ANATOMIC VARIATIONS OF INFRA ORBITAL FORAMEN

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ABSTRACT
Aim of this study was to locate the position of the infraorbital foramen with relation to infraorbital margin and lateral aspect of pyriform aperture, and to determine the frequency and location of accessory foraminae which gives complication during anaesthetization of this region. 100 human adult skulls of unknown sex were taken for study from the collections of skulls in the Institute of anatomy, Madras medical college. Accessory infraorbital foramina were found in 5 skulls, of which bilateral in 3 skulls, unilateral accessory foramina were found in 2 skulls. In one skull there were 2 accessory foraminae on left side. These anatomic characteristics may have important implication for surgical and local anaesthetic procedures. Dentists and surgeons of Head and neck who manipulate the maxillary region e.g in reduction of Lefort fracture, have to know exactly the position of infraorbital foramina.

Key Words: Infraorbital Foramen, Infraorbital Margin, Pyriform Aperture

INTRODUCTION
Infraorbital margin is formed laterally by Zygomatic bone, medially by maxilla. About 1cm below the infraorbital margin is the infraorbital foramen for the passage of infraorbital vessels and nerve. (Williams et al., 1995) Infraorbital nerve supplies sensory innervations to lower eyelid, side of nose and upperlip. The infraorbital nerve, continuation of maxillary division of trigeminal nerve after passing through the Infraorbital canal, appears on the face through IOF and terminates by dividing into palpebral, nasal and labial branches to supply skin over the lower eyelid, conjunctiva, lateral aspect of external surface of nose and upper lip (McMinn, 1990; Moore et al., 1999). The position of Infraorbital foramen varies from 4-12mms (Testut and Latarjet, 1954; Bergman et al., 1988). Exact knowledge of the location of this foramen provides important data in giving local anaesthesia in maxillofacial and plastic surgeries (Aziz et al., 2000; Hwang and Baik, 1999; Rontal et al., 1979; Triandafilidi et al., 1990). This foramen has been used from various reference points, e.g. to determine the morphometric variations of the orbit (Karakas et al., 2002) and variations in size and in symmetry (Bolini and Del Sol, 1990; Berge and Bergman, 2001), as well as, the presence of accessory (supernumerary) foraminae has been reported (Berry, 1975; Bergman et al., 1988; Aziz et al., 2000). The position of infraorbital foramen helps to locate the infraorbital plexus region which we believe a risk zone during plastic surgery (Hwang et al., 2004).

MATERIALS AND METHODS
From the collection of skulls in the Institute of Anatomy Madras Medical College 100 Human skulls of unknown sex were taken. The exact location of Infraorbital foramen was measured using vernier caliper on either right or left side of the skull. Sagittal measure (Vertical) and transverse measures were carried out. Presence of any accessory foramen was also noted. Sagittal measure was carried out through a sagittal plane passing through the centre of infraorbital foramen parallel to median sagittal plane, from infraorbital margin upto superior margin of infraorbital foramen. Similarly transverse measure was taken from lateral margin of pyriform aperture to medial margin of infraorbital foramen. These measures had formed an angle of 90 degrees between itself. Thus all measurements started from the infraorbital foramen to various land marks such as the infraorbital margin and piriform aperture.
RESULTS AND DISCUSSION

Hundred Number of Human Adult skulls of unknown sex were examined. Single number of Infraorbital foramen present bilaterally in ninety five skulls. Accessory foraminae were present in five skulls (figure 3) of which in two skulls it was unilateral i.e one accessory foramen present on right side, only one foramen present on left side (figure 4) in three skulls it was bilateral (figure 5). In one skull there were two accessory foraminae on left side (figure 6).

Location of Infraorbital Foramen

Regarding the location of IOF, Sagittal measure i.e., the mean distance from the Infraorbital margin on right side was found to be 6.12±1.43 mm and 6.53±1.53 mm on the left side. The maximum distance recorded was 12mm, minimum was 3mm (Figure 1).

Transverse measure i.e., the mean distance from pyriform aperture is 16.58±2.57mm on right side, on left side it was 16.38±2.25 mm. The maximum being 22mm minimum being 12mm (Figure 2).
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Table 1: Morphometric measurements mm mean SD of IOFs

<table>
<thead>
<tr>
<th>Plan of measure</th>
<th>Right side</th>
<th>Left side</th>
</tr>
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<tbody>
<tr>
<td>Sagittal</td>
<td>6.12± 1.43</td>
<td>6.53± 1.53</td>
</tr>
<tr>
<td>Transverse</td>
<td>16.58±2.37</td>
<td>16.38±2.25</td>
</tr>
</tbody>
</table>

