

Morphometric analysis of Infra Orbital Foramen

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Abstract: Aim: The AIM of this study is to compare morphometric measurements of the infraorbital foramen in dry Indian skulls. Objective: To assess the dimensions and position of the infra orbital foramen and to conclude the size of the foramen using Dry Indian skulls. Background: Analyzing the variability in position, shape, size and incidence of the infraorbital foramen in Indian dry skulls. The vertical and horizontal dimensions were also measured. All measurements were taken with a compass transferred to calipers and analyzed statistically. The infraorbital foramen is an opening in the maxillary bone of the skull located below the infraorbital margin of the orbit (eye socket). It allows passage for the infraorbital artery, vein, and nerve which are branches of the maxillary branch (V2) of the trigeminal nerve (CN V). Materials and methods: Twenty dry human adult skulls were examined at the Department of Anatomy, saveetha dental college

1. Introduction

The infraorbital nerve, a branch of the second division of the trigeminal nerve exits the skull through the infraorbital foramen. The infraorbital foramen is located bilaterally on the maxillary bone inferior to the infraorbital ridge [1]. It is relatively larger than the supraorbital foramen and vary in form and position [2]. The infraorbital nerve is a totally sensory nerve that innervates the skin of the upper cheek, mucosa of the maxillary sinus, maxillary incisor, canine and premolar teeth and adjacent gingivae, the skin and the conjunctiva of the inferior eyelid, part of the nose and the skin and the mucosa of upper lip[3]. The infraorbital nerve block is used to accomplish regional anesthesia in the maxillo-facial region for diagnostic, surgical and other invasive procedures [4]. Therapeutic infraorbital nerve blocks are used in intractable and pharmacologically unresponsive trigeminal neuralgia [5]. Knowledge of the precise anatomical location of the infraorbital foramen is important in modern surgical procedures and in defining the optimal locations for anaesthetic nerve blocks, which in turn will invariably reduce the relative risks during clinical procedures. A large body of evidence shows a clear racial variation in the morphometry and relative position of the infraorbital foramen among different populations. Modern surgical procedures anesthesia and acupuncture require a more precise understanding of the surrounding anatomy. This study was conducted to compare morphometric measurements of the infraorbital foramen in dry Indian skulls.

2. Material and method

Twenty dry human adult skulls were examined at the Department of Anatomy, Saveetha dental college. Various statistical analyses were conducted and the distances from the infraorbital foramen to the infraorbital margin and the zygomatico maxillary suture were measured to study location pattern. Apart from this, measurements pertaining to shape and size of the foramen were also taken. The reference point for that purpose was the center of the infraorbital foramen. Thus all measurements started from the infraorbital foramen to various land marks such as the infraorbital margin and zygomatico maxillary stature. The distances from the center of the infraorbital foramen to the infraorbital

margin parallel to the sagittal plane which passes through the center of the infraorbital foramen, were measured. Another distance from this foramen to the zygomatico maxillary suture along the transverse plane was taken. Vertical and horizontal dimensions of the foramina were also taken with double tipped compass. The compass opening was transferred to calipers to measure the distances. Range, mean, mode, median, and standard deviation were computed and analysed Statistically.

3. Result

A single infraorbital foramen was present bilaterally in all 20 observed skulls. The mean, mode, median, standard deviation and range derived from data pertaining to the distances between the infraorbital foramen-infraorbital margin, infraorbital foramen-zygomatico maxillary suture and vertical as well as horizontal diameters of the infraorbital foramen are presented in Table. The percentage of horizontally and vertically oval shapes as well as circular shapes of the infraorbital foramen on the left side were 30.09%, 45.45%, and 23.6%, respectively whereas incidences of horizontally and vertically oval shapes as well as circular shapes on the right side were 25.4%, 40%, and 34.5%, respectively. Considering 40 sides (20 skulls both sides), the incidence of a horizontally oval type foramen was 28.1%, vertically oval was 42.7% and circular type was 29%.

4. Discussion

The infraorbital nerve and vessels pass through the infraorbital foramen therefore, knowledge of its location is very essential to surgeons and anesthetists for various surgical procedures in the Indian population in which data on this foramen are very scanty.

Table 1: Shape of infra orbital foramen.

	Vertically oval%	Horizontally oval%	Circular%
Right	40	25.4	34.5
Left	45.45	30.09	23.6
Right+left	42.7	28.1	29

The distances between the infraorbital foramen and the midpoint of the infraorbital margin vary from 4 to 12

mm in several studies [6,7] but the same distance ranged from 2 to 11.5 mm in current study. The range of these distances was wider on lower side among Indians which is an alert to surgeons treating Indians anywhere in the world. The mean distance between the infraorbital foramen and the infraorbital margin was 6.16 mm. The mean distance of the infraorbital foramen from the zygomatic maxillary suture was 15.56 mm. The range provides an indication of the location of the infraorbital foramen depending upon sample space and the dispersion of values.[8,9,10] 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[11]. The mode of the distances of the infraorbital foramen and the infraorbital margin on both sides of the skull was 5-indicating that this distance is 5 mm in most of Indian population. Therefore, this distance should be considered when locating the infraorbital foramen during maxillofacial surgery. [12]The mode of infraorbital foramen and zygomatico maxillary suture distances on the left and right sides were 17 and 15, respectively which provides the most frequent distances to be used when locating the infraorbital foramen precisely in relation to zygomatico maxillary suture.

Table 2

Distances of IOF from land marks and diameters	Mean±SD	Median	Mode	Range
IOM. Right	6.12±1.79	6	5	3-11
Left	6.19±1.81	6	5	2-11
ZMS. Right	15.31±1.7	15	15	6.5-22
Left	15.80±2.86	16	17	6.4-20.5
VD. Right	3.39±0.96	3.5	4	1-5
Left	3.75±1.07	4	4	2-6
HD. Right	3.19±1.18	3	3	1-6
Left	3.52±1.35	3.5	2	1.5-6

IOM infra orbital margin, ZMS zygomatico maxillary suture, VD vertical diameter HD horizontal diameter

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 [13]. The shape of the infraorbital foramen was oval in 71% of the skulls (28.2% horizontally and 42.8% vertically oval) as compared to 34% of skulls with an oval shape [14]. We detected 29% circular but no semicircular shaped infraorbital foramen whereas 66% of infraorbital foramen were circular and semicircular [14]. Thus the incidence of an oval shaped infraorbital foramen was higher in present study than that observed by Other studies.

5. Conclusion

The various mean distances constrained by standard deviation as elaborated in table/s determine the exact position of infraorbital foramen in Indian population and may be first hand vital information to concerned clinicians to avoid complications during surgical procedures and nerve block. Statistically, there was no

significant difference on left and right sides in relation to distances between infraorbital foramen and infraorbital margin along with zygomatico maxillary suture. There was significant correlation on two sides of skull in relation to distances of infraorbital foramen to infraorbital margin and zygomatico maxillary suture.

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