MORPHOMETRIC STUDY OF PTERION IN DRY ADULT HUMAN SKULLS

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ABSTRACT

Introduction: The pterion corresponds to the site of anterolateral fontanelle of the neonatal skull which closes at third month after birth. In the pterional fractures the anterior and middle meningeal arterial ramus ruptures commonly which results in extradural hemorrhage. Pterional approach is most suitable and minimally invasive approach in neurosurgery.

Materials and Methods: The present study was carried out on the pterion of 36 dry adult skulls of known sex from department of anatomy GMC Aurangabad Maharashtra.

Results: The mean and standard deviation of the distance between the centre of pterion to various anatomical landmarks. The distance between Pterion- frontozygomatic (P-FZ) suture 29.81±4.42mm on right side, 29.81±4.07mm on left side; Pterion-Zygomatic arch (P-Z) 37.16±3.77mm on right side, 37.56±3.71mm on left side, Pterion-asterion (P-A) 89.73±6.16mm on right side, 89.46±6.35mm on left side; Pterion-external acoustic meatus (P-EAM) 53.40±7.28mm on right side, 53.57±6.73mm on left side, Pterion- Mastoid process (P-M) 80.35±3.44mm on right side, 80.96±3.79mm on left side and Pterion- Pterion (P-P) 194.54±16.39mm were measured.

Conclusion: The data constructed in the present study will be of immense importance while performing pterional approach surgeries in Indian population.

KEY WORDS: Pterion, Fontanelle, Neonatal Skull, Extradural Hemorrhage, Pterional Approach.

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INTRODUCTION

Pterion is defined as an H-shaped small circular area formed by the junction of four bones: frontal, parietal, temporal and sphenoid on norma lateralis of the skull, being approximately 4cm above the zygomatic arch and 3.5 cm behind frontozygomatic suture [1].

The pterion corresponds to the site of antero-lateral fontanelle of the neonatal skull which

closes at third month after birth [2]. According Moore & Dalley [3] reported that the pterion is two fingers' breadth superior to the zygomatic arch and a thumb's breadth posterior to the frontal process of the zygomatic bone.

Pterion is an important guide for age and sex determination as well as archaeological and Forensic estimation. It is also an important site to assess anterior branch of middle meningeal

artery, Broca's area, sphenoid ridge and optic canal [4].

In the pterional fractures the anterior and middle meningeal arterial ramus ruptures commonly which results in extradural hemorrhage. Pterional approach is most suitable and minimally invasive approach in neurosurgery. It is used to access to structures of anterior and middle cranial fossae.² Pterional approaches have paved the way for the management of wide variety of neurological disorders in the anterior, middle and upper part of posterior cranial fossa with minimal tissue injury, without compromising surgical results [5]. So proper knowledge of pterion, its topography and morphology is mandatory for the pterional approach used in the neurosurgery.

This morphometric analysis will be of immense importance while performing pterional approaches in neurosurgical procedures in Indian population.

MATERIALS AND METHODS

The present study was carried out on the pterion of 36 dry adult skulls of known sex. The skulls with pathological lesions and damage were excluded. Samples were collected from department of anatomy GMC Aurangabad Maharashtra.

Material used for taking measurement Digital Vernier Caliper, cotton thread, scale. For the measurement of the distance of pterion from different bony landmarks, the centre of pterion was first established. Readings were taken twice and mean of two readings was taken to avoid error.

Following measurements were studied

Pterion- frontozygomatic suture (P-FZ): Distance from centre of to the posterolateral aspect of the frontozygomatic suture.

Pterion-Zygomatic arch (P-Z): The distance from the centre of pterion to the superior edge of the midpoint of zygomatic arch.

Pterion - asterion (P-A): The distance between centre of pterion and at asterion.

Pterion- external acoustic meatus (P- EAM): The distance between centre of pterion to the anterosuperior margin of external acoustic meatus.

Pterion- Mastoid process (P-M): The distance between pterion to the tip of the mastoid process.

Pterion- Pterion (P-P): Distance between two pterions.

The distance between Pterion- frontozygomatic (P-FZ) suture, Pterion-Zygomatic arch (P-Z), Pterion-asterion (P-A), Pterion-external acoustic meatus (P-EAM), Pterion- Mastoid process (P-M) were measured with the help of Digital Vernier caliper. Distance between two pterions was measured with the help of cotton thread and measuring scale.

Fig. 1: Distance between pterion and frontozygomatic suture (P-FZ).

