# The Foramen Meningo-orbital in Indian Dry Skulls

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**Abstracts:** Background & objective: Foramen meningo-orbital is present in greater wing of sphenoid bone close to superior orbital fissure. It provide route for an anastomosis between the orbital branch of the middle meningeal artery and recurrent meningeal branch of ophthalmic artery. Basic textbooks of anatomy stated that it was a rare occurrence but some recent studies indicate a more frequent incidence of this which shows side and gender variation. These discrepancies were verified in our research work. Methods: We studied 150 dried human skulls (100 male and 50 female) of known sex. Only patent foramina were included in the observation. Results: Incidence of foramen as whole was 44.33% (male- 37.5% and female- 58%). In 4%, it was present bilaterally. Average distance between lateral end of superior orbital fissure and foramen was 6.22 mm. Conclusion: Our study indicates that a foramen meningo-orbital is present as often as, mostly unilaterally and multiple foramina may exist and also it shows side and genders variation. Knowledge of it may be of surgical significance to ophthalmologist and neurosurgeons and for radiologist because it masquerading as an intraocular foreign body. Further detail study on this topic in other populations from different areas is required. [Jadav S et al NJIRM 2012; 3(4) :46-49]

**Key Words**: Meningo-orbital foramen, Superior orbital fissure, Skull.

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**Introduction:** The Meningo-Orbital Foramen (MOF) is an opening situated in greater wing of the sphenoid which connect the orbit with the middle cranial fossa and rarely with the anterior cranial fossa[1, 2]. It provide route for an anastomosis between the orbital branch of the middle meningeal artery and recurrent meningeal branch of ophthalmic artery[3, 4]. It is not consistently present and occupies a somewhat variable position relative to superior orbital fissure. It can be located to the lateral end of the superior orbital fissure or may confluent with lateral end of the superior orbital fissure. The foramen may be single or multiple. It may be present unilaterally or bilaterally[4, 5]. MOF has been known in human anatomical literature by a variety of names (the lacrimal foramen, Hyrtl's foramen, opthalmo-lacrimal foramen) and in comparative anatomy literature (the cranio-orbital foramen, spheno-frontal foramen, sinus canal, anastomotic foramen) [1, 5, 6]. The prevalence of the MOF varies apparently from 28 to 82.9%[4, 5, 6].

With the increasing higher imaging capabilities of magnetic resonance imaging and computed tomography, foramina of the skulls are being seen as never before in living individuals. Evaluation of these foramina is becoming an important part of diagnostic medicine. Knowledge of the incidence, location of MOF of the human skull will aid in the diagnostic evaluation of radiologic films as it masquerading as an intraocular foreign body[7]. The localization of the MOF and its distance from the superior orbital fissure has clinical importance. Injuries to the arterial branch coming through the foramen during operations on orbit makes surgical interventions longer and augments the operating risk, especially for structures of the superior orbital fissure[4].

Considering its clinical importance and very few studies were done on Indian dry human skulls we carried out this work. The aim of this study was to know the incidence and location of this foramen in Indian dry human skulls.

**Material and Methods:** One hundred and fifty adult dry human skulls (100 male; 50 female) of known sex were investigated. Male and female skulls were differentiated on the basis of their main morphological features[3]. Then the Meningo-orbital Foramina were investigated carefully. Only those foramina which were patent were included

in the observation. Patency of foramen was confirmed by 0.1mm diameter a flexible probe. A conduit between the middle cranial fossa and orbital cavity was also confirmed by this probe which excluded nutrient branches to the greater wing of sphenoid bone. Following observations were made:-

1. Presence or absence of MOF. If present then patency of foramen was confirmed.
2. Number of foramen.
3. Whether unilateral/bilateral.
4. Shape and position of Foramen.
5. Distance from superior orbital fissure.

**Result:** The results of our study are summerised in Table 1. Meningo-orbital foramen was present in 44.33% of the orbits (Fig. 1, 2).

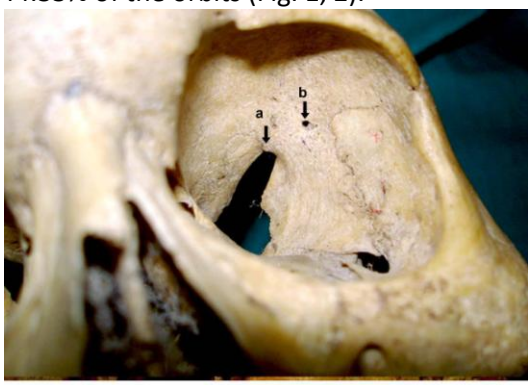

Fig - 1

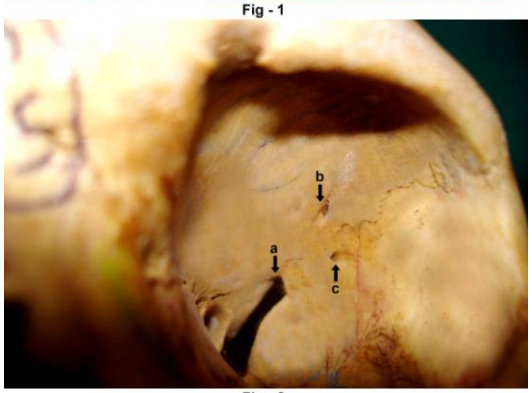

Fig - 2

The incidence of MOF in the female skulls was higher (Table 1). Only in 4% of skull it was present bilaterally. An interesting finding was that in female orbits there was higher prevalence of MOF on right side than left (Table 2). Male orbits showed almost equal incidence of foramina on both sides. Double foramens (Fig. 2) were present in 5 cases only (4 female and 1 male).

