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Original Research Article

A prospective anatomic study of epipteric bones in dry human skulls of Karnataka

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Abstract

Aim: To study the incidence of epipteric bones in the region of pterion in human skulls.
Materials & Methods: The study was done for a period of two years in the department of Anatomy at Kempegowda Institute of Medical Sciences and Research center, Bengaluru. A total of 100 dry unknown skulls from bone sets possessed by first year students of Kempegowda Institute of Medical Sciences and Research center, Bengaluru of 2009 – 2011 batch were evaluated for the presence of epipteric bones.
Results: Out of 100 skulls, epipteric bones were seen in the region of pterion in 24 skulls. Bilateral occurrence was noted in 8 skulls and unilateral occurrence was seen in the remaining 16 skulls. Among the unilateral occurrence, 6 were seen on the right side and 10 were seen on the left side.
Conclusion: In conclusion, identification of the occurrence of epipteric bones at the site of pterion is important as they may be confused for fractures. Also, presence of epipteric bones may lead to complications in making burr holes at the pterion.
Keywords: Epipteric, bone, pterion, human, skulls

1. Introduction

Pterion is defined as an H-shaped sutural junction formed by the meeting of four bones: frontal, parietal, temporal and sphenoid on norma lateralis of the skull[1]. The pterion was first classified into three types (Sphenoparietal, frontotemporal and stellate) by Broca in 1875. Subsequently, four types (Sphenoparietal, frontotemporal, stellate and epipteric) were defined by Murphy (1956)[2].

Epipteric bone or epipteric ossicle is a small irregular ossicle developing at Pterion due to additional ossification center. The incidence of epipteric bones is variable in different populations. Its presence is important for neurosurgeons, radiologists and anthropologists. For neurosurgeons, the knowledge of epipteric bone is important to decide the site in burr hole surgeries**.** The incidence of epipteric bone is of extreme importance in anti- mortem cranial radiograph and forensic medicine as the presence of epipteric bones provides false impressions of fractures or fractures may be interpreted as epipteric bones. Hence it is relevant to the radiologists. The number and frequency of epipteric bone are of much interest to physical anthropologists; hence further studies will be required on different human races.

The **objective** is to study the incidence, number and laterality of epipteric bones in dry human skulls.

2. Material and Method

The prospective study was done in the department of Anatomy, Kempegowda Institute of Medical Sciences and Research centre, Bangalore for a period of three years. After taking the consent from the Institutional Ethical Committee (IEC), one hundred dry, intact, human adult skulls of unknown sex without any gross abnormality were obtained from the department of Anatomy for the study. Skulls which had the third molar teeth erupted were considered as adult skulls and included in the study. Damaged skulls, very old skulls with obliterated sutures were excluded from the study.

The skulls were macroscopically observed with naked eye. All skulls were serially numbered from 1 to 100. Each skull was examined for presence of epipteric bones; the number of epipteric bones; whether the epipteric bones were present unilaterally or bilaterally and for the side in unilateral presence.

Figure 1: Epipteric bone at pterion on right side of the skull.

Figure 2: Ossa epipterica.

3. Results

Epipteric bones were noted in 24 out of 100 skulls. Out of 24skulls, 16 skulls showed epipteric bone on one side (unilateral) and remaining 8 skulls showed epipteric bone on both sides (bilateral). Among the unilateral epipteric bone, occurrence was more common on left side than on right side.

The epipteric bone existed as **2 fragments** in 2 skulls and in rest it was present as a single bone.

Table 1: Incidence of epipteric bones

Skulls Examined	Number of skulls showing Epipteric Bones	Percentage
100	24	24%

Table 2: Laterality of Epipteric bones

No. of skulls with epipteric bones	Unilateral	%	Bilateral	%
24	16	66.6%	8	33.3%

Table 3: Side of unilateral Epipteric bones

Total no. of Unilateral epipteric bones	Side	Number	%
16	Right side	6	37.5%
	Left side	10	62.5%

4. Discussion

Various hypothesis have been put forward to justify the existence of epipteric bones. The most appropriate hypothesis was put forward by Ranke in 1898[3]. He was of the view that the postero-superior border of the greater wing of sphenoid has got a separate center of ossification. This center fuses with the greater wing of the sphenoid during the 4th month of the intrauterine life. In case, it fails to unite with the greater wing, it results in an epipteric bone.

