

# Morphometric analysis of Infra orbital foramen position in south Indian skulls

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## Abstract

The infra orbital foramen is an anatomical structure with an important location, through which the infra orbital vessels and nerve exits. The present study was conducted to determine the mean distance between the infra orbital foramen and infra orbital margin, mean distance between piriform aperture and infra orbital foramen, mean distance between the anterior nasal spine and infra orbital foramen on both side and as well as shape of foramen. Total 125 skulls were used for this study, the results were the mean distance between the infra orbital foramen and the infra orbital margin was  $7.13 \pm 1.78$ mm, on right side it was  $7.06 \pm 1.81$ mm and  $7.20 \pm 1.71$ mm on left. The mean distance between the infra orbital foramen and the piriform aperture was  $18.13 \pm 1.85$ mm, on right side it was  $18.01 \pm 2.03$ mm and  $18.25 \pm 2.01$ mm on left. The mean distance between infra orbital foramen and the anterior nasal spine on right was  $33.97 \pm 5.80$ mm and left was  $34.73 \pm 4.70$ mm. The knowledge of infra orbital foramen is very helpful for neurovascular surgeons.

**Keywords:** Infra orbital foramen, Infraorbital margin, Piriform aperture, Anterior nasal spine.

## Introduction

The infra orbital foramen is situated bilaterally on the maxilar bone, lower to the edge of the orbital cavity, and it is bilateral. This foramen is directed inferior medial infra orbital nerve and vessels run through this foramen. The infra orbital nerve is sensitive and it lengthens the maxillary nerve, which crosses the infra orbital foramen and branches to feed the skin in the upper portion of the face, the maxillary sinus mucosa, the maxillary incisor, the canine and premolar teeth and the adjacent gum portion; the lower eyelid skin and conjunctiva, part of the nose, skin and mucosa of the upper lip (Apinhasmit *et al.*, 2006, Aziz *et al.*, 2000, Berge *et al.*, 2001)

Precise knowledge of the location of reference points in this area provides important data in local anesthesia and in maxillofacial and plastic surgical operations (Aziz *et al.*, 2000, Hwang *et al.*, 1999). There are several reference points on each wall with respect to infra orbital foramen, oral and maxillofacial surgery and local anesthesia (Du Tolt, 2003). Modern surgical procedures, anesthesia

(Zide, 1998), as well as acupuncture practice (Chonghuo, 1993), require more precise understanding of the surrounding anatomy (Bolini, 1990). The IOF is an important anatomical landmark that provides excellent analgesia for the closure of simple lacerations, biopsies, scar revisions, maxillofacial procedures, as well as various endoscopic and cosmetic cutaneous procedures.

## Materials and Methods

125 dry adult human skulls constituted the material for the present study. The skulls belong to the Department of Anatomy, JJM Medical College, Davangere, Karnataka, India. Each was studied for the morphometric analysis of Infra orbital foramen position.

## Results

Total 125 skulls were used for this study, the results were the mean distance between the infra orbital foramen and the infra orbital margin was  $7.13 \pm 1.78$ mm, on right side it was  $7.06 \pm 1.81$ mm and  $7.20 \pm 1.71$ mm on left. The mean distance

between the infra orbital foramen and the piriform aperture was  $18.13 \pm 1.85$ mm, on right side it was  $18.01 \pm 2.03$ mm and  $18.25 \pm 2.01$ mm on left. The mean distance between infra orbital foramen and the anterior nasal spine was  $34.35 \pm 5.25$ mm, on right was  $33.97 \pm 5.80$ mm and left was  $34.73 \pm 4.70$ mm (Table 1). The transverse diameter of infra orbital foramen was  $2.98 \pm 0.69$ mm and vertical diameter is  $2.89 \pm 0.71$ mm (Table 2).

