Anthropometric measurement and variations in positions of infraorbital foramen and its surgical importance

M. Srinisha1, K. Yuvaraj Babu2*, Karthik Ganesh Mohanraj2

ABSTRACT

Introduction: Infraorbital margin (IOM) is formed laterally by the zygomatic bone and medially by the maxilla. Infraorbital foramen (IOF) is situated about 1 cm below the IOM for the passage of infraorbital nerves and vessels. The knowledge about the position of the IOF provides important data in giving local anesthesia in maxillofacial and plastic surgeries. The aim of this study is to determine shape, the position of IOF in relation to maxillary teeth, the presence of accessory IOF, transverse distance from the IOM, and distance from the malar prominence. Materials and Methods: This study was done with 40 skulls of unknown age and sex from the Department of Anatomy, Saveetha Dental College, of which only 26 skulls turned out to be ideal skulls for this research. Each skull was examined for shape, position with respect to maxillary teeth, the presence of accessory foramen and using Vernier caliper distance from IOM and distance from malar prominence was measured. All data were tabulated and statistically analyzed. Results: In the present study, it is clear that the mean distance between IOF and IOM is 7.02 mm in the right side and 7.41 mm in the left side and mean distance between Malar prominence and IOF is 22.36 mm in the right side and 20.98 mm in the left side. Most of the IOF are oval in shape. The position of the IOF was found to be variable in relation to maxillary teeth. Conclusions: The result of this research may assist the surgeons to localize the important maxillofacial openings, avoid injury to the neurovascular bundles and facilitates surgical, local anesthetic, and other invasive procedures.

INTRODUCTION

Infraorbital margin (IOM) is formed laterally by the zygomatic bone and medially by the maxilla. Infraorbital foramen (IOF) is situated about 1 cm below the IOM for the passage of infraorbital nerves and vessels.[1-2] IOF is relatively larger than supraorbital foramen and varies in shape and position.[3] The importance of the anatomical characteristics of facial foramina is increased during certain endoscopic procedures of the face. The knowledge about the position of the IOF provides important data in giving local anesthesia in maxillofacial and plastic surgeries.[4-7] Infraorbital nerve appears on the face through IOF and gives sensory innervations to lower eyelid, side of nose, and upper lip.[8,9] The position of IOF is measured in relation to maxillary teeth.

The knowledge of anatomical features of IOF is essential for the surgeons dealing with maxillary region such as surgeries for fractures of zygoma[10] and intra- or extra-oral anesthesia.[11,12] The position of the IOF varies from 4 to 12 mm.[13,14] Accessory foramina may give complications during anaesthetization of this region.[15] A major factor that inhibits dentists from using the infraorbital nerve block is the fear of injury to the patient’s eye.[16]

Thus, this research is done to determine the shape, position in relation to maxillary teeth, the presence of accessory IOF, transverse distance from the IOM, and distance from the malar prominence were measured using a Vernier caliper.

MATERIALS AND METHODS

This study was done with 40 skulls of unknown age and sex from the Department of Anatomy, Saveetha Dental College, of which only 26 skulls turned out to be ideal skulls for this research. Each skull was examined for shape, position with respect to maxillary teeth, the presence of accessory foramen and using Vernier caliper distance from IOM and distance from malar prominence was measured. All data were tabulated and statistically analyzed.

Results: In the present study, it is clear that the mean distance between IOF and IOM is 7.02 mm in the right side and 7.41 mm in the left side and mean distance between Malar prominence and IOF is 22.36 mm in the right side and 20.98 mm in the left side. Most of the IOF are oval in shape. The position of the IOF was found to be variable in relation to maxillary teeth.

Conclusions: The result of this research may assist the surgeons to localize the important maxillofacial openings, avoid injury to the neurovascular bundles and facilitates surgical, local anesthetic, and other invasive procedures.

KEY WORDS: Infraorbital margin, Infraorbital nerve and vessels, Malar prominence, Position of infraorbital foramen, Shape of infraorbital foramen

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to be ideal skulls for this research. Each skull was examined for shape, position with respect to maxillary teeth; the presence of accessory foramen [Figure 1] and using Vernier caliper distance from IOM, and distance from malar prominence were measured. All data were tabulated and statistically analyzed.

