

Original Article

Study of the Variations of Asterion, Pterion & Inion in Human Dry Skulls & its Anthropological importance

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ABSTRACT

Background and objectives: Asterion is the meeting point of three bones namely parietal, temporal and occipital bones in the norma lateralis of all human skulls the variations showed a pattern of formations. Pterion is the point of convergence of the sutures between the frontal, sphenoid, parietal and squamous temporal bones. Asterion have profound surgical importance.

Materials and methods: Good intact skulls from different medical college of Nepal were used for the present study. Each skull was studied in detail regarding the formation of Asterion, Pterion on

both sides and associated findings were observed. Sixty eight dry unknown human skulls constituted the materials for the present study. The observation was made on Asterion, Pterion & Inion. This study was done in the departments of Anatomy in different medical colleges of Nepal between the years 2019-2021.

Results: Incidence of asterion with wormian bones on the right side was 4.41% that of the left side 5.88%. More number of H shaped pterion on the right side [80.82%] than on left side [70.94%]. Presence of Wormian bones more on the right side [7.69%] than on the left side [2.94%] were observed.

Conclusion: The knowledge of the formation of asterion and the presence of wormian bones in the sutures at the site and its effect should be known not only to the Anatomists but also to the Radiologist and the Neurosurgeons because it has profound neurosurgical importance. Hence this study has been done and reported.

Keywords: Asterion Mastoid fontanelle, Lateral Fontanelle, Mastoid Suture, Occipito-mastoid, Parieto mastoid sutures, Pterion, Sutural bones, Unknown Skulls

INTRODUCTION

Asterion is the meeting point of sutures of three bones namely parietal, temporal and occipital bones. It is an important pathway for surgery of the posterior cranial fossa [1]. It is of paramount surgical importance and landmark where transverse sinus ends and sigmoid sinus begins. The incidences of

sutural bones at the craniometric point vary in different populations as reported by Berry & Berry [3]. The neurosurgeons and Radiologists should be very careful due to the presence of sutural bones for the interpretation of the X-Rays and also during the surgical corrections on fractures [4].

MATERIALS AND METHODS

This study was done on sixty-eight unknown dry human skulls in the Department of Anatomy in the different Medical Colleges Nepal. Good Intact unbroken skulls of the Department of Anatomy with well-defined sutures at Asterion, & Pterion were considered for the present study.

Broken skulls of the department were excluded from the study. Each skull was studied in detail for the:

Their patterns of formation exhibit population-based variations

- i) For the pattern of formation & their variations at Asterion,
 - ii) Various patterns of Pterion & their percentages,
 - iii) Presence and absence of Epipteric bones or wormian bones in the sutures. They were classified into two types. Skull showing wormian bones in the asterion were a group as -Type-I and Skull showing no wormian bones in the asterion were a group as Type-II.
- Approval from Institutional Review board of Janaki Medical College, Ramdaiya, Dhanusha was taken.

RESULTS

The observations of the study is presented in table 1 and 2. Table-1 shows 5.88% of

asterion with sutural bone on the right side and 4.41% on the left side. The total number of skulls showing asterion with sutural bones was 7 [10.29%]. No skull showed asterion with wormian bones on both sides.

Table-2 showed more percentages of **“H”Shaped**-Sphenoparietal type pterion on the right-side (88.83%) and the left side (79.41%). The least percentages of incidences of frontotemporal type of pterion on the left side was (4.41%) and on the right side 1.47% were observed. **“K”Shaped**-stellate pterion was 16.17% on the left side & 10.29 % on the right side. There were more percentages of wormian bones on the right side [7.69%] than on the left side [2.94%]. There were sphenoparietal type of pterion amounting to 80.82% followed by stellate type [16.17%] and Fronto temporal type [2.94%] was observed in the present study.



LEGEND-1, Skull showing sutures with sutural bones

Table 1: Table showing percentages of incidences types of Asterion

The pattern of the Asterion	Left side	Percentage	Right side	Percentage
Asterion with sutural bones	04	5.88 %	03	4.41 %
Asterion without sutural bones	64	94.11 %	65	95.58 %

Table 2: Table showing the types of Pterion & their Percentages of incidence with or without epipteric bones

TYPE OF PTERION	Left Side	Percentage	Right Side	Percentages
H-Shaped-Sphenoaprietal type	54	79.41 %	60	88.23%
K -Shaped-Stellate type	11	16.17 %	07	10.29 %
Fronto temporal type	03	4.41 %	01	1.47 %
Presence of wormian bones	02	2.94 %	05	7.69 %

Other associated findings in the present study are the presence of complete metopic sutures in three skulls [4.41%]. Presence of incomplete metopic sutures at Nasion in Twelve skulls [17.64%] and prominent inion [External Occipital Protuberance] was observed in two skulls [2.94%].



