

A Human Skull with a Tripartite Inca Bone: A Case Report

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Abstract

An adult human skull was discovered in a college osteological collection presenting with two Inca bones. Inca bones or interparietal (supernumerary) bones are rarely seen among dry human skulls. Their frequency of presentation is much less than that of sutural or Wormian bones. Inca bones or interparietal (supernumerary) bones are accepted as normal variants most often found in the occipitoparietal region of the skull. Their characteristic shape, a triangle, resembles a monument design of the Inca tribe of South America and Latin America. The significance of the presence of these variants is that Inca bones or interparietal bones may be mistaken for a skull fracture. They may also be very useful in forensic identification of an unknown individual.

Keywords

Inca Bones, Wormian Bones, Sutural Bones, Supernumerary Bones

1. Introduction

The skull is composed of twenty-two bones divided into eight cranial bones (neurocranium) and fourteen facial bones (viscerocranium) [1]. Some authors may include the three paired middle ear ossicles for a total of twenty-eight. Ossification of the neurocranium begins at approximately two to three months of gestation [2]. The occipital bone forms much of the back and the base of the cranium [1]. It is composed of a squamous part, a basilar and two lateral parts. The squamosal part articulates with the occipital portions of the parietal bones forming the lambdoid suture [1]. The squamous part of the occipital bone develops intramembranously from two centers, one from each side [1]. It may remain separate from the rest of the occipital bone and be known as an “interparietal bone” or in some cases, a Wormian bone of the lambda [1]. The “lambda” is an ectocranialosteometric point and the lambdoidal and the suture between the two parietal bones called the sagittal suture intersect at the point. The consequence of irregularities of the ossification centers is the formation of the Inca bones and/or

Wormian bones within the sutures of the cranial bones [3]. These interparietal bones have been named “Inca” due to their prevalence in the skulls of mummies of the Inca tribe in Peru. Their high abundance in the Peru population is also strongly suggestive of a genetic inheritance [4]. The Inca bones or interparietal bones (ossicles of Goethe) are considered as a normal variant of human skull ossification and may or may not have association with a pathology.

2. Case Presentation

A dry human skull primarily used for study in the anatomy program at Bowling Green State University Firelands in Huron, Ohio was found to have a tripartite Inca bone or interparietal bones. Based upon the size and shape of the piriform aperture as well as the various other anthropometric markings (including piriform aperture morphology), the skull was suspected to be from a black male of unknown age. A tripartite Inca bone or Interparietal bones (ossicles of Goethe) were located about the lambda as seen in **Figure 1** and a typical skull without an Inca bone or other supernumerary bones for comparison is shown in **Figure 2**.

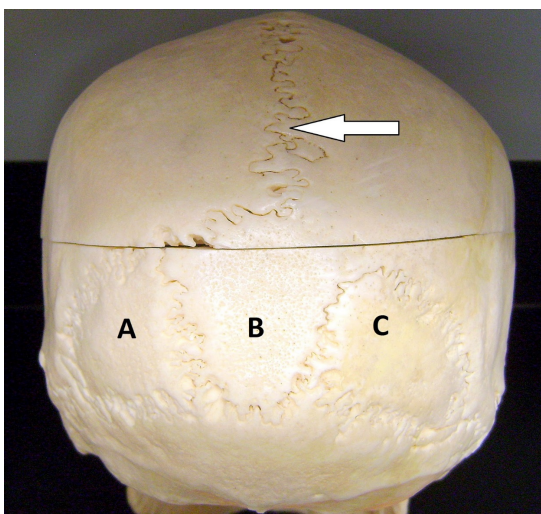


Figure 1. Posterior view of skull. Letters A, B and C indicate a complete tripartite Inca bone. White arrow indicates the sagittal suture.

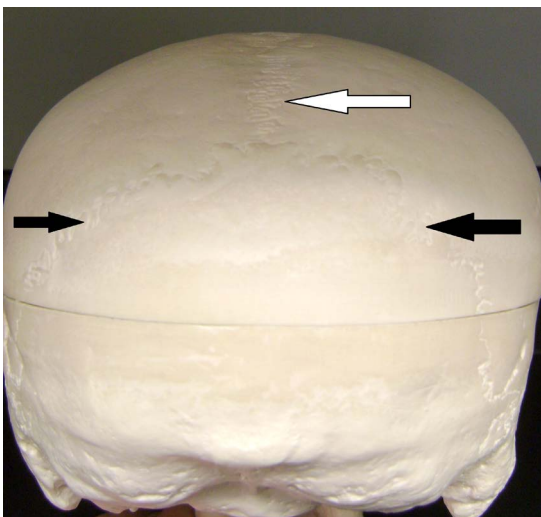


Figure 2. Posterior view of a “typical” skull. White arrow indicates the sagittal suture. Black arrows indicate the lambdoid suture.

3. Discussion

Inca bones or interparietal bones are so named due to their relative abundance in the Peruvian population. They are exceedingly rare among dry human skulls. The interparietal bones are said to exist in a single bone, two symmetrical halves, or in three pieces, a tripartite type [5]. This study presents a tripartite Inca bone. These bones are thought to exist in approximately 0.08% of the population and the incidence varies among different populations [6]. Some authors [7] [8] report the incidence of the interparietal bones vary among different populations. They found Inca bones to be present in 15% in Nigerians, 1.2% in Europeans, 0.8% in Australians, 4.8% in Northern Americans and 2.4% in Indians. Researchers, Hanihara and Ishida studied the presence of the Inca bones in various populations around the world. They found that any geographical occurrence was unclear but discovered some regional variations. They found the highest percentage of 10% was noted in the West African population with the Japanese being next highest at 4.4%. Some authors reported the presence of Inca bones to be associated with other cranial and nervous system abnormalities [9]-[12]. It is clear that the presence of interparietal bones or Inca bones is multifactorial. Factors may be genetic, geographical or most likely a combination of both. Inca bones, if nothing else, certainly create another method to forensically identify an unknown if prior knowledge of its presence is known.

4. Conclusion

Inca bones have very clear anthropometrical value as well as some forensic utility. Clinically, the presence of Inca bones or interparietal bones is significant when discovered radiographically. It must be included in the differential diagnosis of a suspected skull fracture, particularly of the occipital bone. While it is not a pathological entity, it most certainly should be noted as an incidental finding on a radiographic report. The notation of its presence in the report can help with the differential diagnosis. In addition, neurosurgeons should be aware of the many suture or accessory bone formations before any type of cranial surgery.

Conflict of Interest

The author declares no conflict of interest.

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