

MORPHOLOGY AND MORPHOMETRIC STUDY OF INFERIOR ORBITAL FORAMEN

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ABSTRACT

Introduction: The knowledge of the morphometric study of the infra orbital foramen is very much essential to prevent clinical complications during maxillofacial surgeries and regional block anaesthesia. The aim of the study is to locate the position, size and shape of the infra orbital foramen in adult human skulls of Telangana region of south India.

Materials and Methods: A total of 100 dry adult human skulls of unknown age and sex were studied. The distance between infra orbital foramen and inferior orbital margin and from the foramen to the piriform aperture of the nose were measured. The vertical and horizontal diameters were also studied. Variation in shapes of the foramen and the presence of any accessory foramina were observed. All measurements were taken with a compass transferred to callipers and analysed statistically.

Results: The mean distances between the infra orbital foramen and the infra orbital margin on the right and left side were 7.9mm and 8.1mm respectively. The mean distances between the infra orbital foramen and the piriform aperture were 18.3mm and, 17.8mm on right and left sides respectively. The mean vertical dimensions on the right and left side were 3.2mm, and 3.1mm respectively. The mean horizontal dimensions on the two sides were 2.2mm and 2.3mm. Maximum number of foramina was oval in shape.

Conclusion: The present study provide detailed knowledge of anatomical characteristics and clinical importance of the infra orbital foramen, which are of paramount importance for surgeons when performing maxillofacial surgery and regional block anaesthesia

KEY WORDS: Infra orbital foramen, infra orbital margin, piriform aperture, maxillofacial surgery, Anaesthesia.

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INTRODUCTION

The infra orbital foramen is situated on the maxillary bone 1 cm below the infra orbital

margin and it is directed inferomedially. The infra orbital nerve and vessels pass through it and supply the lower eyelids, superior lip, ala of

the nose and the premolar teeth. The knowledge of the morphometry and variations of this foramen is therefore mandatory in procedures like therapeutic infraorbital nerve block or any clinical procedures of maxilla [1]. This foramen is used in Infra orbital nerve block which can provide the intra operative and postoperative pain relief in nasal endoscopic surgeries and also during oral and dental surgeries. This nerve block may be associated with the nerve trauma or hematoma resulting from the damage to infra orbital nerve and vessels.

Knowledge of the precise anatomical location of the infra orbital foramen is important in modern surgical procedures and in defining the optimal locations for anaesthetic nerve blocks which in turn reduces the risks during clinical procedures.

MATERIALS AND METHODS

Fig. 1: Distance between inferior orbital margin and the centre Point of infra orbital foramen.



Fig. 2: Distance between piriform aperture of the nose and infra orbital foramen.



Fig. 3: Measuring the vertical diameter of the foramen.



Fig. 4: Measuring the horizontal diameter of the foramen.



The study was carried out on 100 skulls obtained from the anatomy department of various medical colleges in telangana region of south India. The following parameters of IOF on right and left were measured by using divider, and a measuring scale.

1. Distance between infraorbital foramen and infraorbital margin [Figure 1]
2. Distance between infraorbital margin and piriform aperture [Figure 2]
3. Maximum vertical diameter of infraorbital foramen [Figure 3]
4. Maximum horizontal diameter of the infraorbital foramen [Figure 4]

The shape and direction of the foramen were noted on both sides.

The number of foramina was also observed on each side to know the information about accessory foramina.

The data was tabulated in MS-EXCEL (MS Office 2007). The data was analysed by using SPSS software. The mean and standard deviations were measured twice and the average was taken to avoid errors. The results were compared with similar studies of various authors.

RESULTS

100 adult human skulls of unknown sex and age were taken for the present study. Shape of this foramen was oval in 55.5% and round in 44.5% of skulls.

The shape of the infraorbital foramen in our study was tabulated in Table 1

We found single foramen on both sides in all skulls, there was no accessory foramen. The various parameters of infra orbital margin were measured and results were summarised in Table 2.

Table 1: Shapes and Side Cross tabulation.

Shapes	Side		Total
	left	Right	
Round	48	41	89
Oval	52	59	111
Total	100	100	200

Table 2: Morphometry of various parameters of infra orbital foramen.

