



OS INCA - A CASE REPORT. MATHIVANAN D

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Abstract : INTRODUCTION-Inca is the ethnic sign, depicting the triangular architectural monument design of Inca tribes in south Andes America. Among whom, the members of royal family wore a crown like configuration on their head called as Inca. Rivero and Tschudy in the year 1851 first described the Inca bones in the skull, which resembled the tribal sign. Skull is divided as neurocranium and viscerocranium and consists of 28 bones which are paired and unpaired in nature. The bones are fused by intramembranous and endochondral ossification, the suture by synostosis. Premature fusion of sutures will result in bony malformations. Islands of bones formed are called as sutural or wormian (supernumerary, Inca) bones which are commonly associated within the lambdoid suture. AIM OBJECTIVE-To report the skull based variation called as OS INCA with its morphometrical analysis which carries significance during medicolegal examination, while eliciting radiological diagnosis to rule out the skull fractures, during neurosurgical interventions for burr hole surgeries and while doing anthropological analysis. CASE REPORT-During routine osteological session for undergraduate students, we observed a skull with interparietal (Inca) bone near lambdoid suture. It is of asymmetrical bipartite type and has been reported with its measurements from the nearby bony prominences and foramen, by using the vernier caliper. The observation was discussed with the previous pioneer studies. CONCLUSION-Thus the interparietal bone has been made as a case report which is of asymmetrical bipartite type we are recommending a future scope for this study by adding a radiological correlation and also to find out the incidence of Inca bones in our population.

Keyword : Inca, Interparietal, Asymmetrical bipartite, Lambdoid Suture.

INTRODUCTION:

Human skull is the bony covering of head. It protects the brain, the organs of special senses, the vital centres for respiration & digestion and acts as a bony framework for the attachments of muscles of head and neck. Cranium is the skull without the mandible (lower facial skeleton). Skull is divided as neurocranium & viscerocranium and consists of 28 bones which are paired and unpaired in nature. The neurocranium is made up of frontal, ethmoid, sphenoid, occipital, temporal and parietal bones out of which former four bones are singular in nature and latter two are paired. The cranial vault is made up of flat bones which consists of outer table, inner table and are formed by

intramembranous ossification of head mesenchyme from the neural crest 1, 5 and the sutures which are fused by synostosis (fibrous). The cranial vault reaches the adult size by the seventh year and concentric expansion is observed, attributing to each milestones of further growth of the child. The synostosis begins by the third decade and extends from inwards to outwards, thereby the sagittal suture being involved in the process first. The large sutures will undergo and show the evidence of synostosis by the middle age (20-30 years). Premature fusion of sutures will result in bony malformations. Islands of bones called as sutural or wormian (supernumerary) bones are commonly associated within the lambdoid suture. These are formed due to the separate centres of ossification arising for the respective bones formed. In such a way, the partial or complete failure of fusion of the ossification centers of the squamous part of the occipital bone results in the formation of the inter parietal bone referred as Inca bone (os inca, os inter parietale, Goethe's ossicles).

Inca is the ethnic sign, depicting the triangular architectural monument design of Inca tribes in South Andes America. Also among whom, the members of royal family wore a crown on their head, depicting the monument design, called as Inca. Rivero and Tschudy in the year 1851 first described the Inca bones, which resembled the tribal sign. The portion of the squamous part of occipital bone above the highest nuchal line is the interparietal part which is formed by intramembranous ossification and below the line, the supra occipital part which is formed by both intramembranous and endochondral ossification. The ossification centres for the interparietal part are three pairs of ossification nuclei (centers); one pair appears on each side of the midline between the highest and superior nuchal line and the remaining two pairs on each side above the highest nuchal line. Failure of fusion of these centers results in the formation of Inca bone which is bounded by lambdoid suture and mensal suture (transverse occipital suture). Sometimes there may be a longitudinal suture formed between the inter parietal bone, thereby making it bipartite, tripartite and multipartite in nature. Human Osteology varied in various phases of human evolution. The morphology and morphometry of bones varies across different geographical areas in response to climatic (topographical) and hereditary factors. Osteology of skull plays a vital role in anthropological studies, forensic aspect, diagnostic and interventional aspects

in neurosurgery. So the sound and updated knowledge of Inca bone, a varied bony Anatomy of skull, proves mandatory for the foresaid fields and also helps as a marker for osteogenesis imperfecta and hydrocephalus kind of central nervous system pathological disorders³.