RESULTS

In the present study, it is clear that the mean distance between IOF and IOM is 7.02 mm in the right side and 7.41 mm in the left side and mean distance between Malar prominence and IOF is 22.36 mm in the right side and 20.98 mm in the left side. Most of the IOF are oval in shape. The position of the IOF was found to be variable in relation to maxillary teeth.

DISCUSSION

The importance of the anatomical characteristics of facial foramina is increased during certain endoscopic procedures of the face. Knowledge of the position of the IOF is useful to dentists for both diagnostic and clinical procedures. The IOF contains the infraorbital nerve and vessels. The contents of the IOF can be injured during surgical procedures, and this may result in paraesthesia or anesthesia. Various authors have reported on the morphometry of the IOF. Most of the data in the available literature were based on studies that were carried out in the United States of America and the United Kingdom. In our study, on the other hand, represent the South Indian population, which differs in physical build from Western populations. Knowledge of the anatomical characteristics of the location, diameters, shapes, directions, and accessory foramina of the IOF may have important implications for blocking the infraorbital nerve for surgical and local anesthetic planning. Therefore, the risks associated with facial surgery may be reduced for the South Indian population if the anatomic morphometry is taken into consideration.

The distance between the IOF and IOM was measured in this study. The diameter of the IOF increases with the thickness of the infraorbital nerve and vessels. Various authors have reported on the different shapes of the IOF. Elias et al. and Apinhasmit et al. have reported that most of the IOFs they had studied were in the inferomedial rather than the vertical direction. While passing the needle to block the nerve, the groove may play an important role in the success of the anesthesia.

In a previous study by Bressan et al., an accessory IOF was found in 4.7% of the skulls (5.4% in male and 4.26% in female skulls), with a higher frequency on the left side for both genders. It was found that about 52.3% IOF was found above the second premolar and about 29.5% found above the first molar, and 18.2% found above first premolar in a study done by Nithya and Thenmozhi. Fazeelath in her study has reported the accessory IOF in 7.24% of skulls. In the present study, it was found in one skull on the right side (3.8%) Table 1.

In this study, the position of IOF was 32.6% above the first premolar, 19.2% above the second premolar and 26.9% above the first molar tooth [Table 2]. In the present study, it is clear that the mean distance between IOF and IOM is 7.02 in the right and 7.41 in the left and mean distance between malar prominence and IOF is 22.36 in the right and 20.98 in the left [Table 3]. About 42.3% of the IOF is round in shape in the right side, and 34.61% in left side whereas 57.69% of the IOF is oval in shape in the right side, and 65.38% in the left side is oval shaped [Table 1].

CONCLUSION

The knowledge about the position of the IOF provides important data in giving local anesthesia.

![Image](image_url)

**Figure 1:** (A) Infraorbital foramen, (B) Accessory infraorbital foramen

**Table 1: Shape of IOF and Incidence of Accessory IOF**

<table>
<thead>
<tr>
<th>Shape</th>
<th>Oval</th>
<th>Round</th>
<th>Accessory foramen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>15</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Left</td>
<td>17</td>
<td>9</td>
<td>0</td>
</tr>
</tbody>
</table>

IOF: Infraorbital foramen, IOM: Infraorbital margin

**Table 2: Position of IOF in relation to maxillary teeth**

<table>
<thead>
<tr>
<th>Position of IOF</th>
<th>1st Premolar</th>
<th>Between 1st and 2nd Premolar</th>
<th>2nd Premolar</th>
<th>1st Molar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>8</td>
<td>3</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Left</td>
<td>9</td>
<td>8</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

IOF: Infraorbital foramen, IOM: Infraorbital margin
in maxillofacial and plastic surgeries. The result of this research may assist the surgeons to localize the important maxillofacial openings, avoid injury to the neurovascular bundles and facilitates surgical, local anesthetic, and other invasive procedures.

REFERENCES


Table 3: Range and mean distance of IOF from IOM and malar prominence

<table>
<thead>
<tr>
<th>Measures</th>
<th>Distance of IOF from IOM in mm</th>
<th>Distance of IOF from malar prominence in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right</td>
<td>Left</td>
</tr>
<tr>
<td>Range</td>
<td>4.4–9.6</td>
<td>5.3–11.7</td>
</tr>
<tr>
<td>Mean</td>
<td>7.02</td>
<td>7.41</td>
</tr>
</tbody>
</table>

IOF: Infraorbital foramen, IOM: Infraorbital margin

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