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Research Article

STUDY OF VERTICAL DISTANCE BETWEEN SUPRAORBITAL FORAMEN AND INFRAORBITAL FORAMEN AMONG NORTH INDIAN HUMAN DRY SKULLS

SUBHASH GUPTA*, KAMTA PRASAD NIRALA, MISS SAGUN SHUKLA

Department of Anatomy, Varun Arjun Medical College and Rohilkhand Hospital, Banthara, Shahjahanpur, Uttar Pradesh, India.
Email: guptadrsubhash819@gmail.com

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ABSTRACT

Objectives: The aim of study was to document the positional distance of supraorbital foramen (SOF) in relation to Infraorbital foramen (IOF), which is necessary for periorbital procedures.

Materials and Methods: A total of 72 dry human skulls of unknown age and gender from North India, were studied. In each skull, distance between supraorbital and IOF was measured on both sides using a metal casing Vernier Caliper.

Results: The mean distance between inferior wall of SOF and superior wall of IOF was found to be 40.81 (±6.66) mm on the left side and 40.91 (±6.15) mm on the right side. The overall value for both sides was 40.86 (±6.28) mm

Conclusion: Precise knowledge about distance between supraorbital and IOF have important bearings on orbital and periorbital procedures. It provides guidance for anesthesiologists and facial surgeons

Keywords: Vertical distance, Supraorbital and infraorbital foramen, North Indian human skull.

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INTRODUCTION

The facial foramina transmit nerves and blood vessels between the facial structures and the cranium. They show variable positional and metric features as described in standard anatomy textbooks [1-3]. Positional knowledge of the reference points in the orbital area provides important data for anesthetic and maxillofacial surgical operations [4,5]. The most certain way to avoid damage to these structures is to know their location. Among the important maxillofacial anatomic features are the neurovascular bundles of the supraorbital and infraorbital foramina. The cutaneous nerve supply of the maxillofacial region is largely contributed by these nerves. They may be encountered in maxillofacial procedures. Supraorbital margin is formed by the frontal bones. It is interrupted at the junction of its sharp lateral two-third and rounded medial one third by the supra orbital passage which transmits supra orbital vessels and nerve. Supra Orbital Nerve block is carried out in treatment of some headache such as Migraine and Chronic paroxysmal hemicrania. The supraorbital nerve is one of the main cutaneous nerves supplying the forehead and scalp region. It exits through supraorbital foramen (SOF) and innervates the skin and may be injured during various surgical and anesthetic procedures [6]. The SOF is a convenient landmark for procedure requiring probing of nasolacrimal canal [7].

Infra orbital foramen (IOF) is an important passage through which infra orbital vessels and nerve pass. It is situated bilaterally on the anterior surface of maxilla, about 10 mm inferior to inferior orbital margin [3,8]. Infra orbital nerve is a sensory nerve. It is the continuation of Maxillary division of Trigeminal nerve. After passing through infra orbital canal it appears on face through IOF and terminates by dividing into Palpebral, Nasal, and Labial branches. It carries sensation from the skin of the upper cheek, the mucosa of the maxillary sinus, the maxillary incisor, canine, and premolar teeth and adjacent upper gingivae, the skin and conjunctiva of the inferior eyelid, and lateral aspect of external surface of nose [9]. The knowledge of distance of IOF from various reference points is necessary to minimize the complications of Orbital Surgery [10]. Chrcanovic *et al.* (2011) [11] found in their study that the mean distance between SOF and IOF was 43.43 (±3.24) mm in males, and 42.67 (±3.03) mm in females, thus 42.92 (±3.11) mm as overall. Further they revealed that SOF-IOF distance was 42.71 (±3.02) mm on the right side, 43.28 (±3.17) mm in males and 42.44 (±2.93) mm in females; and 43.12 (±3.21) mm on the left side, 43.58 (±3.37) mm in males and 42.89 (±3.14) mm in females. Ilayperuma *et al.* (2010) [12] found in their study that the distance from IOF to SOF was 44.86±3.35 mm in males and 43.26±3.63 mm in females. Apinhasmit *et al.* (2006) [13] observed that mean distance between IOF and SON/F was 44.95±2.96 mm (45.41±2.88 mm in males and 44.15±2.94 mm in females). Aziz *et al.* (2000), [4] in their study found that the mean distance between the IOF and supraorbital notch in males was 43.3±3.1 mm and in females was 42.2±2.4 mm. Chung (1995) [14] observed that the average length of the line from the center of the supraorbital notch/foramen to the center of the IOF was 45.6 mm.

