



MORPHOMETRIC ANALYSIS OF ETHMOIDAL FORAMEN IN ADULT DRY INDIAN SKULL.

Anatomy

Dr. Saima Manzoor Post Graduate (3rd Year), Department of Anatomy, Govt. Medical College, Jammu.

Dr Sheetal Chandel Demonstartor, Department Of Anatomy, Govt. Medical College, Jammu.

Dr. Shahnaz Chowdhary* Associate Professor, Department of Anatomy, Govt. Medical College, Jammu.
*Corresponding Author

Dr. Yusra Magrey Post Graduate (3rd Year), Department of Anatomy, Govt. Medical College, Jammu.

ABSTRACT

Ethmoid bone is located in the anterior part of the base of the cranium between the orbits. The medial orbital wall separates the content of the orbit from the ethmoidal air sinuses. The anatomical landmarks of orbital cavities are very much important during orbital surgeries which includes surgery of anterior cranial fossa and endonasal microsurgies of ethmoidal region. On this medial orbital wall, the anterior and the posterior ethmoidal foramina are located along the frontoethmoidal suture and more anteriorly to the optic canal and these are very much important in orbital surgeries. This prospective observational study was undertaken to study the morphology of Ethmoidal foramen in adult dry Indian skull and to study the clinical implications of ethmoid foramen. A total 50 dry adult skulls were measured for the ethmoidal foramen. It was reported that the mean of posterior ethmoidal canal right and left was $2.09 \pm 0.75\text{mm}$ and $2.31 \pm 0.132\text{mm}$ respectively. The study concluded that to ensure the safety of surgical procedures to be performed among ethmoid foramen it is very important to measure the various landmarks; as the anatomical variations can cause problems and leads to surgery related complications.

KEYWORDS

Foramen, Ethmoid, Morphology, Skull, Orbit and Clinical significance.

INTRODUCTION

The floor of the anterior cranial fossa is composed of the orbital plates of the frontal bone, which consist of the cribriform plate of ethmoid bone, and anterior part of the sphenoid bone. There are two openings on medial orbital wall that lie in the frontoethmoidal suture, the anterior and posterior ethmoidal foramina (AEF and PEF respectively).¹

Ethmoid bone is located in the anterior part of the base of the cranium between the orbits. The medial orbital wall separates the content of the orbit from the ethmoidal air sinuses. The anterior and the posterior ethmoidal foramina are located on this wall along the fronto ethmoidal sutures and so also, more posteriorly, the optic canal.²

The anatomical landmarks of orbital cavities are very much important during orbital surgeries which includes surgery of anterior cranial fossa and endonasal microsurgies of ethmoidal region. On this medial orbital wall, the anterior and the posterior ethmoidal foramina are located along the frontoethmoidal suture and more anteriorly to the optic canal and these are very much important in orbital surgeries.³

Anterior ethmoidal foramen situated in middle lateral margin of olfactory groove, transmit the anterior ethmoidal vessels and nerve. The posterior ethmoidal foramen opens posteriorly in the medial wall of the orbit anterior to optic canal and it transmits the posterior ethmoidal vessels and nerve. Both supply the anterosuperior quadrant of the lateral wall of nose and the nasal septum.⁴

The ethmoidal vessels and the nerves pass through these foramina and play a crucial role on ligation of the vessels during haemorrhages or in preventing and treating the anterior ethmoidal nerve syndrome and also in cases of optic nerve decompression.⁵

The various studies have reported the higher incidence of variations about ethmoidal foramina on the medial orbital wall. The exact measurement of the landmarks or study of these variations of the orbits helps in performing various surgeries and also preventing the post-operative complications.

Thus, the present study was undertaken to study the morphology of ethmoid foramen in adults.

AIMS AND OBJECTIVES

1. To study the morphology of Ethmoidal foramen in adult dry Indian skull.
2. To study the clinical implications of ethmoid foramen.

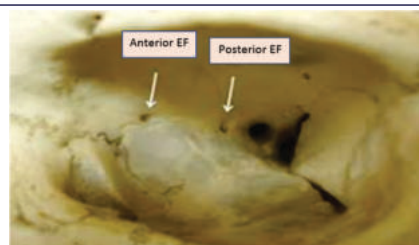


Figure 1. Ethmoidal foramina

MATERIAL AND METHODS

This prospective observational study was conducted in the Department of Anatomy, Government Medical College, Jammu. A total of 50 dry adult skulls were studied.

