



RESEARCH ARTICLE

MORPHOLOGICAL ANALYSIS OF LOCATION OF PTERION IN HUMAN DRY SKULL

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ABSTRACT

Pterion is point formed the summit of frontal, parietal, the greater wing of sphenoid and temporal bones which forms a 'H'- shaped sutures. The Pterion is identified as the weakest part of the temporal bone skull. The Pterion is the important bony land mark to find out the position of anterior division of middle meningeal artery in the cranium. Our study was focused on the morphometry of various suture patterns in Pterion and its relation to the middle meningeal artery is also revealed. The quantity analysis will provide a clear idea for neurosurgeons, anthropologists and forensic medicine.

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INTRODUCTION

Pterion (Zalawadia *et al.*, 2010) is a point in the anterior part of the floor of the temporal fossa which resembles "H" shaped sutures. The sutures are formed by the meeting point of greater wing of the sphenoid, the parietal, frontal and the squamous part of temporal bone. The pterion (Saxena *et al.*, 1988) is located above the midpoint of the zygomatic arch formed by the zygomatic process of temporal bone and temporal process of zygomatic bone and behind the frontozygomatic suture where the frontal process of zygomatic bone and zygomatic process of frontal meet. The pterion is the weakest part of the skull. It is covered by the temporalis muscle and temporal fascia. The bones are very thin and weak at pterion. It can be easily worn out during fracture or it can be wrecked easily during clinical procedures by the surgeons (Gurbachan Singh Gindha *et al.*, 2015) during the drainage of collected fluid or blood at pterion site. It is also an important landmark for the approach of the anterior branch of the middle meningeal artery. It is also important landmark for the approach of Broca's motor speech area, insula, the sylvian fissure and for the anterior circulation aneurysm and tumours. So knowledge of the surface anatomy of the middle meningeal artery is very important and should be well known for the accurate positioning of burr hole to evacuate extradural haematoma (Praba and Venkatramaniah,

2012). There are four types of pterion defined by Murphy (1956), i.e. Sphenoparietal (SP) - a sutural pattern in which the sphenoid and parietal bones meet directly by separating the contact of the frontal and temporal with each other; Fronto-temporal (FT) - In this pattern the frontal and the temporal bones meet directly and apart the sphenoid and parietal bone, Stellate (ST) - It is characterized by articulation of four bones (sphenoid, parietal, frontal, temporal) at a point and Epipteric (EP) - this type is defined by presence of a small sutural bone between the four bones articulating to form Pterion (Fig.1). The mechanism of formation of sutural bones is not fully understood. Some authors suggested that these bones develop from pathological influences such as hydrocephalus while others believe that sutural bones develop from normal processes.

MATERIALS AND METHODS

50 dry human skulls of unknown sex were used as the material for the study which was collected from the Anatomy department, Sree Balaji Dental College & Hospital, BIHER and Melmaruvathur Adhiparasakthi Institute of Medical Sciences & Research. The skulls which are atypical and wrecked were discarded. Both the sides of skulls were studied for the types and position of the pterion. The shapes and types of pterion were noted by the appearance of the articulation of bones forming the sutures on both the side of the skulls and it was recorded.

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Evaluation of pterion landmark

To evaluate the location of pterion the following three points were marked:

- Centre of pterion
- Midpoint of the superior border of the zygomatic arch and
- The zygomatico-frontal suture.

The measurements were recorded in centimeter (Fig. 2)

RESULTS

The present study is concluded on 50 dry human skulls. The photography was taken on the types of pterion available and it is recorded. The measurements was taken from the centre point of the pterion to zygomatico-frontal suture and to midpoint of the zygomatic arch of the both sides of 50 dry human skulls and recorded in centimeter Fig. 2. The present study was compared with the standard literatures among Indian populations. Most of the types of pterion were bilaterally present.

Table 1. Comparison of the studies of pterion with their present study

| References | Spheno-parietal type | Epipteric type | Fronto- temporal type | Stellate type |
|--|----------------------|----------------|-----------------------|---------------|
| Murphy (1956) | 73.00 | 01.00 | 7.50 | 18.50 |
| Saxana (1988) | 72.00 | 11.79 | 3.46 | 1.38 |
| Zalawadia <i>et al</i> (2010) | 91.70 | 04.80 | 2.40 | 1.20 |
| Praba and Venkatramiah (2012) | 74.00 | 14.00 | 3.00 | 9.00 |
| Shenoy <i>et al</i> (2012) | 77.33 | 21.33 | ----- | 1.34 |
| Seema and Mahajan (2014) | 89.00 | 12.0 | 7.00 | 4.00 |
| Satpute and Wahane (2015) | 82.94 | 7.04 | 2.94 | 5.28 |
| Gurbachan Singh Gindha <i>et al</i> (2015) | 72.31 | 23.08 | 4.61 | 0 |

Table 2. Sutural patterns of pterion available in the present study in %

| Present study (2017) | Spheno-parietal type | Epipteric type | Fronto- temporal type | Stellate type |
|----------------------|----------------------|----------------|-----------------------|---------------|
| | 60% | 22% | ----- | 18% |