Objective

The objective of this study was to document about positional measurement of SOF in relation to IOF among North Indian population. This would provide very helpful information to surgeons involved in periorbital procedures.

MATERIALS AND METHODS

Type of study

This was Museum-based cross-sectional dry bone observational study.

Table 1: Mean distance (in mm) between SOF and Infra orbital foramen (SOF-IOF) on left (LT) and right (RT) side

PARAMETER→	SOF-IOF (LT)	SOF-IOF (RT)	Average
Number	72	72	72
Mean	40.81	40.91	40.86
Standard Deviation	6.66	6.15	6.28
Standard Error of Mean	0.78	0.72	0.74

SOF: Supraorbital foramen, IOF: Infraorbital foramen

Table 2: One-Sample Test

PARAMETER↓	Test Value=0					
	T	Degree of freedom (df)	Sig. (2-Tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
SOF-IOF (LT)	51.99	71	0.00	40.81	39.24	42.37
SOF-IOF (RT)	56.42	71	0.00	40.91	39.47	42.36
Average	55.23	71	0.00	40.86	39.38	42.33

SOF: Supraorbital foramen, IOF: Infraorbital foramen, LT: Left, RT: Right

Place of study
This study was conducted in the Department of Anatomy, Varun Arjun Medical College and Rohilkhand Hospital, Shahjahanpur, Uttar Pradesh, India.

Duration of study
It was a horizontal study from January 2021 to June 2021.

Study samples
Seventy-two dry human adult skulls of unknown age and sex.

Inclusion criteria
Human dry skulls having complete orbital margins were included in the study.

Study tool
Single observer using a metal casing Vernier caliper with an accuracy of up to 0.01 mm, transparent scale, and double tip compass.

Study technique
Single observer method.

Analysis of data
Data obtained were collected and analyzed statistically using Statistical Package for the Social Sciences software and Microsoft Excel 2007.

Methods
After taking permission from the appropriate authorities, measurements were taken. In each skull, the distance between inferior wall of supraorbital margin and superior wall of infraorbital margin on both sides was measured using a metal casing Vernier caliper and double-tip compass.

RESULTS

The mean distance between inferior wall of SOF and superior wall of IOF was measured. It was found to be 40.81 (±6.66) mm on the left side and 40.91 (±6.15) mm on the right side. The overall value for both sides was 40.86 (±6.28) mm (Tables 1 and 2).

DISCUSSION

The average length of the line from the inferior border of SOF to the superior border of IOF was 40.86 mm in our study while it was which was very near to, 40.86 mm as found by Charcanovic *et al*. [11] and 43.3 mm as found by Aziz *et al*. [4]. While other studies showed slightly higher values than our findings, like Ilayperuma *et al*. [12] reported it 44.86 mm; Apinhasmit *et al*. [13] reported it 44.95 mm, and Chung [14] reported a high of 45.6 mm. When compared in terms of individual sides, similar differences were noted. Our study showed the distance between SOF and IOF on the right side to be 40.81 mm and on the left side to be 40.91 mm while Charcanovic *et al*. [11] reported 42.71 as their finding on the right side and 43.12 mm on the left side.

CONCLUSION

Data in the available literature were based on studies that were carried out in the foreign samples. Our study, on the other hand, represented the Indian population which differs in physical build from other populations. Comparison of results from the previous studies shows large variation of the distance between the two anatomical landmarks, infraorbital and SOF. This is due to the distinct investigated populations. With a possibility of these characteristics being dependent on population groups, this study makes it relevant. The results showed a large dispersion and variability because we analyzed skulls from different geographical areas; individual's precision in measurements; and varying osteoblastic and osteoclastic activity in different individuals. The mean distance along with standard deviation as elaborated in table determine the exact position of IOF with respect to SOF, in Indian population. It will provide first hand vital information to the concerned surgeons to avoid complications during surgical procedures and nerve block. Besides, these results can play a role in the improving performance of surgical procedures in the periorbital area. The skew values found in present study will alert the surgeons. Therefore, the risks associated with facial surgery may be reduced for the Indian population.

CLINICAL RELEVANCE

Different rates of growth of facial bones especially frontal and Maxillary and Zygomatic produce different values of distance between supraorbital and IOF. This study provides first-hand information for surgeons and clinicians performing procedures on orbital rims.

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AUTHORS CONTRIBUTION

All the three authors contributed equally.

CONFLICT OF INTEREST

None.

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