

MORPHOMETRIC STUDY OF PTERION IN ADULT DRY SKULLS IN DAKSHINA KANNADA DISTRICT, KARNATAKA STATE, INDIA

Anjana.S ¹, Satheesha. K.S ², Ravi Bhaskar ^{*3}, Shakunthala. R. Pai ⁴.

Tutor ^{1,*3}, Associate Professor ², Professor ⁴.

Department of Anatomy, Srinivas Institute of Medical Sciences and Research Centre, Mukka, Mangaluru, Karnataka, India.

ABSTRACT

Introduction: The objectives of the present study were to determine the type of the pterion in the dry human skulls of Dakshina Kannada district of Southern India and to study its topography.

Materials and Methods: The present study included 32 adult human skulls of unknown gender. The pterions of both the right and left sides were studied.

Results: The present study observed all the 4 types of pterion. Among them, Spheno-parietal type was higher in frequency. This type was found on right side 25 (78.1%) and left side 28 (87.5%) skulls. The distance between the centres of pterion to the midpoint of zygomatic arch (P-ZA) was 40.08 ± 0.46 mm on the right side of the skull, whereas on left side of the skull it was 39.9 ± 0.17 mm. Distance between the centre of pterion to the postero-lateral aspect of fronto-zygomatic suture (P-FZ) on right side of the skull was 30.37 ± 0.44 mm and it was 29.53 ± 0.26 mm on the left side.

Conclusion: We believe that the present study has provided the additional information about the morphology and morphometry of pterion, which is important to the neurosurgical and radiological literature.

KEY WORDS: Morphometry, Pterion, Skull, Adults, Dakshina Karnataka, India.

Address for Correspondence: Dr. Ravi Bhaskar, Department of Anatomy, Srinivas Institute of Medical Sciences and Research Centre, Mukka, Mangaluru, Karnataka, India.

E-Mail: drravibhaskarr@gmail.com

Access this Article online

Quick Response code



DOI: 10.16965/ijar.2015.298

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 13 Oct 2015 Accepted: 03 Nov 2015
Peer Review: 13 Oct 2015 Published (O): 30 Nov 2015
Revised: None Published (P): 31 Dec 2015

INTRODUCTION

Pterion is the area where frontal, sphenoidal, parietal and temporal bones meet. It is indicated by an H-shaped formation of sutures of these bones. It is located at the anterior end of the temporal fossa, 3-4 cm above the midpoint of the zygomatic arch. This area is clinically important as it is related to the anterior division of the middle meningeal artery. The knowledge of surface anatomy of the middle meningeal artery is important for the accurate positioning of burr-hole. This procedure is required to evacuate the epidural haematomas. Pterion is

a site of relatively thin bone, which is frequently fractured in traumatic blows to the side of the head. The middle meningeal artery is located deep to this site and it may get injured in skull fractures, at this location leading to epidural haematoma. Broca's motor speech area, the lateral sulcus are situated deep to the pterion.

According to Murphy [1], there are four types of pterion. The spheno-parietal type, which has the sphenoid and parietal bones are in direct contact. Fronto-temporal type is a sutural pattern in which the frontal and temporal bones are in direct contact. The third type is the stellate

type, in which all the four bones like frontal, parietal, sphenoid (greater wing) and temporal bones articulate. The fourth one is the epiptereric type, which has the presence of small sutural bone between the sphenoid and parietal bone. The objectives of the present study were to determine the type of the pterion in Dakshina Kannada district of Southern India and to map the location of pterion in this population.

MATERIALS AND METHODS

The present study included 32 adult human skulls of unknown gender. The skulls were obtained from the Department of anatomy of our institution. The pterions of both the right and left sides were studied. The skulls which exhibited pathological changes and congenital anomalies were excluded from the present study. The following criteria were followed and studied:

1. Type of the pterion
2. The radius of the pterion was measured by drawing a smallest circle, which connects all the 4 bones which are involved in the formation of pterion.
3. The centre of the radius was considered as the centre of pterion
4. P-ZA: vertical distance from the centre of pterion (P) to the zygomatic arch (ZA)
5. P-FZ: distance between the centre of the pterion (P) and the postero-lateral aspect of Fronto-zygomatic suture (FZ).

All the measurements were performed by using the stainless steel electronic digital calliper 0-150mm with an accuracy of 0.1mm and mean value was noted. The data collected was tabulated according to the side of the bones and it was statistically analysed. The p value > 0.05 was considered significant. The measurements were taken thrice by independent observers, in order to reduce the chances of variability of the data and to minimise the bias errors.

RESULTS

The present study observed all the 4 types of pterion. Among them, sphenoparietal type was higher in frequency. This type was found on right side 25 (78.1%) and left side 28 (87.5%) skulls. The fronto-parietal type was found in only one skull in each side right (3.1%) and left (3.1%). Stellate type found 2 on right skull (6.2%) whereas only one (3.1%) on left side of skull. The frequency of the different types of pterion after combining the both sides (n=64) is analysed in Fig. 1. The distance between the centres of pterion to the midpoint of zygomatic arch (P-ZA) was 40.08 ± 0.46 mm on the right side of the skull, whereas on left side of the skull it was 39.9 ± 0.17 mm. Distance between the centre of pterion to the postero-lateral aspect of fronto-zygomatic suture (P-FZ) on right side of the skull was 30.37 ± 0.44 mm and it was 29.53 ± 0.26 mm on the left side. The mean of the radius around the pterion was 9.91 ± 0.46 mm and 10.47 ± 0.28 mm on the right and left sides respectively.

