

## A Study on Cadaveric Dry Skulls to Calculate the Incidence of types of Pterion in North-West Indians

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Available online at: [www.isroset.org](http://www.isroset.org)

Received: 20/Feb /2020, Accepted: 04/Apr/ 2020, Online: 30/Apr/2020

**Abstract-** Pterion is a small area present in the temporal fossa and is covered by temporal muscle and temporalis fascia. Pterion is formed on norma lateralis where 4 bones greater wing of sphenoid, parietal, frontal, and squamous part of the temporal bone articulate with each other. The aim of present study is to calculate the incidence of different shapes of the pterion. This study was conducted on 108 human dry skulls in the Department of Anatomy, National Institute of Medical Sciences and Research, Jaipur. The following parameters Sphenoparietal, Frontotemporal, Epipteric and Stellate were observed in pterion and noted down in table format. The study was conducted on 108 human dry skulls and 216 types of pterion were observed where 133 sphenoparietal, 60 were frontotemporal type, 23 were epipteric type and no incidence of stellate type. Sphenoparietal type of pterion was the most dominant type of pterion which was observed in 61.57% of cases. This study will be helpful to anatomists, neurosurgeons, anthropologists and researchers. This study concludes that the knowledge of the position of pterion will be helpful for burr hole surgeries and neurosurgeries, anatomists, anthropologists and researchers.

**Keywords-** Pterion, Sphenoparietal, Frontotemporal, Epipteric

### I. INTRODUCTION

Pterion is a small area present in the temporal fossa and is covered by temporal muscle and temporalis fascia. It is present on the Norma lateralis of the skull and is formed when 4 bones articulate with each other. They are greater wing of sphenoid, parietal, frontal, and squamous part of the temporal bone[1].

Pterion marks the anterior division of the middle meningeal artery and the Sylvian point of the brain. From the superior border of the zygomatic arch, it is usually measured 4.0 cm and the measurement from zygomatico-frontal suture to pterion is measured as 3.0 cm - 3.5 cm. Manually it is measured by thumb and finger, as zygomatic arch lies two fingers superior to pterion and frontal process of zygomatic bone is a thumb posterior to pterion. The meeting point of all four bones is also the weakest part of the skull. The course of anterior division of middle meningeal artery lies posterior to the pterion[2].

This area is of great clinical and neurosurgical importance as this part of bone is very delicate and can be easily broken for doing craniotomy and burr hole surgeries. Drainage of hematoma which is done after an accident is a lifesaving surgery, in this surgery the blood collected in subdural (space present between Dura mater and Arachnoids' mater) space is drained out. That is the

reason why burr hole surgery is done at the site of pterion as it is the weakest site present on the Norma lateralis of the skull. That is why knowledge of surface anatomy of the middle meningeal artery is important so that burr hole surgery can be done to evacuate extradural hematoma[1].

### II. MATERIAL AND METHODS

The study was conducted on 108 human dry skulls available in the Department of Anatomy, National Institute of Medical Sciences and Research and other Medical Colleges of Jaipur (SMS Medical College, JNU Medical College, and Mahatma Gandhi Medical College) between the periods of January 2019 to December 2019.

The following parameters were observed in pterion and noted down in table format. Results are compared with the previous studies. Fractured skulls and deformed skulls have been excluded from the study.

- A. Sphenoparietal
- B. Frontotemporal
- C. Epipteric
- D. Stellate

**A. Sphenoparietal type of pterion:-** It is sutural pattern in which the greater wing of sphenoid articulate with the parietal bone.

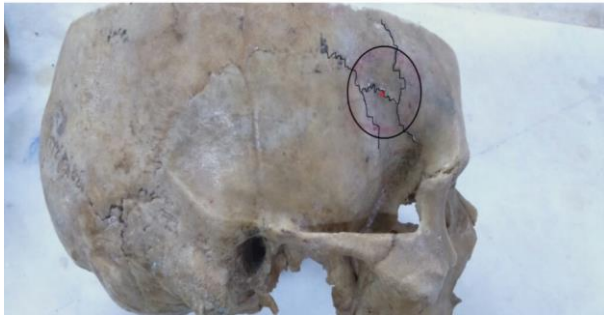


Fig.1:- Sphenoparietal

**B. Frontotemporal type:-** It is a sutural pattern in which the frontal bone articulates with the squamous part of temporal bone.