The calliper was used to measure the distance between ethmoidal foramina and optical canal. All the measurements were taken two times to prevent the measuring errors. The data was recorded and analysed through descriptive statistics. The following parameters were measured in the study:

- The distance between the frontomaxillary suture and the optical canal.
- The distance between frontomaxillary suture and the ethmoidal foramen.
- The distance between the middle ethmoidal foramen and the posterior ethmoidal foramen.
- The distance between the posterior ethmoidal foramen and the optic canal.
- The distance between the anterior ethmoidal foramen to the optic canal.

Inclusion criteria

1. Indian adult dry skull.

Exclusion criteria:

1. Broken skull and broken orbit.

OBSERVATION AND RESULTS

In this observational study a total 50 dry adult skulls were measured for the ethmoidal foramen.

Table 1. Measurements of ethmoidal foramen

Ethmoidal foramen	N	Mean $\pm$ SD
Anterior EF (right)	50	27.89 $\pm$ 4.98

Anterior EF (left)	50	28.02±5.01
Posterior EF (right)	50	14.98±8±6.8
Posterior EF (left)	50	15.01±8.71
Middle EF (right)	38	7.59±3.94
Middle EF (left)	34	8.13±4.25

Table 1, depicted the measurements of ethmoidal foramen. The mean anterior ethmoidal foramen right and left was 27.89±4.98mm and 28.02±5.01mm respectively. The mean posterior ethmoidal foramen right and left was 14.98±8±6.8mm and 15.01±8.71mm respectively. The mean middle ethmoidal foramen right and left was 7.59±3.94mm and 8.13±4.25 mm respectively.

Table 2 Posterior ethmoidal canal (PEC)

PEC	N	Mean±SD
Right	5	2.09±0.75
Left	7	2.31±0.132

Table 2 represented the mean of posterior ethmoidal canal right and left was 2.09±0.75mm and 2.31±0.132mm respectively.

DISCUSSION

The findings of the present study were discussed with literature. The literature suggests that the study of orbital morphology is a very much essential component for orbital surgeries for better results and to prevent further complications.

The findings of the present study observed the mean anterior ethmoidal foramen right and left was 27.89±4.98mm and 28.02±5.01mm respectively. The mean posterior ethmoidal foramen right and left was 14.98±8±6.8mm and 15.01±8.71mm respectively. The mean middle ethmoidal foramen right and left was 7.59±3.94mm and 8.13±4.25 mm respectively. And the mean of posterior ethmoidal canal right and left was 2.09±0.75mm and 2.31±0.132mm respectively. The findings are in accordance with the study conducted by Y Takahshi Y, et al. 2011, observed that 17 anterior foramen were located above the frontoethmoidal suture (mean distance 1.0mm) and 2 posterior ethmoidal foramen were located at 1.0 mm & 1.5mm above suture. The anterior ethmoidal foramen was the most foramen followed by the accessory and posterior foramen.⁶

In similar study conducted by I Zareen N, (2015), measured the mean anterior ethmoidal foramen, middle ethmoidal foramen and posterior ethmoidal foramen. The mean anterior ethmoidal foramen right and left was 28.80±5.592mm and 28.00±4.161 mm respectively. The mean posterior ethmoidal foramen right and left was 17.83±8±6.029 mm and 17.00±6.443 mm respectively. The mean middle ethmoidal foramen right and left was 6.59±2.740mm and 8.93±3.575 mm respectively.⁷

In another study conducted by Abed SF, et al. (2012), reported the mean distances from the anterior ethmoidal foramen to the first posterior ethmoidal foramen and last posterior ethmoidal foramen were 13.88±3.51 mm and 16.60±2.19 mm respectively.⁸

CONCLUSION

In the present study the clinical and surgical significance of ethmoidal foramen was established and these significances helps in predicting the various anatomical variations in the position of ethmoidal foramen. It is an important factor to ensure the safe and precise performance of medial orbital wall surgeries to avoid injuries and complications to the important neurovascular bundles passing through various foramina and fissures. It was further concluded that to ensure the safety of surgical procedures to be performed among ethmoid foramen it is very important to measure the various landmarks; as the anatomical variations can cause problems and leads to surgery related complications.

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