A Cross-sectional Study on Morphology and Position of Pterion in Andhra Pradesh Population

ABSTRACT

Introduction: Pterion is the important surgical landmark in temporal fossa, deeper to which vital areas of the brain are located. Injuries are common at this suture area due to confluence of multiple bones which are relatively slender and weak. Since the variations in morphology of the pterion is common, thorough knowledge of its location, types and subtypes, helps health professionals of varied speciality to confidently explore this area and perform the necessary interventions.

Aim: This study is aimed to determine the prevalence of different types of pterion, position of pterion, and compare the morphological variance between the right and left side among adult human skulls in Andhra Pradesh.

Materials and Methods: This cross-sectional study on human skull bones was conducted in Apollo institute of medical sciences and research, Chittoor, and Great eastern medical school and hospital, Srikakulam of Andhra Pradesh state in India from June 2020-August 2020. The study was conducted on 54 adult dried skulls and research, Chittoor, and Great eastern medical school and hospital, Srikakulam of Andhra Pradesh state in India from June 2020-August 2020. The study was conducted on 54 adult dried skulls. The pterion of both sides of the skulls were keenly observed and studied for the type and subtypes of Pterions based on Murphy's classification. The position of pterion was measured from Frontozygomatic Suture (FZS) and Midpoint of Zygomatic Arch (MZA) with Vernier callipers. Data was analysed with descriptive statistics and also compared with earlier research works.

Results: Sphenoparietal 89 (82.4%) was the commonly observed pterion type in the present study, frontotemporal pterion was not found. Pterion was positioned at a Mean distance of 3.16±0.48 cm and 3.20±0.50 cm from frontozygomatic arch on right and left side, respectively. From MZA the pterion was present at 3.70±0.35 cm and 3.78±0.35 cm on right and left side, respectively.

Conclusion: The present study reveals variations in suture morphology pattern and position of pterion in the skulls oftentimes. Notable difference was observed while comparing the position of pterion with other country population. Cognizance of such variations would help the radiologists, neurosurgeons and forensic experts to diagnose opine and treat judiciously.

INTRODUCTION

Pterion word was coined by Broca in 1875, derived from ‘Pteron’ which means ‘wing’. The floor of the temporal fossa is formed by the frontal and parietal bones superiorly and the greater wing of the sphenoid and squamous part of the temporal bone inferiorly. All four bones of one side meet at a roughly H-shaped sutural junction termed the pterion. The pterion is usually positioned 4.0 cm above the zygomatic arch and 3.5 cm behind the FZS. It corresponds to the site of the anterolateral (sphenoidal) fontanelle of the neonatal skull, which closes during the third month after birth [1]. Presence of fontanelle in the fetal head helps for the molding during its passage through the birth canal as well as the rapid growth of brain during infancy period. The pterion is known to be the weakest part of the skull; therefore it is most important sutural landmark in craniofacial region and has clinical significance [2].

Neurosurgeons operate through this reference landmark to approach anterior branch of middle meningeal artery, lateral (sylvian) cerebral fissure, insula, Broca’s motor speech area to the left, pathologies of optic nerve, orbit, sphenoidal ridge and for the anterior circulation aneurysms and tumors. Pterion burr hole operation helps in evacuating and treating extradural haematomas [3]. Determination of age of the skull by archaeology and forensic experts can be done by studying pterion. Sutural bones at pterion, detected on X-rays should not be confused as fracture by radiologists [3]. Pterion presents as various structural patterns that can mislead the clinicians during diagnosis of the lateral skull fractures in emergency situations [4].

As the variations in the morphological pattern and position of pterion is common, study of pterion gains importance as a valuable reference landmark to various health professionals [4]. Therefore, this study of pterion on adult human skulls of Andhra Pradesh population aims to determine the prevalence of types of pterion and compare between right and left sides of skull. Also, to determine the Pterion position and compare between right and left sides of skull. Further the differences of Pteria type and position is compared among Indian and overseas population.

MATERIALS AND METHODS

This cross-sectional study was performed on 54 adult dry skulls of both sexes collected from the osteology museum, Department of Anatomy, Apollo Institute of Medical Sciences and Research, Chittoor and Great Eastern Medical School and Hospital, Srikakulam, Andhra Pradesh state, India. The study was done over a period of three months from June 2020-August 2020. As the study was conducted on anonymous human skull bones, ethical clearance was not considered.