Fig. 2:- Frontotemporal

**C. Epipteric type:-** It is defined as the presence of sutural bone between the all 4 type of bones.



Fig. 3:- Epipteric

**D. Stellate type:-** All the four bones, squamous part of frontal bone, greater wing of sphenoid bone, Sphenoid angle of parietal bone and the squamous part of temporal bone, meet at a common point forming a stellate type suture.

### III. RESULTS

The study was conducted on 108 human dry skulls of unknown gender in the department of anatomy of National Institute of Medical Sciences and Research. In 216 types of pterion 133 were sphenoparietal, 60 were frontotemporal type, 23 were epipteric type and no incidence of stellate type.

**Table 1: Percentage of pterion observed on right and left aspect of skulls**

Type of pterion	Right N=108	Left N=108	Both Sides
Sphenoparietal	62 (57.40%)	71 (65.74%)	133 (61.57%)
Frontotemporal	31 (28.70%)	29 (26.85%)	60 (27.77%)
Epipteric	15 (13.88%)	8 (7.40%)	23 (10.64%)
Stellate	0	0	0

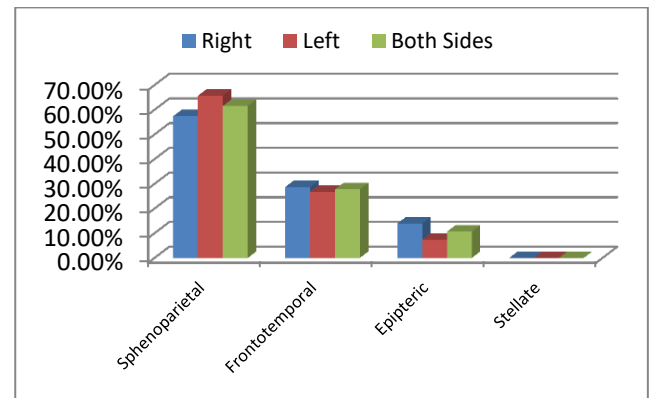


Fig.4

Sphenoparietal type of pterion was observed in 61.57% sample (57.40% on right side and 65.74% on the left aspect) frontotemporal was the second-highest which was observed in 27.77% sample (28.70% on right side and 26.85% on the left aspect). Epipteric were observed on the lowest percentage basis which was observed in 10.64% sample (13.88% were present on the right side and 7.40% on left aspect).

**Table 2: Percentage distribution of symmetrical and asymmetrical pterion**

Presentation	Number	Percentage
Asymmetrical	17	15.74%
Symmetrical	91	84.25%

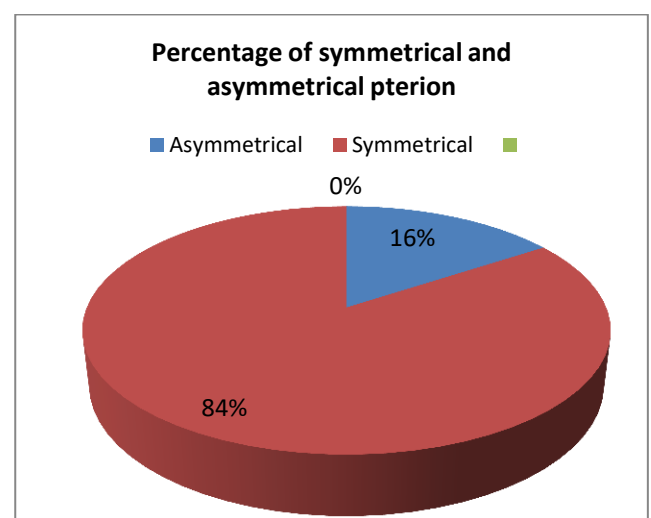


Fig.5. Symmetrical and asymmetrical presentation

#### IV. DISCUSSION

Table 3: Percentage distribution of Symmetrical and Asymmetrical pterion in different studies

Study/Population	Symmetrical (%)	Asymmetrical (%)
Mwachaka P.M et al, 2009, Kenyans, n=90, Known gender.	78	22
Ankur Zalwadia et al, 2010, Western Indians, n=42, unknown gender.	99	01
Wandee C, et al, 2011, Thailand, n=268, Known gender.	84.7	15.8
In present Study, Indians population, n-108, Unknown gender	84.25	15.74