*Table 1 :The mean distances between Infra orbital foramen and various reference points*

Distances between	Right side	Left side	Total
IOF – IOM	$7.06 \pm 1.81$ mm	$7.20 \pm 1.71$ mm	$7.13 \pm 1.78$ mm
IOF – PA	$18.01 \pm 2.03$ mm	$18.25 \pm 2.01$ mm	$18.13 \pm 1.85$ mm
IOF – ANS	$33.97 \pm 5.80$ mm	$34.73 \pm 4.70$ mm	$34.35 \pm 5.25$ mm

*Table 2: Transverse Diameter and Vertical diameter of Infra orbital foramen*

Measurement of IOF	
Transverse Diameter	$2.98 \pm 0.69$ mm
Vertical diameter	$2.89 \pm 0.71$ mm

### Discussion

The Infra orbital foramen is the way to the infraorbital nerve, vessels and the knowledge of its position is very useful to the professionals who manipulate the maxillary region like in acupuncture (Esper *et al.*, 1998), zygoma's fracture surgery (Du Tolt, 2003), practical of intra and extra oral anesthesia (Figun, 1994). The dentist and surgeons of head and neck have to know the exact position of Infra orbital foramen (Figun, 1994), 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 and in consequence, the block of the branches that supply the central superior incisor teeth, lateral incisor and superior canine, ipsilateral to the blocked nerve (Zide, 1998).

Figun (1994) point out that, the topography of Infra orbital foramen presents unquestionable interest on the anesthesia practice of alveolar anterior superior nerve and the infraorbital branch, because the foramen is an excellent reference point to intraoral functions and extra oral, 5 to 7mm inferior to the infra orbital margin. Dubrul (1991) reported about the variable distance between 6 to

8mm under the inferior margin of the orbit. Bergman *et al* (1988) describe a bigger variation, between 3 to 7mm inferior to the infra orbital margin. The distance between the Infra orbital foramen and midpoint of the inferior orbital margin has been reported to be from 4 mm to over 10 mm in several studies (Bolini 1993, Ochs, 1993, Chung *et al.*, 1995, Leo *et al.*, 1995).

Rontal *et al* (1979) found the distance between the Infra orbital foramen and midpoint of the inferior orbital fissure to be 24 mm. Karakas *et al.* (2002) pointed that the measurement between the Infra orbital foramen and midpoint of the inferior orbital margin was taken as 7 mm, Monod and Wanverts located an IOF on a line which is between the supraorbital incisure and the lip's commissure. According to the literature there are some standards of location of the foramen on the surface (Dubrul 1991), one of them is to check the line that joins the gingival margin, situated between the central and lateral incisor, medial to the fronto-zigomatic suture, a reference point easily recognized 4mm over a horizontal line that passes by the lateral angle of eyelid slit. Another classic conduct suggests situate the foramen on a vertical line that joins the supraorbital incisure to the mentonian foramen, 5 to 6mm under the orbital margin. Information on skull foramina size and symmetry (Del Sol *et al.*, 1989) is increasingly important because of the advancements in radiologic techniques such as magnetic resonance imaging and computed tomography. These methods are making difficult diagnoses of pathologic conditions of skull foramina possible (Berge, 2001).

The importance of the incidence and lateralization of the Infra orbital foramen is also evident in facial surgical procedures. The recognition of the presence of double or triple foramina is essential when the appropriate amount of anesthesia is applied, or it can be inappropriate. The study of the Infra orbital foramen is also basic to prevent the potential risk for iatrogenic injury during facial surgeries due to the presence of additional branches of the infra orbital nerve (Kazkayasi, 2003).

Previous studies show the relation between infra orbital foramen and the other anatomical structures, in studies with different purposes, what shows its importance as a repair point: distance between infra orbital foramen and an imaginary horizontal line in the piriform aperture base, inferior orbital fissure and the more inferior portion of the optical channel (Rontal, 1979) medium facial line on an imaginary line that passes through the supraorbital incisure; eyes pupil and second premolars (Molliex *et al.*, 1995) medium sagittal plane and supraorbital incisure (Chung, 1995) and finally related to the piriform aperture (Kazkayasi *et al.*, 2001).

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