LEGEND-2, Skull showing sutures without sutural bones



Legend-3, Skull showing prominent external occipital protuberance [INION]

DISCUSSION

Asterion is a point present 4cm behind and 12cm above the auricular point. It marks the meeting point of lambdoid suture with Occipitomastoid and Parietomastoid sutures [5]. Asterion is a craniometric point at the site of posterolateral of mastoid fontanelle .This point is made use of as a lateral approach to the poster cranial fossa. Burr holes are made at the site of asterion which may open the bone directly on the Transverse sinus sigmoid complex [6]

A study by Hussain in 2011 on 125 skulls showed the maximum number of percentages of incidences of Asterion [23.15%] on Indian Subjects Followed by studies done by Mwachak⁹ in 2009 on Kenyans skulls with an incidence of 20.00%. But a study on 250 skulls of Egyptians by Berry has shown only 14.4% of type-1, types of skulls&85.6 % in type-II South Americans study by Berry [1967] has shown least percentages of incidences of Type-1 in 7.5%& 92.5% of Type-II Asterion. A study was done by Charulata Satpute, Abhilasha Wahane showed bilateral type I asterion in 3.3% cases and Type II in 96.66% of cases [4].

The present study showed bilateral type-I in 1.47% & type -II in 98.52% bilaterally. The present study has shown 11.76% of Type-1, similar to the North American [12%] studies as done by Berry in 1967[3].

Table 3, Shows Asterion study was done by different authors in the different population group

POPULATION GROUP	AUTHOR & YEAR	NUMBER OF BONES	TYPES -I ASTERION	TYPE-II ASTERION
North American	Berry, 1967 [3]	50	12%	88%
South American	Berry, 1967 [3]	53	7.5%	92.5%
Egyptian	Berry, 1967 [3]	250	14.4%	85.6%
Indian Burma	Berry, 1967 [3]	51	14.7%	85.3%
Indian Punjab	Berry, 1967 [3]	53	16.9%	83.1%
Turks	Gumusburun, 1997 [7]	302	9.92%	90.08%
Indians	Hussain, 2011 [8]	125	23.15%	76.85%
Kenyan	Mawachaka, 2009 [9]	79	20%	80%
South Indians	R Sudha, 2013 [2]	150	7.6%	92.3%
Indian	Satpute &, Wahane, 2015 [4]	60	9.1%	90.83%

Mastoid fontanelle usually ossifies at the end of the first year. The fontanelles which close first are more likely to show the sutural bones [10]. Additional ossifications occur in or near the suture giving rise to isolated sutural bones known as Wormian bones. They are usually irregular in size and shapes, commonly seen in the lambdoid suture, in hydrocephalic skulls, they appear in great number and they are linked with rapid cranial expansion [11].

The incidences of sutural bones at the craniometrics point vary in different populations as reported by Berry & Berry, 1967 [3]; Kellock & Parsons 1970 [12]. The pterion is the meeting point of sutures in the norma-lateralis formed by the meeting of four bones namely frontal, parietal, temporal, and sphenoid in the norma-lateralis [13] quoted in 38th edition Gray's Anatomy. The Presence of sutural bones at these points may give rise to pitfalls by complicating the surgical orientation [14-15].

The present study also showed more of the sphenoparietal type of pterion amounting to 75.88% followed by the Stellate type [13.23%]. & Frontotemporal type [2.94%].

CONCLUSION

The knowledge of asterion, Pterion, and the presence of sutural bones in the sutures should be known especially by the

Anatomists Radiologist [during interpretation of X-Rays] and by the Neurosurgeons because it has profound Anthropological neurosurgical, and clinical importance. Hence it has been studied and reported. This study gives sound knowledge of various types of Asterion, Pterion & Nsaion [Incomplete metopic sutures] in the sutures of unknown human skulls. So they have a great clinical & Anthropological importance.

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