Fig. 1: Showing the frequency of the different types of pterion, which were observed in the present study (n=64).

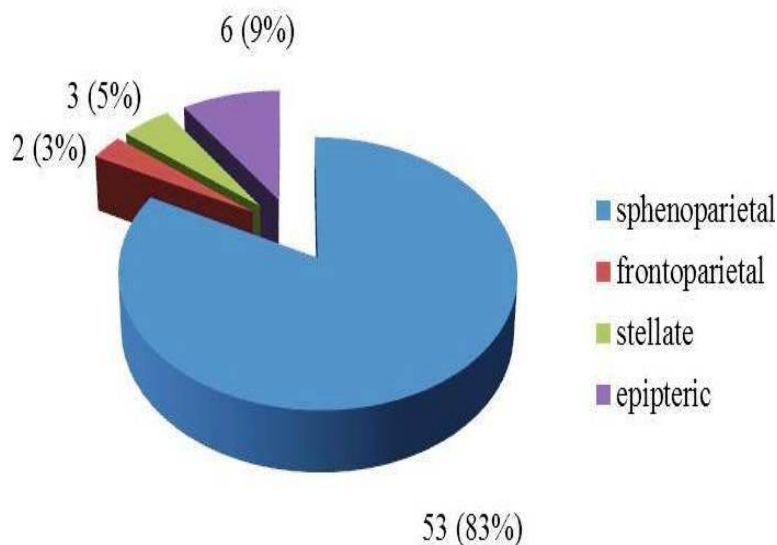


Table 1: Showing the global comparison of frequency of different types of pterions.

authors	population	sphenoparietal	frontoparietal	stellate	epipteric
Murphy [1]	Australian	73%	7.50%	18.50%	1%
Matsumura et al. [2]	Japanese	79.10%	2.60%	17.70%	0.60%
Lee et al. [3]	Korean	76.50%	Nil	nil	23.50%
Oguz et al. [4]	Turkish	88%	10%	nil	2%
Mwachaka et al. [5]	Kenyan	66%	15%	7%	12%
Eboh and Obaroefe [6]	Nigerian	83%	5%	6%	6%
Present study	Indian	82.80%	3.10%	4.70%	9.40%

Table 2: Comparison of frequency of different types of pterion among different regions in India.

authors	population	sphenoparietal	frontoparietal	stellate	epipteric
Saxena et al. [7]	Northern India	87.70%	10%	2.30%	nil
Katri et al. [8]	Western India	86%	2%	0.30%	11.70%
Present study	Southern India	82.80%	3.10%	4.70%	9.40%

Table 3: Comparison of morphometric data of the present study with the previous studies.

Authors	population	P-ZA (right side)	P-ZA (left side)	P-FZ (right side)	P-FZ (left side)
Mwachaka et al. [5]	Kenyan	3.9 ± 0.3	3.8 ± 0.3	3 ± 0.3	3 ± 0.4
Eboh & Obaroefe [6]	Nigerian	4 ± 0.3	3.9 ± 0.3	3.2 ± 0.3	3.1 ± 0.2
Zalawadia et al. [9]	Western Indian	3.1 ± 0.4	2.9 ± 0.3	3.7 ± 0.5	3.5 ± 0.4
Present study	Southern Indian	4 ± 0.5	4 ± 0.2	3 ± 0.4	2.9 ± 0.2

P-ZA: the distance between the centres of pterion to the midpoint of zygomatic arch; P-FZ: distance between the centres of pterion to the postero-lateral aspect of fronto-zygomatic suture.

DISCUSSION

It is advisable to have an idea about the topography and type of the pterion before performing the neurosurgical procedure. The present study followed the Murphy [1] classification of the pterion. There are few studies available across the world about the type and topography of pterion among the different population. The present study observed that the most common type was the speno-parietal (83%) type of pterion, which is similar to the previous studies. The comparison of the different types of pterion of the present study, with the various races from the different countries of the world is represented in Table 1. Table 2 shows the comparison of frequency of different types of pterion in different regions in India. The morphometric data of the present study has been compared with the other population across the world and is represented in Table 3.

The pterion is a most commonly used surface landmark by the neurosurgeons. The presence of epipteric bones in this region may cause the

surgical problems, since the pterion can be mistakenly assessed to be at the anterior most junctions of bones, where burr hole may cause inadvertent orbital penetration [10]. Therefore, it is wise to know the exact topography of pterion during the surgical intervention. This is important to locate the anterior division of the middle meningeal artery. The Broca's motor speech area and the Sylvian fissure are also related to it. The practical approaches to these structures are performed on the left side through the pterions [9]. We believe that the present study has provided the additional information about the morphology and morphometry of pterion, which is important to the neurosurgeons and radiologists.

Conflicts of Interests: None

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How to cite this article:

Anjana.S, Satheesha. K.S, Ravi Bhaskar, Shakunthala. R. Pai. MORPHOMETRIC STUDY OF PTERION IN ADULT DRY SKULLS IN DAKSHINA KANNADA DISTRICT, KARNATAKA STATE, INDIA. Int J Anat Res 2015;3(4):1603-1606. DOI: 10.16965/ijar.2015.298