



A STUDY ON PTERION IN ADULT DRY HUMAN SKULL BONES IN RAYALASEEMA POPULATION

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ABSTRACT **Introduction:** The knowledge of the variations of pterion & its surgical anatomy are important for surgeons in operating the fields. This study also contribute additional information as skull bone fractures in infancy & early childhood which may be associated with large inter sutural bones giving false appearance of fracture radiologically. **Materials & Methods:** 100 dry human skulls which were obtained from the Departments of Anatomy, SVIMS - SPMCW; SV Medical college, Department of Anthropology, SV University, Tirupati; RIMS Medical college, Kadapa. **Results:** The sphenoparietal type of variety is seen in 71%, Frontotemporal - 20 %, Epipteretic - 6 %, Stellate - 3%. **Conclusion & Key Message:** The knowledge of location of pterion and its types in relation to important internal landmarks are really very essential for the neurosurgeon in their routine surgical approach.

KEYWORDS : Pterion, fractures, frontozygomatic suture, sphenoparietal, Epipteretic.

INTRODUCTION

The Pterion is the localized region in anterior part of temporal fossa where the frontal, sphenoid, temporal and parietal bones of skull meet. Pterion is the weakest part of skull and it is the basis for surface marking to locate Broca's 1 motor speech area, anterior pole of insula & middle cerebral artery, optic nerve, sphenoidal ridge and orbit. The craniometric points are related to the structures in the cranial cavity and one such craniometric point formed by confluence of skull bones in the floor of temporal fossa is called pterion. The anatomical location of pterion helps in surgical intervention following extradural hemorrhage as well as tumor involving the inferior aspect of frontal lobe such as olfactory meningioma.

The knowledge of the variations of pterion & its surgical anatomy are important for surgeons in operating the fields. This study also contribute additional information as skull bone fractures in infancy & early childhood which may be associated with large inter sutural bones giving false appearance of fracture radiologically. Pterion approach is commonly employed in surgery of anterior circulation upper basilar artery aneurysm as well as tumors of orbital, retroorbital, sellar, chiasmatic, sub frontal and prepontine areas. Thus the anatomical variations of pterion are being so much cared by anthropologists, forensic pathologists and neurosurgeons.

II. MATERIALS AND METHODS

The study has been carried out in 100 adult human dry skulls of unknown sex and Digital Vernier caliper of 0.1mm accuracy, Digital camera were used as materials for the study. In the present study data were obtained from the Department of Anatomy, Sri Padmavathi Medical College for Women - SVIMS Tirupati; SV Medical college Tirupati; RIMS Medical college, Kadapa and from 1st MBBS students of these colleges and also from the department of Anthropology, SV University. Adult human skulls of unknown sex, Skulls without calvaria, third molar tooth erupted, Sutures well defined were included in the study and damaged skulls, new born, infants, children skulls and very old skulls that are obliterated sutures are excluded from the study.

Both sides of each skull were studied for the type of pterion and determined based on established description [Sphenoparietal, Frontotemporal, Stellate, Epipteretic types]. Measurements were taken on both sides of skull, using digital Vernier caliper with accuracy of 0.1mm.

III. OBSERVATIONS AND RESULTS

MEASUREMENTS:

- Pterion to zygomatic arch (P-ZA):- Vertical distance from centre of pterion to zygomatic arch.
- Pterion to Frontozygomatic suture (P-FZS):- Distance from centre

of pterion to posteriolateral aspect of frontozygomatic suture.

- Pterion to Lesser wing of sphenoid (P-LWS):- Horizontal distance from internal aspect of centre of pterion to outer end of sphenoid ridge on lesser wing of sphenoid.
- Pterion to Optic canal (P-OC):- Horizontal distance from internal aspect of centre of pterion to lateral margin of optic canal.

Figure 1: Centre of pterion to Zygomatic arch (P-ZA).



Figure 2. Centre of pterion to Frontozygomatic suture (P-FZS).



Figure 3. Internal aspect of center of pterion to lateral margin of optic canal (P-OC).



Figure 4: Internal aspect of center of pterion to lateral end of ridge on lesser wing of sphenoid (P-LWS).



RESULTS

In the present study, the sphenoparietal type of variety was seen in 71%, Frontotemporal was 20 %, Epipetric was 6 %, Stellate was 3%.

Table 1: Percentage occurrence of different types of Pterion

| Type | Percentage |
|----------------|------------|
| Sphenoparietal | 71 % |
| Frontotemporal | 20 % |
| Epipetric | 6 % |
| Stellate | 3 % |

Table 2: Measurements from centre of pterion to different suture lines

| Sl.No | Type | Right Side | | | Left Side | | |
|-------|-------|------------|----------|-----------------|-----------|----------|-----------------|
| | | Min (mm) | Max (mm) | Mean ± S.D (mm) | Min (mm) | Max (mm) | Mean ± S.D (mm) |
| 1 | P-ZA | 26.18 | 44.8 | 36.6±4.19 | 21.03 | 42.1 | 35.7±4.71 |
| 2 | P-FZS | 20.12 | 38.9 | 27.5±4.75 | 18.6 | 40.7 | 27.19±5.2 |
| 3 | P-OC | 28.17 | 48.1 | 39.6±4.16 | 21.02 | 47.6 | 39.73±5.09 |
| 4 | P-LWS | 10.18 | 47.7 | 25.25±6.8 | 10.08 | 39.16 | 24.97±6.32 |

Out of 100 skulls measurement taken from pterion to zygomatic arch, the maximum distance on right side is 44.8mm and minimum of 26.18mm & on left side maximum of 42.1mm and minimum of 21.03mm, the mean on right side 36.67mm and left side mean is 35.74mm with standard deviation right side 4.19 and left side is 4.71mm.