Present study has shown that the same type of pterion occurs more bilaterally than unilaterally. This is in comparison with Mwachaka PM et al[3], Ankur Zalwadia et al[4] and Wandee C et al[5]. When compared on bilateral basis, it was high in comparison to Mwachaka PM et al[3] and low when compared to Ankur Zalwadia et al[4]

When compared unilaterally it was low than Mwachaka et al[3] and high when compared to Ankur Zalwadia et al[4]. In the study conducted by Wandee C et al[5] the distribution was almost same unilaterally and bilaterally when compared to all the 3 studies above.

Table 4: Percentage distribution of Sphenoparietal type of pterion in different studies

Author	Population	N= skulls	Sphenoparietal (%)
Murphy 1956	Australian	388	73.2
Ankur Zalwadia et al, 2010,	Western Indian	42	92.9
Wandee C, et al, 2011,	Thai	268	81.0
Anjana.S, et al, 2015	Karnataka	32	78.1
Alper Sindel et al 2016,	Turkey	150	63
Present Study	Indian	108	61.57

Sphenoparietal type of pterion is more frequent in all the regions. This is in comparison with other studies. In the this study the occurrence of SP type was 61.57% which was low when compared to Ankur Zalwadia et al[4], Wandee C et al[5], Murphy[6], Anjana.S. et al[7], Alper Sindel et al[8] studies. The high occurrence of sphenoparietal type could have some evolutionary basis [9]. The sphenoparietal type is dominant in humans and frontotemporal is dominant in non-human primates.

Table 5: Percentage distribution of Frontotemporal type of pterion in different studies

Author	Population	N= skulls	Frontotemporal (%)
Murphy, 1956	Australian	388	7.7
Ankur Zalwadia et al, 2010,	Western Indian	42	2.4
Hussain sahib et al, 2011	Indian	125	17.35
Wandee C. et al, 2011	Thai	268	1.1
Anajana.S et al, 2015	Karnataka	42	3
Present Study	Indian	108	27.77

This type is among the second highest in the present study which is [27.77%]. It is high when compared to Wandee et al[5], Murphy[6], Hussain Saheb et al[9] studies.

Table 6: Percentage distribution of Epipteric pterion in different studies.

Author	Population	N= skulls	Epipteric (%)
Murphy, 1956	Australian	388	18.3
Ankur Zalwadia et al, 2010	Western Indian	42	4.8
Wandee C. et al, 2011	Thai	268	17.5
Anjana.S et al, 2015	Karnataka	32	0
Present Study	Indian	108	13.88

The type is least common in the present study i.e. 13.88%. Which is high in comparison to Ankur Zalwadia et al[4] of skulls, absent in the studies done by Anjana S. et al[8]. It is low in comparison to Wandee C et al[5] Murphy et al[6]. In the present study it is mostly arranged with sphenoparietal variety, as compared to frontotemporal type of pterion.

Table 7: Percentage distribution of stellate pterion in different studies

Author	Population	N= skulls	Stellate(%)
Murphy, 1956	Australian	388	0.7
Ankur Zalwadia et al, 2010	Western Indians	42	0
Wandee C, et al, 2011	Thai	268	0
Anjana.S et al, 2015	Karnataka	32	6.2
Present Study	Indian	108	0

In the present study stellate type of pterion were absent. When compared with various studies it is least frequently

present in the studies done in the past. In the study conducted by Anjana S. et al [8] 2015 6.2% stellate type of pterion were observed.

## V. CONCLUSION

Sphenoparietal type of pterion was the most dominant type of pterion which was observed in 61.57% of cases, frontotemporal was observed in 27.77% of cases, epipteric type of pterion which was observed in 10.64% of cases. This study concludes that the knowledge of the position of pterion will be helpful for burr hole surgeries and neurosurgeries of the lesions of anterior and middle cranial fossa and useful in microsurgeries of olfactory meningiomas present on the inferior aspect of the frontal lobe, tumor in retro orbital, orbital, sellar & chiasmatic areas and operations in Broca's motor speech area so this study will be helpful to anatomists, neurosurgeons, anthropologists and researchers.

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