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ORIGINAL RESEARCH ARTICLE

STUDY OF SUTURAL MORPHOLOGY OF PTERION AMONG HUMAN ADULT NEPALESE SKULLS

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ABSTRACT

Background: The sutural morphology of the pterion is important in surgical approaches to the cranial fossae. The pterion portrays variations in the sutural pattern of the fusion of constituent bones. Pterion depicts the H-shaped sutural junction of frontal, sphenoid, parietal, and temporal bones within the temporal fossa. The pterion is known to be the weakest part of the skull.

Methods: All together 24 dry human skulls were collected from the Department of Anatomy at Chitwan Medical College for the study. Sex and ethnicity of the skulls were undefined. All damaged skulls excluded from the study. Both the sides of the skull were studied for the locations and types of pterion. The shape and type of pterion were noted by observing the articulation of the bones. Photographs were taken and were studied. Statistical analysis was done using Microsoft excel 2019 and analyzed as frequency and distribution.

Results: Twenty-four human skulls of known gender were examined. Three types of pterion were observed. The sphenoparietal- 66.66%, frontotemporal- 25% and stellate - 8.4%.

Conclusions: We believe that there are different patterns of pterion present in human skull. Since pterion is an important surgical landmark, the findings may be helpful in surgical approach and intervention.

INTRODUCTION

The temporal fossa is the area of skull bounded by zygomatic arch, temporal lines and frontal process of the zygomatic bone. The pterion is a craniometric point near the sphenoid fontanelle of the skull.[1] It portrays the variations in the sutural pattern of the fusion of constituent bones which depicts the H-shaped sutural junction of frontal, sphenoid, parietal, and temporal bones.[2]It is the site of the anterolateral fontanelle of the neonatal skull which closes at 3 months of age.[3]

The pterion is a weakest point located approximately 4 cm above the midpoint of the upper border of the zygomatic arch. It generally marks the position of the frontal or anterior branch of the middle meningeal artery, the lateral sulcus of brain and Broca's motor speech area. It may be fractured indirectly by blows to the top or back of the head.[3,4] It is an important guide for age and sex determination as well as archaeological and forensic estimation.[5]The morphology of pterion was studied by Broca in 1875 later, Murphy in 1956 reclassified it into four types: sphenoparietal, frontotemporal, stellate and epipheric.[6]

Pterion is common neurosurgical landmark. This is important for the surgical approaches to the anterior and middle cranial fossae, extradural hemorrhage, tumors involving inferior aspects of the frontal lobe.[7] The anatomical varieties of the pterion are mainly of interest to neurosurgeons, anatomist, forensic pathologists, and anthropologist for assessing the location of the pterion in archeological remains or forensic material.[2]The present study was aimed to assess the morphological variations of Pterion.

METHODS

The study was conducted at Department of Anatomy of Chitwan Medical College form 5th January 2021 to 30th January 2021. Observational cross-sectional study was conducted one 24 dry human skulls available in the department. The sex and ethnicity of the skulls were undefined. All damaged skulls were excluded from the study. Both the sides of the skull were studied for the locations and types of the pterion. The shape and type of the pterion was noted by observing the articulation of the bones. The photographs were taken as a document for all types of pterion on each side. Statistical analysis was done using Microsoft Excel 2019 and analyzed as frequency and distribution.

The following criteria were observed to categorize the different

types of pterion among the 24 dry skulls:
1-Sphenoparietal type: The greater wing of sphenoid articulates with the parietal bone to form the letter "H".
2-Frontotemporal type: The squamous part of the temporal bone articulates with the frontal bone.
3-Stellate type: In this, all the bones articulate at a point in the form of the letter "K".
4-Epipteric type: A sutural bone is lodged between the four bones that form the pterion.

