



Interparietal (Inca) bone: a case report

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ABSTRACT

The squamous part of occipital bone consists of two parts, supraoccipital and interparietal. The interparietal portion ossifies intramembranously and in rare cases may be separated from the supraoccipital part by a suture. It is then called as the interparietal or Inca bone. The occurrence of Inca variable is rare in humans. The authors here report a case of true interparietal or Inca bone in adult human skull. Knowledge of Inca ossicles in human skulls may be useful to neurosurgeons orthopedic surgeons, anthropologists, radiologists and forensic experts. © IJAV. 2011; 4: 90–92.

Key words [interparietal bone] [supraoccipital bone] [occipital bone] [intramembranous ossification] [Inca bone]

Introduction

The squamous part of occipital bone consists of two parts, supraoccipital and interparietal [1]. The interparietal portion may remain separated from the supraoccipital by a suture; it is then called the interparietal or Inca bone [2]. This is the true interparietal bone which has migrated from the parietals of lower animals during evolution to become part of the occipital bone in man. The supraoccipital part develops both in cartilaginous and intramembranously and the interparietal part develops intramembranously. The segment of supraoccipital bone between the highest and superior nuchal lines forms the intermediate segment. It ossifies intramembranously and probably never separates from the cartilaginous supraoccipital part [1]. True interparietal bones or Inca bones are bounded by lambdoid suture and sutura mendosa (transverse occipital suture) [3]. They were previously known as os Incae, os interparietale, Goethe's ossicles [4]. Inca bone resembles triangular architectural monument design of Inca tribe [5]. Inca bones were supposed to be present in Inca tribals in South Andes – America 1200 – 1597 A.D. The members of Royal family of Inca tribe had crown-like configuration on their head. Hence, thereafter these ossicles have been known as Inca [6].

Case Report

The present case of interparietal or Inca bone was obtained as an incidental finding in adult skull from the Department of Anatomy, Kempegowda Institute of Medical Sciences, Bangalore, India. A single large true interparietal bone was found behind the lambda in between the two lambdoid sutures (Figure 1). The suture separating the interparietal bone from the rest of the occipital bone was at the level of the highest nuchal line at a distance of 2 cm from the external occipital protuberance and 1 cm above the superior nuchal line near the lambdoid suture. A sutural bone was seen in the left lambdoid suture at about its middle.

Discussion

The occurrence of Inca variable is rare [3]. Srivastava, in a study of 620 skulls found complete separate interparietal bone in 3 skulls with an incident of 0.8% [7]. He found the suture between the interparietal and supraoccipital parts 2 cm above the external occipital protuberance and 0.4 cm above the superior nuchal line near the lambdoid suture. He stated that when interparietal bone develops as a complete separate bone, the suture between it and rest of the occipital bone lies at the highest nuchal line. The present study correlates with this. Yucel et al., in a study of 544 skulls, found the incidence of interparietal bones in 2.8% of the cases. However, complete separate interparietal bone (with



Figure 1. Photograph showing Inca – interparietal bone.

fusion of all nuclei of 2nd and 3rd pairs of center) was not found in any of the skulls [8].

Saxena et al. in a study of 40 Nigerian skulls found the presence of interparietal bone in only one skull with an incidence of 2.5% of the cases [2].

Marathe et al. found the presence of Inca bone in 5 out of 380 skulls from Central India with an incidence of 1.315% of the cases. They also found sexual dimorphism for the presence Inca bones, the incidence being higher (1.428%) in males compared to females (1.176%) [3].

Srivastava studied the ossification of membranous portion of squamous part of occipital bone in 21 fetuses aged from 9 to 16 weeks. He observed that it develops from three pairs of centers. The first pair of center forms the intermediate segment, which forms the portion of bone between superior and highest nuchal lines and always fuses with the cartilaginous supraoccipital part. The second and third pair of centers forms the interparietal bone which lies above the highest nuchal line, the second pair forms the lateral plate and the third pair forms the medial plate. Each center consists of 2 nuclei (Figure 2) [1]. Interparietal bone observed in the present case can be easily interpreted in the light of ossification centers observed by Srivastava [1]. It can be analysed that the present case is due to non-fusion of second and third pairs of center (4 nuclei) with the first pair of center which forms the intermediate segment.