CASE REPORT:

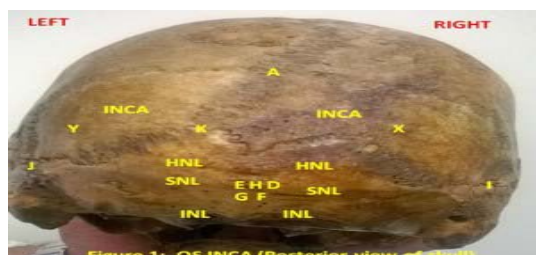


Figure 1: OS INCA (Posterior view of skull)

During the routine osteological session for the undergraduate students in our Anatomy department, we came with the accidental finding of the interparietal bone (INCA) which is of asymmetrical bipartite type. The right side is marked as X and the left side is kept as Y, which are separated by a longitudinal suture and are limited by lambdoid suture above, mendosal suture below, asterion forming the postero inferior angles and apex (A) being the joining of the longitudinal suture with the lambda (Figure 1). Thus the asymmetrical bipartite interparietal bone assumed a triangular shape and its morphometrical analysis are:

The measurements are taken from the apex

(A) of the each triangle, which is the common point, towards the following points with the help of the digital vernier caliper.

(B) Point at the centre of parietal foramen (right side). (AB) (Figure 1,2)

(C) Point at the centre of parietal foramen (left side). (AC) (Figure 1,2)

(D) Point at the junction of external occipital protuberance and right sided highest nuchal line (HNL). (AD)

(E) Point at the junction of external occipital protuberance and left sided highest nuchal line. (AE)

(F) Point at the junction of external occipital protuberance and right sided superior nuchal line (SNL). (AF)

(G) Point at the junction of external occipital protuberance and left sided superior nuchal line. (AG)

(H) Point at the centre of external occipital protuberance. (AH)

(I) Point at the asterion (right side). (AI)

(J) Point at the asterion (left side). (AJ)

(K) Point at the junction of longitudinal suture with mendosal suture.

LINEAR DIMENSIONS OF INCA BONE ON RIGHT AND LEFT SIDE: (Table 1)

RIGHT SIDE (X)			LEFT SIDE (Y)		
S.NO	DISTANCE	(cm)	S.NO	DISTANCE	(cm)
1.	AB	5.11	1.	AC	4.81
2.	AD	5.49	2.	AE	5.42
3.	AF	6.03	3.	AG	5.90
4.	AH	5.90	4.	AH	5.90
5.	AI	7.69	5.	AJ	7.37

TRIANGULAR DIMENSIONS OF INCA BONE ON RIGHT AND LEFT SIDE: (Table 2)

TRIANGLE X			TRIANGLE Y		
S.NO	DISTANCE	(cm)	S.NO	DISTANCE	(cm)
1.	AI	7.69	1.	AJ	7.37
2.	AK	3.75	2.	AK	3.75
3.	IK	7.31	3.	JK	5.50

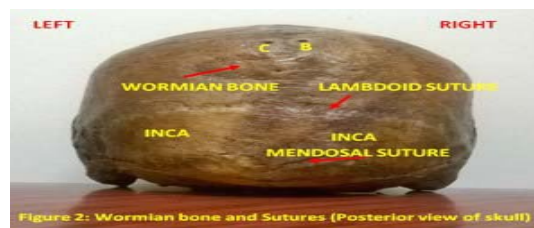


Figure 2: Wormian bone and Sutures (Posterior view of skull)