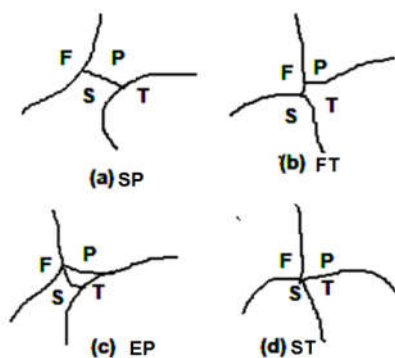


Figure 1. The types of Pterion. (a) SP- Sphenoparietal (b) FT –Frontotemporal (c) EP – Epipteric (d) ST – Stellate

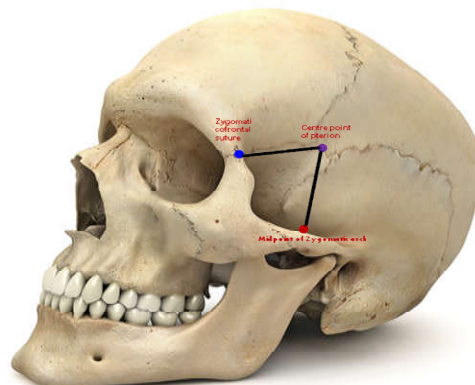


Figure 2. Evaluation of the location of pterion

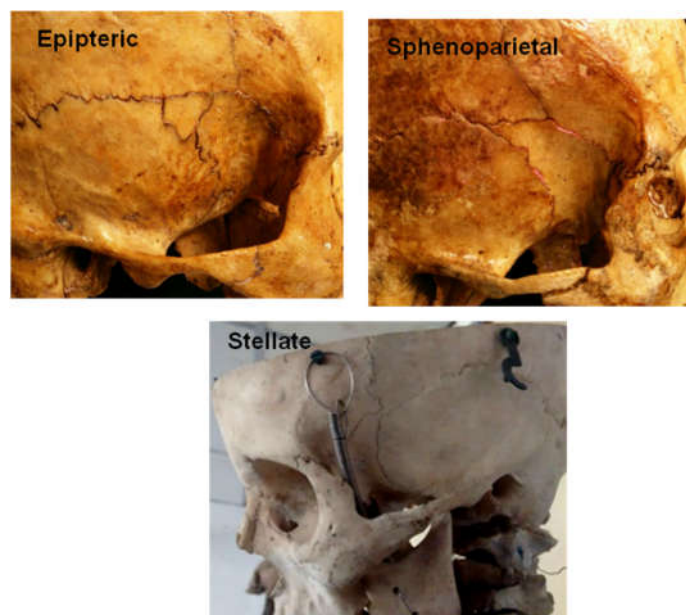


Figure 3. Photographs illustrating the different types of pterion sutural patterns

In one skull we came across different pattern of pterion on both the side. No case of Fronto-temporal type was found in this study. Highest rate of the type of Pterion is Sphenoparietal type which is found in 30 (60%) out of 50 skulls. The epipteric type of pterion are found 11 (22%) out of 50 skulls and Stellate is found to be in 9(18%) out of 50 skulls Fig.3.

DISCUSSION

The sutural pattern of the pterion and its relation to the bony landmark around it is very important for the specialist in various medical fields. Four types of pteria have been described by Murphy (1956). In his study out of 388 pteria he found (73%) sphenoparietal type, (7.5%) fronto-temporal type, (18.5%) stellate type and only (1.0%) epipteric type of pteria. Ankur *et al.* (2010) found sphenoparietal type as the most common form comprising 91.7%. While in our study we got more sphenoparietal type which coincide with Zalawadia *et al.* (2010) study. Saxena *et al.* (1988) reported that Indian skulls have more epipteric bones as compared to other population. They reported (11.79%) cases in their study. Seema and Mahajan (2014) reported in their study on North Indian population, they found that sphenoparietal type of pterion was (89.0%), epipteric type of pterion (12.0%), fronto-temporal type (7.0%), and stellate type (4.0%). Again they reported that higher rate was of sphenoparietal and least rate was of stellate type of pterion. Praba and Venkatramaniah (2012) reported that sphenoparietal type of pterion was higher on side (74.0%), epipteric (14.0%), stellate (9.0%) and fronto-temporal was least on side i.e. (3.0%) which also coincided with our study. Shenoy *et al.* (2012) reported out of 150 sides of skulls, 116 sides were having sphenoparietal type of suture (77.33%). It is higher in rate as compared to other sutures, like epipteric (21.33%), stellate (1.33%) and fronto-temporal type of suture was not found in their study. Gurbachan *et al.* (2015) out of 130 sides of skulls, 94 (72.31%) sides were having sphenoparietal type of pterion. EpIPTERIC type of pterion was found in 30 (23.08%) cases and 6 (4.61%) cases were found to be having fronto-temporal type of pterion. No case of stellate type of pterion was found in this study. All the three types of pteria found were bilaterally present. Satpute and Wahane (2013) observed that sphenoparietal type of pterion is most common seen in Northern Indians (82.35%) on right side and (83.52%) on left side and average it was (82.94%). In our study we didn't come across the Fronto-temporal type. The Sphenoparietal type (60%), Stellate (18%), epIPTERIC (22%) and no atypical types were seen.

Conclusion

The pterion has cultural difference in both its location and pattern of union of the bones. The morphometric study is done on measurement of sphenoparietal, epIPTERIC and stellate type of pterion. The knowledge of various types of pterion is very important for radiologist as well as neurosurgeons because it can be misguided for fractured bones which make difficult for the surgical orientation. This study may help the anatomists, neurosurgeons, anthropologist, forensic medicine and forensic pathologists in their diagnosis and treatment.

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