Fig. 2: Distance between pterion and middle of the zygomatic arch (P-ZA).

Fig. 3: Distance between pterion and anterosuperior margin of external acoustic meatus (P-EAM).

Fig. 4: Distance between pterion and asterion (P-A).

OBSERVATION AND RESULTS

The distance between Pterion-frontozygomatic (P-FZ) suture, Pterion-Zygomatic arch (P-Z), Pterion-asterion (P-A), Pterion-external acoustic meatus (P-EAM), Pterion- Mastoid process (P-M) were measured to determine the location of pterion.

The mean and standard deviation of the distance between the centre of pterion to various anatomical landmarks are tabulated as follows:

Table 1: Distance of pterion from various bony landmarks.

Sr. no.	PARAMETERS	Right (mean±SD) in mm	Left (mean±SD) in mm
1	The distance between Pterion-frontozygomatic (P-FZ)	29.81±4.42	29.81±4.07
2	The distance between Pterion-Zygomatic arch (P-Z)	37.16±3.77	37.56±3.71
3	The distance between Pterion - asterion (P-A)	89.73±6.16	89.46±6.35
4	The distance between Pterion-external acoustic meatus (P-EAM)	53.40±7.28	53.57±6.73
5	The distance between Pterion-Mastoid process (P-M)	80.35±3.44	80.96±3.79
6	The distance between Pterion-Pterion (P-P)	194.54±16.39	

No significant variation on right and left side was observed in various parameters measured from the centre of pterion.

DISCUSSION

Pterional approach was considered as the minimally invasive neurosurgical approach ideal for anterior and middle cranial fossa lesion [6]. The location of pterion and its relation to the surrounding bony landmarks is important. Such detailed information can only precisely be obtained from an examination of dry Skulls.

Mishra et al [1] found that the mean distance P-EAM was 5.12cm on right side, 5.19cm on left side; P-M was 8.13cm on right side and 8.02cm on left side. K Epharaim Vikram Rao et al [2] observed that the distances of centre of pterion from midpoint of zygomatic arch (P-FZ) was 37.74±3.66 on right side, 37.07±4.19 on left side; P-F was 30.48±4.06 on right side, 30.39±4.70 on left side; P-EAM was 51.81±4.08 on right side, 51.54±3.89 on left side and P-M was 80.40±6.43 on right side and 79.68±6.08 on left side.

Table 2: Comparison between distances of centre of pterion from different bony landmarks in previous studies and present study.

Comparative studies	The distance between Pterion-Zygomatic arch (P-Z) (cm)		The distance between Pterion-Zygomatic arch (P-FZ) (cm)	
	R	L	R	L
Mishra et al (2015) [1]	3.71	3.68	3.2	3.11
Oguz et al (2004) [7]	4.05	3.85	3.3	3.44
Mwachaka et al (2009) [8]	3.888	3.824	3	3
Adejuwon et al (2013) [9]	3.91	3.877	3.1	3.082
Sowmya S et al (2017) [10]	4.02	3.99	3.42	3.33
Apinhasmit et al (2011) [11]	3.848	3.848	3.112	3.112
Ukohla et al (2013) [12]	4.02	4.01	2.74	2.74
Kumar S. et al (2013) [13]	3.76	3.76	3.25	3.35
Eboh and Obaroefe (2014) [14]	4.02	3.95	3.2	3.1
Present study	3.71	3.75	2.98	2.98

Results of current study are in line with Mishra et al¹ and K Epharaim Vikram Rao² Mwachaka et al [8] Apinhasmit et al [11] Kumar S. et al [13] Whereas mean values of present study are slightly less than those of Oguz et al [7], Ukohla et al [12] and Eboh and Obaroefe [14].

CONCLUSION

The present study concludes that the location of pterion in relation to different bony landmarks are important in neurosurgeries or mini-craniotomy while approaching anterior or middle cranial fossa. Such detailed information can readily be obtained from morphometric study of dry skulls. However, as imaging techniques continue to develop, it may be possible to determine more precise relationships between bony landmarks and the underlying soft tissues. The data constructed in the present study will be of immense importance while performing pterional approach surgeries in Indian population.

ABBREVIATIONS

P-FZ - Distance between Pterion-frontozygomatic suture

P-Z - Distance between Pterion-Zygomatic arch

P-A - Distance between Pterion-asterion

P-EAM - Distance between Pterion-external acoustic meatus

P-M - Distance between Pterion- Mastoid process

Conflicts of Interests: None

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