RESULTS

Our observation showed that sphenoparietal type of pattern was the most common type. Interestingly we could not find epipteric type of pterion. The sphenoparietal type of pattern was found in 66.66% of the skull studied. The frontotemporal type of pterion was found in 25% of the dry skull and remaining 8.4% of the pattern of pterion was stellate type (Table 1).

Figure 1: Sphenoparietal pterion

Figure 2: Frontotemporal pterion

Figure 3: Stellate pterion

Table 1: Pattern of pterion

Sphenoparietal Pterion	Frontotemporal Pterion	Stellate Pterion
66.60%	25.00%	8.40%

Table 2: Pattern of pterion on right and left side

Type	Right Side	Left Side
Sphenoparietal(32)	56.25%(18)	43.75%(14)
Frontotemporal(12)	33.33%(4)	66.66%(8)
Stellate(4)	25%(1)	75%(1)
Epipteric(0)	-	-

On studying pterion on right and left side we found the maximum number of sphenoparietal pterion on right side and frontotemporal on left side. The lowest incidence was found to be of stellate type.

DISCUSSION

The type, location of the pterion and its relation to surrounding bony landmarks is important. Such detailed information can only readily be obtained from an examination of dry skulls. However, as imaging techniques continue to develop, it may become possible to use these to determine more precise relationships between bony land-marks and the underlying soft tissues. Since the shape and location of the sutures associated with the pterion are variable, the pterion has been classified according to its shape.[8] An accurate knowledge of the location and relations of the pterion is important in relation to surgical intervention, most importantly with respect to the course of the branches of the middle meningeal artery and Broca's motor speech area on the left side.[9] The distances between the pterion and the lesser wing of the sphenoid, optic canal are of practical importance in surgical approaches. Both the type of pterion and the associated measurements variations present between different racial groups, and hence the need for accurate and up-to-date data when performing intracranial surgery guided by recognizable bony landmarks.[10] The findings of the present study showed sphenoparietal type of pattern in 66.66% of the skull. Similarly frontotemporal type was found in 25% and 8.4% of the pattern of pterion was stellate type. We in our study could not find epipteric type of pterion concurrent with Adejuwon et al[11] sphenoparietal pterion (86.1%) frontotemporal (8.3%), stellate (5.6%), and epipteric types (0%). The cause of this similarity might be because of genetic influence especially the MSX2 gene.[12]

Hussain et al[13] in their study registered four types of pterion present in the examined 125 skulls. They also reported sphenoparietal type (69.2%) the most common also frontotemporal type in 17.35% and stellate type in 9.7%. Similarly they also reported 3.7% epipteric type. This similarity might be because of similar region with similar ethnic and racial group.[11]

Francis et al [14] in their study noted sphenoparietal type of pattern was most common type of pterion. The high occurrence of the sphenoparietal pterion could have an evolutionary basis.

Sphenoparietal type is the most common type in humans and biped primates such as bonobos and orangutans. Furthermore, it has been shown that the development of calvarial bones is tightly coordinated with the growth of the brain and requires interactions between different tissues in the sutures. Consequently, the increase in brain size in bipeds[15] may have caused morphological changes in neurocranium that led to meeting of greater wing of sphenoid and parietal bone.

Havaldar et al[16] in their study documented 39.20% and 33.60% of sphenoparietal pterion on right and left side, similarly 6% and 10.40% frontotemporal,3.20% and 5.60% were stellate and 1.60% and 0.40% were epipteric type on right and left side respectively similar to the present study, our findings also documented highest number of sphenoparietal type followed by frontotemporal and epipteric. This similarity might be because of similarity in region, similar ethnic group, genetic factor.

The study was conducted with limited number of study samples. So cannot be generalized among adult Nepalese population. The result might vary if the sample size was more.

CONCLUSION

Sphenoparietal pterion had the highest prevalence among population studied followed by the frontotemporal. Sutural morphology of the pterion in the Nepalese population is similar from that of other populations. These findings may be of useful in surgical approaches and interventions via the pterion.

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CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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