The Inca bones may give a false appearance of fracture on roentgenographs. Such bones may lead to complications during burr-hole surgeries and their extensions may lead to

continuation of fracture lines. Due to clinical implication information of presence of Inca bones, their incidence, sexual dimorphism and number of fragments is essential to clinicians [3].

Keith stated that a separate single interparietal bone in man is an extremely rare anomaly. He observed that phylogenetically, the interparietals fuse with the parietals in marsupials, ruminants and ungulates, while in rodents, they fuse both with occipital and parietal bone. In primates and carnivora as in man, they fuse with occipital. But sometimes as a variant in man, the interparietal is seen as a separate bone [9].

Hanihara and Ishida studied the variation in frequency of Inca bones in major human populations around the world. They found that the new world populations have generally high frequencies of Inca bones, whereas lower frequencies occur in North East Asians and Australians. Tibetan/Nepalese and Assam/Sikkim populations in Northeast India have more Inca bones than do neighbor populations. They stated that geographical and ethnographical patterns of the variation in the frequency of Inca bones found in their study indicate the possible genetic background for the occurrence of this bone [10].

Knowledge of Inca ossicles in human skulls may be useful to neurosurgeons, orthopedic surgeons, anthropologist, radiologists and forensic experts.

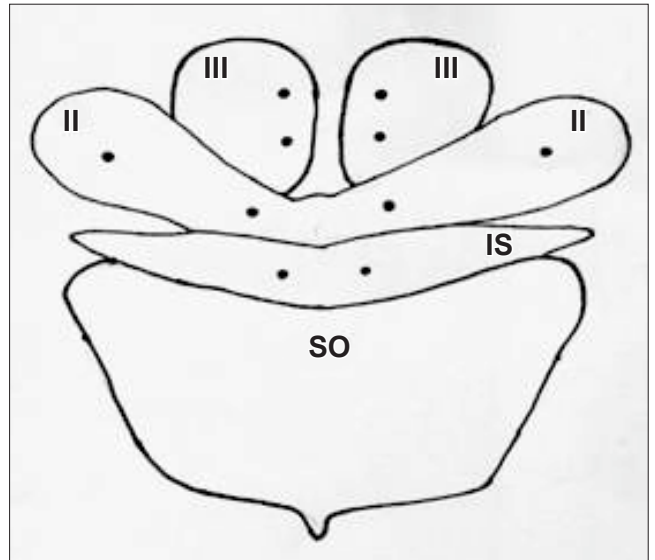


Figure 2. Diagrammatic representation of centres and their nuclei in the membranous part of the occipital bone above the *supraoccipital bone (SO)*– paired centers of the *intermediate segment (IS)*, medial and lateral nuclei of *2nd pair of centers (II)* which form the lateral plate and upper and lower nuclei of *3rd pair of centres (III)* which form the medial plate. [Redrawn from Srivastava HC. Ossification of the membranous portion of the squamous part of the occipital bone in man. J Anat. 1992; 180: 219–224]

References

- [1] Srivastava HC. Ossification of the membranous portion of the squamous part of the occipital bone in man. *J Anat.* 1992; 180: 219–224.
- [2] Saxena SK, Chowdhary DS, Jain SP. Interparietal bones in Nigerian skulls. *J Anat.* 1988; 144: 235–237.
- [3] Marathe RR, Yogesh AS, Pandit SV, Joshi M, Trivedi GN. Inca – interparietal bones in neurocranium of human skulls in central India. *J Neurosci Rural Pract.* 2010; 1: 14–16.
- [4] Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, Ferguson MWJ. *Gray's Anatomy*. 38th Ed., London, Churchill Livingstone. 1995; 583–606.
- [5] Gordon S. *The Book of Knowledge*. 8th Ed, London, Waverlay Book Co Ltd. 1963; 161–166.
- [6] Moseley M. The Incas and their ancestors. In: *The Archaeology of Peru*. London, Thames and Hudson. 1992; 8.
- [7] Srivastava HC. Development of ossification centres in the squamous portion of the occipital bone in man. *J Anat.* 1977; 124: 634–639.
- [8] Yucel F, Egilmez H, Akgun Z. A study of the interparietal bone in man. *Turk J Med Sci.* 1996; 28: 505–509.
- [9] Keith A. *Human Embryology and Morphology*. 6th Ed., London, Edward Arnold and Co. 1948; 223–224.
- [10] Hanihara T, Ishida H. Os incae: variation in frequency in major human population groups. *J Anat.* 2001; 198: 137–152.