Parameters	side	N	MEAN	S.D	Standard error mean
Inferior orbital margin	Left	100	8.169	3.00766	0.30077
	right	100	7.929	2.82469	0.28247
Piriform aperture	left	100	17.892	3.42412	0.34241
	right	100	18.361	3.26536	0.32654
Vertical height	left	100	3.135	0.94776	0.09478
	Right	100	3.295	1.05671	0.10567
Horizontal height	Left	100	2.385	0.62706	0.06271
	Right	100	2.265	0.55712	0.05571

IOF- Inferior orbital foramen, IOM- Inferior orbital margin, PA- Piriform fossa

DISCUSSION

Infraorbital foramen transmits the infraorbital nerve and vessels; therefore the knowledge of this foramen is very essential to surgeons and anaesthetists for various surgical procedures. All the foramina were single, bilaterally present.

No accessory foramina found in this study. Whereas multiple ipsilateral foramina were found in one study in about 15% of cases [2].

In the present study shape of this foramen was oval in 55.5% and round in 44.5%, these values are quite variant from other studies. The shape of the infraorbital foramen was oval in 71% of the skulls study conducted by Rajini's [7] and only 34% of skulls with an oval shape study done by Kazkayasi M [3]. The distance between the infraorbital foramen and the midpoint of the infraorbital margin vary from 4 to 12 mm in several studies [lokanayaki, 2013] [11]and in present study it was ranged from 2mm to 20 mm. The range of these distances was wider on lower side among Indians. This is an alert to surgeons treating Indians anywhere in the world.

The mean distance between the infraorbital foramen and the infraorbital margin was 7.9mm on right side and 8.16mm on left side which was very close to the studies of Hussain sahib et al. [9], Rohit varshney et al. [12] and Bharti et al. [13].

The mean distance of the infraorbital foramen from the piriform aperture was 18.36mm on right side and 17.89mm on the left side which was close to the values of Bhoopathi et al. [6] and Hussain sahib shaik et al. [9] as described in table.

The mean vertical diameter of the foramen was 3.2 ± 1.0 on right side and 3.13 ± 0.94 mm on left side, these values coincide with the same values of Rajini's study [7]. The mean horizontal diameter on right and left sides were 2.2 ± 0.55 mm and 2.38 ± 0.62 mm respectively.

The range provides an indication of the location of the infraorbital foramen depending upon sample space and the dispersion of values. The mean distance is indicative of the infraorbital foramen location. The standard deviation provides variability in the position of the foramen around mean position. This is very vital information for rapidly locating this foramen during surgical procedures.

The incidence of a single foramen on either side in all skulls was in contrast to more than one foramen in 10% of adult cadavers were found in a study done by Hindy AM in Egyptian population in 1993 [1].

Table 3: Comparing the data of present study with other studies.

Studies	Sample Size	IOF-IOM		IOF-PA		VD		HD	
Kazkayasi M. et al. 2001 [3]	35	7.19±1.39		17.23±2.64		-		-	
Karakas P et al. 2003 [4]	31	6.7±1.9		-		-		-	
M.G. Elias.s brazil 2004 [5]	210	6.71±1.7	6.83±1.83	13.28±2.17	13.31±2.19	-		-	
BOOPATHI.S et al. 2010 [6]	80	6.5±1.28		18.13±1.85		2.89±0.71		2.87±0.78	
RAJANI SINGH 2011[7]	55	6.12		15.31	15.8	3.39	3.75	3.19	3.52
Oliveira j et al. 2012 [8]	60	6.49±1.68		13.67±2.17	14.26±1.83	-		-	
Hussain sahib et al. 2012 [9]	125	7.13±1.78		18.13±1.85		2.89±0.71		2.98±0.69	
k.k Gour et al. 2012 [10]	100	7.39±1.63		-		-		-	
Lokanayaki V 2013 [11]	100	6.33±1.48		16.58±2.57		-		-	
Rohit varshney et al. 2013 [12]	100	7.65±1.35		-		-		-	
Bharti et al. 2013 [13]	100	7.65±1.35		-		-		-	
Tilak raj et al. 2013 [14]	70	6.75±1.85		15.79±1.76	16.14±1.72	2.93±0.78	3.08±0.85	3.05±0.79	3.27±0.85
KOPAL SAINI 2014 [15]	100	6.7±1.67		17.4±2.43		4.3±0.95	3.6±0.84		
Present study	100	7.92±2.82	8.16±3	18.36±3.2	17.8±3.42	3.2±1	3.13±0.94	2.2±0.55	2.38±0.62

IOM- Inferior orbital margin, PA- Piriform aperture, VD- Vertical diameter, HD- Horizontal diameter,

IOF- Inferior orbital foramen

CONCLUSION

The results of this study highlighted the differences of the various parameters of infra orbital foramen from different studies and emphasized the need for proper preoperative evaluation of the infra orbital foramen in patients posted for maxillofacial surgeries and regional block anaesthesia.

Conflicts of Interests: None

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