Sample size: The number of samples studied was 54 skulls. Sample size was calculated based on previous studies with expected proportion of 89%, absolute precision of 10% and desired confidence level of 95%.

Inclusion criteria: Adult human skulls with well-defined pterion sutures were considered for the study (adult skulls were determined by observing the third molar teeth eruption).

Exclusion criteria: Deformed, damaged and skulls with obliterated sutures were not included in the study. Skulls of new born, infants and children were excluded in this study.

Methods: The pteria morphology were studied and categorised based on Murphy’s classification into four types [Table/Fig-1].
Sphenoparietal (sphenoid and parietal bones are in direct contact), Frontotemporal (frontal and temporal bones are in direct contact), Stellate (all the four bones meet at a single point to form star shaped suture) and Epipetric (sutural bones are present in the Pterion suture) [Table/Fig-1] [2].

The position of pterion was determined by measuring the pterion Centre Point (CP) distance from FZS and MZA using vernier callipers [Table/Fig-2]. To minimise the errors in measurements, average of two readings was considered.

The observational findings were tabulated in excel sheet and analysed. The descriptive statistical data like mean, percentage and standard deviation was derived using Statistical Package For The Social Sciences (SPSS) software version 22.0.

**STATISTICAL ANALYSIS**

The observational findings were tabulated in excel sheet and analysed. The descriptive statistical data like mean, percentage and standard deviation was derived using Statistical Package For The Social Sciences (SPSS) software version 22.0.

**RESULTS**

a. Percentage occurrence of types of pterion: In the current study, the following types of pterion were observed Sphenoparietal, Epipetric and Stellate [Table/Fig-3]. Majority of the pterions 89 (82.4%) were sphenoparietal, the second common type was epipetric 17 (15.7%) and least were stellate 2 (1.85%)

b. Presentation: About 42 (78%) of the skulls studied have shown bilateral symmetry (same type of pterion on right and left side), but in the rest, there were different pterions on right and left sides of the skull. Sphenoparietal pterion were more commonly observed on right side than on left side, on the contrary epipetric were more common on left side than on the right side [Table/Fig-5].

c. Position of pterion: The center of pterion (CP) from FZS on right side was 3.16±0.48 cm and on left side was 3.20±0.50 cm. From MZA the (CP) was at distance of 3.7±0.35 cm on right side and 3.78±0.35 cm on left side [Table/Fig-6].

**DISCUSSION**

The current study reveals the similarity of occurrence of sphenoparietal (82.4%) type of pterion with the findings of Satpute C and Wahane A,
Altogether the present study findings of Pteron types are close by to the findings of earlier studies done on south Indian population. The incidence of sphenoparietal pterion (82.4%) in present study is adjacent to that by Matsmura G et al., (79.1%) of Japan and Chaijaroon-khanarak W et al., (87.27%) of Thailand. The findings of epipteric (15.7%) and stellate (1.85%) variety are similar to that of Matsmura G et al., (79.1%) of Japan and Chaijaroon-khanarak W et al., (87.27%) of Thailand. The findings of epipteric (15.7%) and stellate pterion (1.85%) occurrence was consistent with findings of Shenoy V et al., of Tamil Nadu and Manjunath KY and Thomas IM of Karnataka [Table/Fig-7] [3,5-13].

The current study was done on human skulls to determine the pteron morphology and position. Sexual dimorphism of pterion was not considered in this study. Hence there is scope for further research, to compare the pteron types and position between male and female skulls.

CONCLUSION(S)

The variations in the pteron morphology are commonly observed. Sphenoparietal type of pteron is the most commonly observed pteron while there are no frontotemporal pteron observed in the present study. Minimal variation of position of pteron was observed on right and left side. There is similarity among south Indian population pteron morphology and position, but difference was
noted from that of north Indian population. Notable difference was observed while comparing the position of pterion with other country population. In conclusion, the key knowledge of similarities and differences found in the present study will help the radiologists, forensic experts, neurosurgeons, anthropologists and other health professionals in perfect diagnosis, ethnic comparisons, forensic experts, neurosurgeons, anthropologists and other

REFERENCES