In the measurement taken from pterion to frontozygomatic suture, the maximum distance on right side is 38.99 mm and minimum of 20.12 mm and on left side maximum of 40.7 mm and minimum of 18.6mm, the mean on right side is 27.51 mm and left is 27.19 mm with standard deviation right side is 4.75 mm, left side is 5.25 mm.

In the distance of inner aspect of pterion from lateral margin of optic canal is more on left side than the right side, out of 100 skulls, the maximum distance on right side is 48.1mm and minimum of 28.17mm and on left side maximum of 47.6mm and minimum of 21.02mm, the mean on right side is 39.60mm and left is 39.73mm with standard deviation right side is 4.16mm, left side is 5.09mm.

The distance of inner aspect of pterion from lesser wing of sphenoid is more on right than left side, out of 100 skulls, the maximum distance on right side is 47.70mm and minimum of 10.18mm and on left side maximum of 39.16mm and minimum of 10.8mm, the mean on right side is 25.25mm and left is 24.97mm with standard deviation right side is 6.80mm, left side is 6.32mm

IV.DISCUSSION

Broca¹ classified the Pterion into 3 types (1) In H type Pterion where greater wing of sphenoid bone articulates with parietal bone in form of H, also known as sphenoparietal type. (2) "Retourne" type of Pterion where squamous part of temporal bone articulates with frontal bone. It is also called frontotemporal type. (3) "enk" type of Pterion where frontal, parietal, temporal and sphenoid articulate in the form of letter K. It is also called as stellate type of Pterion.

Murphy³ described 4 types of Pterion are Sphenoparietal, Frontotemporal, Epipetric, Stellate type. In the present study classification of Pterion is based on Murphy's classification. In their study the incidence of different types are sphenoparietal-73%, frontotemporal-75%, stellate-18.5%, epipetric-1%. In comparison with our study the percentage of occurrence in descending order are Sphenoparietal, Frontotemporal, Epipetric and Stellate.

Saxena⁴ al 4 conducted a study on 203 skulls and studied the incidence of sphenoparietal type ranging from 87% in male to 82.5% in female based on the gender. Frontotemporal type in male - 13.4%, in female - 7% and stellate in males - 6%, females - 4.36%. In our present study the work is done on skulls of unknown sex and incidence of percentage occurrences Sphenoparietal-71%, Frontotemporal -20%, Epipetric-6%, Stellate-3%.

The percentage occurrence of sphenoparietal type of pterion according to Murphy³- 73.1%, Saxena⁴- 84.72%, OGUZ⁵- 88%, Mwachaka⁶- 66%, Hussain sahib et.al⁷- 69.25%.

The incidence of sphenoparietal 69.25% which is apart with present study.

As per the study of Hussian et.al⁷ the incidence of frontotemporal type is 17.35% which is almost as per with the present study.

As per the study conducted by Dr. AnkurZalawadia et.al⁸ sphenoparietal - 92.9% on right side and 90.5% on left side, frontotemporal - 2.4% on right side, 2.4% on left side, stellate - 0% on right side, 2.4% on left side, Epipetric - 4.8% on right side, 4.8% on left side.

U. Ukoha et.al⁹ findings are similar in comparison with our study that is the percentage of occurrence in descending order are Sphenoparietal, Frontotemporal, Epipetric, Stellate. Results of Sunday A.Adejuwon et.al¹⁰ didn't correlate with this frequency of any type.

The studies done by Seema and Mahajan et.al¹¹ are almost reflecting same as our present study. The incidence of types of Pterion in present study differs with study of Eboh D.E.O & Obaroefe et.al¹².

In a study done by Gurubachansingh et.al¹³ frequency of sphenoparietal nearing to our present study and other types varied grossly. As per the study conducted by Pavan et.al¹⁴ the frequency of sphenoparietal and frontotemporal reflected as per our study and differed with stellate and epipetric type. In a study done by Ruiz et.al¹⁵ results varied grossly with present study.

Alpersindel et.al¹⁶ conducted study on 150 dry adult human skulls and observed presence of pterion as Sphenoparietal 63%, Frontotemporal 2%, Stellate 19%, Epipetric 16%. The percentage incidence of types Pterion is not correlating with present study. Dr.P.R. Wadekar et.al¹⁷ study coincides with the incidence of sphenoparietal and stellate types and varied grossly with relevance to epipetric and frontotemporal types. The similar study done by Gyanaranjan Nayak et.al¹⁸ results of present study didn't correlate this frequency with any type. Umesh et.al¹⁹ exhibited variations with our present study. Prashant et.al²⁰ incidence of sphenoparietal and stellate are concurring with our study.

V.SUMMARY AND CONCLUSION

The present study is extended to measure various parameters in different types of pterion. The analysis revealed that there is variation in the given parameters in frontotemporal, Epipetric, stellate types. And it is also observed that in sphenoparietal type it coincides with the present study not based on type of pterion and the implying reason is dominance of sphenoparietal type of pterion.

The knowledge of location of pterion in relation to important internal landmarks are really very essential for the neurosurgeon. In relation to surgical approaches for branches of middle meningeal artery, Broca's motor speech area, insula, the lateral cerebral fissure, pathologies of optic nerve, orbit, sphenoidal ridge and for the anterior circulation aneurysm, intracranial tumors, the knowledge of relations are really significant.

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