two pieces of bones. One large piece is formed by fusion of upper pair nuclei, medial nuclei of middle pair and left lateral nucleus of middle pair. The separate piece is formed by the lateral nucleus of middle pair of right side (Figure 6). In one case, completely separate interparietal bone is found which sutures the rest of the occipital bone at highest nuchal line (Figure 7). In one case, two lateral nuclei of middle pair form two separate pieces of interparietal bones (Figure 8).

Discussion

Variations in the interparietal region as well the interparietal part of the occipital bone have been studied extensively in the adult skull.[1-7]

The incidence of interparietal bone varies among different groups as described by different studies. It was found to be 15% in Nigerians (both pre-interparietal & interparietal), 0.8% in Australians, 1.2% in Europeans, and 4.8% in North Americans.[8-10] In Turkish population, incidence of interparietal bone varied and was found to be 4%[10], 2.8%[11], 6.59%[12] and 3.8%[13] in different studies. Various studies done in India reveals the incidence of interparietal bone from 0.8%[3] to 3.6% (both pre-interparietal and interparietal)[14].

In our study, all the anomalous interparietal bones could be easily interpreted with the help of ossification centers as described by Srivastava. Same has been described by Ranke.[4] Whereas others like Brash[15], Breathnach[16], Pal et al[5] and Gopinathan[3] state that interparietal bone develops from two ossification center with possibility of a third pair near the upper angle of bone forming the pre-interparietal bone. This may be because these observations do not mention the presence of medial pair nuclei of lateral plate. Srivastava[1] also states that sutural bones should not be confused with interparietal bones. Knowledge of the ossification centers and their nuclei as described by Srivastava[1] is essential to prevent this kind of confusion.

In Figure 7, it can be clearly seen that complete interparietal bone is formed by fusion of all the nuclei and the suture between it and rest of the occipital bone lies at the level of highest nuchal line.[5,6] This indicates that the bone developing from middle and upper pairs of nuclei was part of parietal bone in early mammalian phylogeny and it has now come to join the occipital bone in primates and man.[1] Further, the intermediate segment which lies between the superior and highest nuchal lines remains fused with supraoccipital part of occipital bone. They together form the lamella triangularis, which extends from posterior margin of foramen magnum to highest nuchal lines, as described by Debierre.[17]

Once the basis of development of interparietal bone is clear, various anomalies in its development as described by different investigators can be easily understood. Thus, the interparietal bone can appear in different forms and all the bones other than sutural bones are part of interparietal bone. Further, the pre-interparietal bone is not a separate anomaly but is a type of interparietal bone and so should not be described separately.

Conclusion

The ossification of intramembranous part of occipital bone occurs from different ossification centres. Clear understanding of ossification of membranous part of occipital bone can easily explain different varieties of interparietal bone. In present study, the interparietal bone was found in 7.96% of total skull. Further, eight different varieties of interparietal bone anomalies were observed due to variations in fusion of different ossification nuclei.

References

1. Srivastava HC. Development of ossification centres in the squamous portion of occipital bone in man. J Anat. 1992; 180: 219-224.
2. Kolte DT, Mysorekar VR. Tripartite interparietal bone. J Anat Soc India. 1966;15(1): 96.
3. Gopinathan KA. A rare anomaly of 5 ossicles in the pre-interparietal part of squamous occipital bone in north Indian. J Anat. 1992;180(1);201-202.
4. Schaffer EA, Symington J, Bryce TH. Quain's elements of Anatomy. 11th ed (Vol.4). London: Longmans, Green. 1915. p. 53-55.
5. Pal GP, Tamankar BP, Routal RG, Bhagwat SS. The ossification of the membranous part of squamous occipital bone in man. J Anat. 1984;138:259-266.
6. Srivastava HC. Development of ossification centres in the squamous portion of the occipital bone in man. J Anat. 1977;124:643-649.
7. Matsumura T, Uchiumi K, Kida R, Ichikawa, Kodama G. Developmental studies on the interparietal part of the human occipital squama. J Anat.1993;182:197-204.
8. Saxena SK, Chowdhary DS, Jain SP. Interparietal bones in Nigerian skull. J Anat. 1986;144:235-237.
9. Singh PJ, Gupta CD, Arora AK. Incidence of interparietal bones in adult skulls of Agra region. Anat Anz. 1979;145:528-531.
10. Cireli E, Tetik S. Insan neurocraniumunu olusturan kemiklerde gorulen varyasyonlarin morfolojik ve antropolojik degerlendirilmesi (I-II). Ege Universitesi Tip Fak. 1985:24:3-35.
11. Yucel F, Egilmez H, Akgun Z. A Study on the Interparietal Bone in Man Tr J Med Sci. 1998;28: 505-509.
12. Aycan K. Interparietal kemiklerin gelisimi ve varyasyonlari. Erciyes Universitesi Saglik Bilimleri. 1993;2:70-76.
13. Magden AO & Muftuoglu A. Insan desmocranium unda sutura cranialis ve os incae varyasyonlari. Cerrahpasa Tip Fak. 1989;21:313-317.
14. Murlimanju BV, Prabhu LV, Paul MT, Pai MM, Krishnamurthy A, Rai A. Variant morphogenesis of squamous part of occipital bone in human skulls. J Morphol Sci. 2010; 27(3-4): 139-141.
15. Brash JC. Cunningham's text book of Anatomy, 9th edition. London: Oxford University Press. 1951; 212-220.
16. Frazer JES, Breathnach AS. Frazer's Anatomy of the Human Skeleton. 6th ed. London: Churchill Ltd. 1965.
17. Debeirre C. Occipital bones in man and Bufo. J Anat Physiol. 1895; 31:385.

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