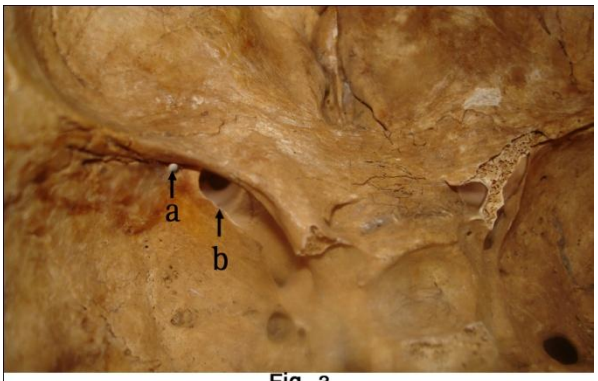

Fig. 3

Most of the MOF were round in shape; only 2 were elliptical. All MOF were located lateral to the lateral end of superior orbital fissure (Fig.1, 2). We did not found any MOF which is confluent with superior orbital fissure. All foramina open in the middle cranial fossa (Fig.3). The minimum and maximum distance between MOF and superior orbital fissure were 3 mm and 11 mm respectively, average distance was 6.22 mm.

**Table 1: Showing incidence of MOF**

| Sex | Number of orbits | Number of foramina | % of foramina |
|---|---|---|---|
| Male | 200 | 75 | 37.5 |
| Female | 100 | 58 | **58** |
| Total | 300 | 133 | 44.33 |

**Table 2: Showing incidence of MOF on right and left side of orbits.**

| Sex | Foramina on right side | | Foramina on left side | |
|---|---|---|---|---|
| | | | No. | Percentage |
| Male (n=100) | 38 | **38** | 37 | 37 |
| Female (n=50) | 32 | **64** | 26 | 52 |

**Discussion:** Present study examined the occurrence of MOF in 150 dry adult skulls. The incidence of the foramen in 44.33% (Table 1) of orbits is almost equal to incidence reported by Jovanovic et al.[8]. Other authors have reported a variable prevalence as shown in Table 3. Study of incidence of MOF in Indian population was done by Mysorekar and Nandedkar[9] and Krishnamurty et al.[6]. They reported higher incidence when compared with our results.

Higher prevalence of MOF was reported in female orbits than male. Also, there was higher prevalence of MOF on right side than left in female orbits but male orbits showed almost equal incidence of foramina (Table 2). Going through the available literature, we did not come across comparison between the incidence of MOF on right and left sides in both gender. As we reported higher prevalence on right side in female orbits which is an important finding to be kept in mind during surgery.

We reported significant difference between male and female orbits regarding the occurrence of foramen (Table 1). Kwiatkowski et al.[4] reported higher incidence of MOF in females and our observations are also same but Krishnamurty et al.[6] reported lower incidence (38.5%) in females. Kwiatkowski et al.[4] stated that, particular attention being drawn to the fact that both the occurrence and morphology of the meningo-orbital foramina presented significant sex differences in humans.

We observed foramen meningo-orbital bilaterally only in 4% of skulls which is comparable with the and close to findings of Mysorekar and Nandedkar[9] (7.86%). Other authors reported higher prevalence. The results of the measurement between the superior orbital fissure and MOF are comparable with those of Jovanovic et al.[8].

The MOF represents an embryonic conduit between the supraorbital division of stapedial artery and permanent stem of the ophthalmic artery. In adults it may be represented by connecting vessel between the orbital branch of the anterior division of the middle meningeal artery and the lacrimal branch of the ophthalmic artery[4]. The anatomy of the MOF and course of the orbital branch should be well known to surgeons reconstructing the anterior base of skull and during excision of meningiomas[9, 10].

The anatomy of orbital foramina appears to vary depending on population studied[11]. Although, that there are different data in the literature about the MOF incidence between different populations, suggestion of Berry and Berry that wide spectar of bone variations can be used to calculate statistical distance between different population specimens[12]. Also this variation, when combined with some other non-metrical and metrical variants, may become useful anthropological tools for identification of skulls[4].

Prevalence of this foramen shows variability which may be due to different population specimens of different regions were used for study. Present data may be useful for ophthalmologist, radiologist, anthropologist and neurosurgeons operating in orbital, pterional and subfrontal areas and for anatomist. Also it suggests that side and genders should be concerned during the orbital surgery and this data may be good references for Indian subjects.

**Table 3: Comparison of the percentage of Meningo-orbital foramen in different population**.

| Study /population | No of Skull | Sex | Percentage of foramen |
|---|---|---|---|
| Mysorekar & Nandedkar (1987)[9], Indian | 100 | unknown | 38 |
| Georgiou (1991)[5], Asian, | 50 | unknown | 49 |
| Jovanovic (2003)[8] | 30 | unknown | 43.3 |
| Erturk etal. (2005)[10] | 170 | unknown | 82.9 |
| Kwiatkowski (2003)[4], Polish | 46 | known | F-40; M-20.6 |
| Krishnamurthy et al. (2008)[6], Indian | 138 | known | F-38.5; M-87.9 |
| Present study, Indian | 150 | known | F-58; M-37.5 |

**Conclusion:** The results of present study indicate that a foramen meningo-orbital is present as often as, mostly unilaterally and shows greater incidence on right side. In female skulls the occurrence of this foramen is significantly higher than male skulls. More elaborated anatomical study along with new techniques is required which may throw light on this topic.

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