Table 2: Morphometric measurements mm of Accessory foramen

<table>
<thead>
<tr>
<th>S.no</th>
<th>Sagittal measurement mm</th>
<th>Transverse measurement mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right side</td>
<td>Left side</td>
</tr>
<tr>
<td>1.figure 4a</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>2.figure 4b</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>3.figure 5a</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>4.figure 5b</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>5.figure 6</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6.figure6(2nd accessory foramen)</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 3: Presence of Accessory foraminae
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Figure 4a: Unilateral Accessory foraminae on right side

Figure 4b: Unilateral Accessory foraminae on right side

Figure 5a: Bilateral one Accessory foramen

Figure 5b: Bilateral one Accessory foramen

Figure 6: One accessory foramen on right side, two accessory foramininae on left side
DISCUSSION
The dentist and surgeons of head and neck have to know the exactly position of IOF (Hollinshead, 1982), because the anesthetic must be put on the foramen in order that it diffuses by the canal and causes the anterior superior alveolar nerve block (that appears on the infraorbital canal of 6.0 to 10.0mm before the infraorbital nerve emerges on the foramen), and in consequence, the block of the branches (which proceed of that nerve) that supply the central superior incisive teeth, lateral incisive and superior canine, ipsilateral to the blocked nerve (Zide and Swift, 1998). The distance between the IOF and midpoint of the inferior orbital margin has been reported to be from 4 mm to over 10 mm in several studies (Hollinshead, 1982; Bolini and Del Sol, 1990; Triandafilidi et al., 1990; Hindy and Abdel-Raouf, 1993; Ochs and Buckley 1993; Chapman et al., 1995; Chung et al., 1995; Leo et al., 1995; Aziz et al., 2000; Karakas et al., 2002).
In the present study the sagittal measure i.e the distance between midpoint of infraorbital margin and infraorbital foramen is on an average 6.12mm on right side, 6.53mm on left side. Maximum distance being 12 mm which coincides with the study of Elias et al., (2004), the mean distance between IOF and IOM in our study was found in close range with Cutright et al., (2003), Elias et al., (2004), Boopathi et al., (2010), Saraladevi et al., (2013). The mean distance in our study was lower than that of Aziz et al., (2000), Apinhasmit et al., (2006).

Accessory or Supernumerary Foramen (AF)
Kadanoff et al., (1970) found it doubled in 9%, tripled in 0.5% and greater than 3 in 0.3%. Bressan et al., (2004) demonstrated AF in 5.4% males, 4.26% in females with high frequency on the left side in both males and females. According to Hanihara and Ishida (2001), AF was more commonly found in Northeast Asian skulls. Boopathi et al 2010 reported AF in 16.25% of skulls in South Indians. The presence of supernumerary foramina also has been documented (Berry, 1975; Bergman et al., 1988). In the present study, accessory foramen was found to be in 5% of skulls. The presence of accessory foraminae and the morphometric measurements showed in this study may interfere on the infiltrative anesthesia in maxila, so, we suggest that should be considered on the anaesthetic evaluation and remembered during the procedures used for localization of the foramen.

Table 3: Comparison of present study with previous studies

<table>
<thead>
<tr>
<th>Study</th>
<th>No: of samples</th>
<th>Mean ± SD; distance of IOF from IOM (mm)</th>
<th>Accessory foramen (%)</th>
</tr>
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<tbody>
<tr>
<td>Aziz et al., (2002)</td>
<td>47</td>
<td>8.3±1.9</td>
<td>15</td>
</tr>
<tr>
<td>Cutright et al., (2003)</td>
<td>80</td>
<td>6.4±0.3</td>
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</tr>
<tr>
<td>Agthong et al.,</td>
<td>110</td>
<td>7.9±0.02</td>
<td>4</td>
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<tr>
<td>Apinhasmit et al., (2006)</td>
<td>106</td>
<td>9.23±2.03</td>
<td>3.8</td>
</tr>
<tr>
<td>Gupta</td>
<td>79</td>
<td>7.0±1.6</td>
<td></td>
</tr>
<tr>
<td>Boopathi et al., (2010)</td>
<td>80</td>
<td>6.57±1.7</td>
<td>16.25</td>
</tr>
<tr>
<td>Saraladevi et al., (2013)</td>
<td>125</td>
<td>6.50±1.7</td>
<td>9.6</td>
</tr>
<tr>
<td>Present study</td>
<td>100</td>
<td>6.33±1.48</td>
<td>5</td>
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Knowledge of the position of infraorbital foramen, presence of accessory foraminae and its morphometric measures is very useful to maxillofacial surgeons as in reduction of Lefort’s fracture, Dentists and for regional block anaesthesia and so may be considered for the better outcome of diagnostic or therapeutic procedures. Such anatomic landmarks may assist surgeons to localize the foramen avoiding injury to neurovascular bundle and facilitate surgical, local anaesthetic and other invasive procedures.

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REFERENCES


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