Morphometric study of the infraorbital foramen in local anesthesia

Bathala Ananya¹, S. Sangeetha²*, Dinesh Premavathy²

ABSTRACT

Introduction: The infraorbital foramen (IOF) is located on the maxillary bone inferior to the infraorbital margin which transmits infraorbital nerve and vessels thereby supplies the skin and mucous membrane of the midface, such as the lower eyelid, cheek, lateral aspect of the nose, upper lip, and the labial gum. The IOF is an important landmark in anesthetic and surgical interventions of the midface region. It varies according to the location, shape, and size. The study of the IOF is significant in local anesthesia procedures in maxillofacial surgeries and consequently in protection against procedural neurovascular injuries. Materials and Methods: The present study has adopted 50 dry human skulls of unknown sex of South Indian populations in the department of anatomy. Results: The total of 50 dry skulls was examined. An IOF was present both the sides of the skull. The present study has observed single IOF in almost all the skulls; meanwhile, bilateral oval shape foramina are present in one skull. The shape of the IOF was oval (38.6% in the right side and 36.3% in the left side) and circular in outline (13.6% in the right side and 17.0% in the left side). The opening of the IOF was directed medially downward in 48.6%, medially in 43.3%, and downward in 8.1% of the skulls observed. The mean distances between the IOF and IOM were 0.9704 mm on the right side and 1.0004 mm on the left side. The transverse diameter was 0.4978 mm on the right side and 0.5632 mm on the left side. Conclusion: The present study thus concluded that the morphometrical knowledge of infraorbital foramen is very much needed for safe nerve block and surgical procedures of the face to avoid complications.

KEY WORDS: Dry skulls, Infraorbital foramen, Infraorbital nerve, Local anesthesia

INTRODUCTION

The infraorbital foramen (IOF) is located on the maxillary bone inferior to the infraorbital margin which transmits infraorbital nerve and vessels thereby supplies the skin and mucous membrane of the midface, such as the lower eyelid, cheek, lateral aspect of the nose, upper lip, and the labial gum.[1] The IOF is an important landmark in anesthetic and surgical interventions of the midface region. It varies according to the location, shape, and size. The study of the IOF is significant in local anesthesia procedures in maxillofacial surgeries and consequently in protection against procedural neurovascular injuries. Likewise, the IOF is used as a pressure point to test the sensitivity of the infraorbital nerve.[2] The foramen continued as infraorbital canal, which is the anterior continuation of the infraorbital groove at the floor of the orbit. The ramifications of the three important parts of the trigeminal nerve at the supraorbital, infraorbital, and mental foramen are dispersed on a vertical line (in anterior view) going through the center of the pupil.[3,4]

The nerve block is an important procedure that anesthetizes the maxillofacial regions for surgical procedures through locating the IOF and also for the trigeminal nerve treatment. The position of the IOF helps to locate the infraorbital plexus region, which is a risk zone during plastic surgery. Knowing the exact location is very important for the above-mentioned procedures to avoid any risk at facial surgeries, for that knowledge of morphometry of such foramen is needed. The morphometry of this foramen plays an important role during regional block anesthesia techniques of the infraorbital nerve.[5,6] Hence, the detailed knowledge of the anatomical location and the

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variations of the IOF is to ensure safe and successful local anesthetic procedures to avoid the risk of damaging the neurovascular bundle during surgery in this region. Various investigations have also exhibited that the measurements and relative position of the IOF change between the sexes and among various population groups.\[10\]

**MATERIALS AND METHODS**

The present study has adopted 50 dry human skulls of unknown sex of South Indian populations in the Department of anatomy. All the parameters were measured in the following planes:
- Vertical and horizontal diameters of the IOF [Figure 1].
- Distance from the center of the IOF to the IOM along the sagittal plane [Figure 2].

The vernier caliper is used to measure the IOF.

**RESULTS**

The total of 50 dry skull was examined. An IOF was present both the sides of the skull. The present study has observed single IOF in almost all the skulls; meanwhile, bilateral oval shape foramina are present in one skull. The shape of the IOF was oval (38.6% in the right side and 36.3% in the left side) and circular in outline (13.6% in the right side and 17.0% in the left side) [Table 1]. The opening of the IOF was directed medially downward in 48.6%, medially in 43.3%, and downward in 8.1% of the skulls observed. The mean distances between the IOF and IOM were 0.9704 mm on the right side and 1.0004 mm on the left side. The transverse diameter was 0.4978 mm on the right side and 0.5632 mm on the left side. The vertical diameter was 0.41 mm ± 0.52 mm [Table 2 and Graph 1-3].

**DISCUSSION**

The knowledge of the anatomical variations of the IOF may contribute toward reducing the risk of injury during surgical or anesthetic procedures. Injury to this neurovascular plexus may lead to bleeding and numbness of the lower eyelid, the ala of the nose, upper lip (including skin, mucosa, and gingiva), and upper incisors and canines.\[11-13\]

The present study has noticed the presence of single IOF in almost all the skulls. Furthermore, the distance between the IOF and IOM has more diameter in the left side when compared to the right side on averaging skulls. The transverse and vertical diameters are more on the left side when compared to the right side. The functional analysis performed on the maxillary bone showed that the occurrence of variation in the width and length of the IOF was dependent on the type of dentition.\[14\] The height of the IOF was significantly greater on the right side. There was no association between this variable and sex. The morphometry study of the foramen in the skull and different bones of the skull is helpful in surgery practice. The present study results of the IOF and their measurements are helpful in facial and dental

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**Table 1: The distance between IOF and IOM**

<table>
<thead>
<tr>
<th>Distance between</th>
<th>Right side</th>
<th>Left side</th>
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<tbody>
<tr>
<td>IOF–IOM</td>
<td>0.9704 mm</td>
<td>1.0004 mm</td>
</tr>
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</table>

IOF: Infraorbital foramen, IOM: Infraorbital margin

**Table 2: Transverse diameter and vertical diameter of the infraorbital foramen**

<table>
<thead>
<tr>
<th>Diameter of</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse diameter</td>
<td>0.49 mm±0.5632 mm</td>
</tr>
<tr>
<td>Vertical diameter</td>
<td>0.41 mm±0.52 mm</td>
</tr>
</tbody>
</table>

**Graph 1:** Distance between the infraorbital margin and the infraorbital foramen

**Graph 2:** Maximum transverse diameter

**Graph 3:** Maximum vertical diameter
CONCLUSION

The present study thus concluded that the morphometrical knowledge of infraorbital foramen is very much needed for safe nerve block and surgical procedures of the face to avoid complications.

REFERENCES


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