4.1 Incidence of epipteric bones

The incidence of epipteric bones is variable in different populations within the same country as seen in Table 4.

Table 4: Comparison of percentage distribution of Epipteric bone as quoted in different studies

Study	Race	Number of skulls	Epipteric bone (%)
Ahuja *et al*[4]	Punjab	126	18.5
Agarwal *et al*[5]	North Indians	450	23.34
Manjunath *et al*[6]	South Indians	172	17.3
Zalwadia *et al*[7]	Western Indians	42	4.8
Hussain Saheb *et al*[8]	Indians	125	3.7
Khatri *et al*[9]	Gujarat	311	11.73
Walulkar *et al*[10]	Vidarbha	300	13
Nair *et al*[11]	Bihar and Uttar pradesh	500	5.9
Hariprasad *et al*[12]	North Indians	60	2.5
Present Study	Karnataka	100	24

The percentage incidence of epipteric bones in the present study is 24% which correlates with study done by Agarwal *et al*[5] in 1980 in North Indians. Compared to other studies on Indian population, the percentage distribution of epipteric pterion is significantly high in the present study.

4.2 Laterality of epipteric bones:

The epipteric bones are more frequently encountered unilaterally as seen in various studies (Table 5). Our study shows the presence of epipteric bones predominantly on left side of the skull, similar to the studies done by Ahuja *et al*[4], Manjunath *et al*[6] and Chirag *et al*[9]. This is in contrast to the study done by Walulkar *et al*[10], where the epipteric bones were seen predominantly on right side of the skull.

Table 5: Comparison of percentage distribution of unilateral epipteric bone as quoted in different studies

Study / Population	Number of Unilateral epipteric bones	Right	Percentage (%)	Left	Percentage (%)
Ahuja *et al*[4], Punjab	29	14	48.3	15	51.7
Manjunath *et al*[6], South Indians	42	20	47.6	22	52.3
Chirag *et al*[9], Gujarat	73	35	47.9	38	52.1
Walulkar *et al*[10], Vidarbha region.	27	16	59.2	11	40.7
Present Study, Karnataka.	16	6	33.5	10	62.5

Bilateral occurrence of epipteric bones was seen in 33.3% of skulls in the present study. This was almost similar to the study done by Walulkar *et al*[10] in Vidarbha region. The percentage incidence was significantly higher than the study done by Manjunath *et al*[6] on south Indians.

Table 6: Comparison of percentage distribution of bilateral epipteric bone as quoted in different studies

Study / Population	Total number of skulls showing epipteric bones	Number of bilateral epipteric bones	Percentage of bilateral epipteric bones (%)
Ahuja *et al*[4], Punjab	34	5	14.7
Manjunath *et al*[6], South Indians	49	7	14.3
Walulkar *et al*[10], Vidarbha region.	39	12	30.7
Present Study, Karnataka.	24	8	33.3

4.3 Number of Epipteric bones or fragments

When the Epipteric bones exist in the form of multiple fragments then these bones referred to as "Ossa Epipterica" Brock[13]. In the present study the Epipteric bones in two skulls had two bones. This is in contrast to the study done by Walulkar *et al*[10], where in all 39 skulls showed epipteric bone in a single piece.

5. Conclusion

To conclude, the occurrence and laterality of epipteric bone in human skulls is variable in different populations. Identification of the occurrence of epipteric bones at the site of pterion and its variations are important for neurosurgeons, radiologists and anthropologists. As incidence of epipteric bone is variable, further studies will be required on different populations.

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