Along with this, an incidental finding of a wormian bone situated 15.08 cm from the obelion and 18.63 cm from the lambda in the sagittal suture, measuring about 1.47 cm in height, 3.3 cm in breadth and oval in shape. (figure 2)

DISCUSSION:

Os Inca presentation was not very uncommon, owing to the fact of describing it, the following discussions were made: Murlimanju et al (2010) on observing 78 human adult skulls in mangalore population reported 3.8 % incidence of interparietal bone and 10.3 % incidence of pre interparietal bone⁵. Mayuri et al (2014) on screening 105 human skulls showed the incidence of interparietal bone as 3.81 % and preinterparietal type as 2.86% ⁴. In our report, we add a case of interparietal bone with a sutural bone which is not of pre interparietal type. Udupi et al (2011), Badkur et al (2011), Sharma V et al (2013) documented a case report of interparietal bone (INCA) bone which is a single large interparietal bone between the lambdoid suture 11,2,9, where as in our study it is a asymmetrical bipartite type of interparietal bone. Kumud dharwal (2011) studied 150 intact macerated skulls in Amristar and reported inca bones of types, such as bipartite (symmetrical, asymmetrical), tripartite (symmetrical, asymmetrical) and multipartite³. Solitary or multiple INCA bones presence were also been documented with a morphometrical analysis of the INCA bone and the incidence given was 2.7% in the study⁷. Affirmative with the above studies, we got the case of asymmetrical bipartite type of interparietal bone. Padmaja V (2013) reported a case of unilateral (left) wormian bone on coronal suture and three wormian bones, two on either side of lambda and another on the left side of the lambdoid suture⁷.

In our study we report interparietal bone on either side of lambda and a wormian bone above the lambdoid suture. Natekar PE et al (2015) reported the case of Inca bones at asterion where as we report near the lambda⁶. 151 human dry skulls were examined by Cirpan S et al in west anatolian population and their report on incidence of Inca (inter parietal) bones were 1.98% with 1 incomplete lateral asymmetric and 1 complete divided asymmetric bipartite Inca², as an adjunct to the above report we also report a case of complete divided asymmetrical bipartite Inca (interparietal) bone.

AUTHOR (S)	REFERENCE REPORT	OUR REPORT
Murlimanju et al(2010), Mayuri et al(2014)	3.8 % incidence of interparietal bone and 10.3 % incidence of pre interparietal bone respectively.	Interparietal bone with a wormian bone which is not of pre interparietal type.
Udupi et al(2011), Badkur et al (2011), Sharma v et al(2013)	Interparietal bone (INCA) bone which is a single large one, between the lambdoid suture.	Asymmetrical bipartite type of interparietal bone.

Kumud D (2011)	Reported inca bones of types, such as bipartite (symmetrical, asymmetrical), tripartite (symmetrical, asymmetrical) and multipartite.	Asymmetrical bipartite type of interparietal bone.
Padmaja V (2013)	Unilateral (left) wormian bone on coronal suture and three wormian bones, two on either side of lambda and another on the left side of the lambdoid suture.	Interparietal bone on either side of lambda, a wormian bone above the lambdoid suture.
Natekar PE et al (2015)	Case of inca bones at asterion.	We report the inca bone near the lambda.
Cirpan S et al (2014)	Report on incidence of inca (interparietal) bones was 1.98% with 1 incomplete lateral asymmetric, 1 complete divided and 1 complete divided asymmetric bipartite inca.	Complete divided asymmetrical bipartite inca (interparietal) bone.

CONCLUSION:

Inca, the traditional tribal sign which was personified as Os Inca, the interparietal bone in skull, has been made as a case report with its morphometrical analysis. It is of asymmetrical bipartite type which carries huge significance during: medicolegal examination, radiological diagnosis to rule out fractures, neurosurgical interventions for burr hole surgeries and while doing anthropological analysis. Based on this report, we are hoping to find out the incidence of Inca bones in our population and also to substantiate with radiological correlation both morphometrically and morphologically, in the near future.

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