

Supraorbital Foramen - Morphometric Study and Clinical Implications in Adult Indian Skulls

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Introduction: Supraorbital foramen is an important site for various surgical and anesthetic procedures. Accurate localization of the foramen holds the key to success, although racial variations exist in various population groups. The study included the morphometry of supraorbital foramen and its location with respect to nearby anatomical landmarks. **Methods:** A total of 100 dry skulls (60 male and 40 female) were collected and observed for the study. Various parameters in the sagittal and transverse planes were noted from supraorbital foramen on both sides, together with its vertical and horizontal dimensions. In addition, the location of supraorbital foramen with respect to midline and frontozygomatic suture were noted. **Results:** The study of 100 adult skulls revealed that the SON (71% on right and 70% on left) was found more frequently than the SOF (29% on right and 30% on left). The distance between centre of SOF/SON and midline was found to be statistically significant on right and left sides. **Conclusions:** This study makes possible the identification of exact position of supraorbital foramen and also discuss its racial variation.

Keywords: Morphometry, Supraorbital foramen, Supraorbital nerve block

INTRODUCTION

Supraorbital foramen (SOF) or notch is present at the junction of lateral two-third and medial one third of supraorbital margin. According to previous studies^{1,2} in 25% of cases supraorbital notch is converted into foramen by ossification of periosteal ligament bridging it. Supraorbital nerve and vessels are important structures passing through this notch. Supraorbital nerve is the important cutaneous nerve which passes through this nerve to innervate skin of forehead and scalp region. The supraorbital nerve blocks are commonly performed in the region of supraorbital foramen during procedures such as closure of facial wounds, biopsies, and debridements, as absolute but temporary treatment for supraorbital neuralgia and other cosmetic cutaneous procedures.³

For the purpose of supraorbital block an imaginary straight line is drawn vertically from the pupil up towards the supraorbital margin.⁴ No anatomical landmark is considered for locating exact position of SOF, thus increasing the rate of failure of the block.⁵

Limited literature availability for localization of appropriate position of SOF in Indian skull together with marked racial variations raises the idea behind the aim of our study to evaluate the location SOF in dry

adult Indian skulls. This helps in decreasing morbidity and provides satisfactory results.

METHODS

A total of 100 dry skulls (60 male and 40 female) collected from medical and dental colleges of Teerthanker Mahaveer University, India, were used for the study. We excluded skulls of children and skulls with damaged orbit and nasal bone. All parameters were measured in the following planes:

Sagittal plane: A plane parallel to the mid-sagittal plane and passing through the center of SOF was adopted for taking various vertical dimensions.

Transverse plane: A plane passing through the center of SOF and perpendicular to the above-mentioned sagittal plane was used for measuring transverse dimensions.

After aligning the skull in Frankfurt horizontal plane (using rulers and manipulating or adding sand bags as required), following parameters were measured to evaluate the location of SOF on both sides of skull.

- Presence or absence of SOF/notch on both sides
- Vertical (VD) and horizontal diameters (HD) of SOF
- Distance from centre of SOF to midline of skull (Figure 1)

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- d) Distance from centre of SOF to midpoint of fronto-zygomatic suture (Figure 2)
- e) Presence of accessory foramen.

The measurements related to SOF were taken with double-tipped compass and then transferred to callipers (least count 0.01 mm) to measure the distances. The dimensions were taken three times by the same person and mean was taken, thus increasing the accuracy of the data.

Statistical Analysis

From the above measurements, mean and standard deviation (mean±SD), median, range and mode were calculated. Data analysis was done by using Statistical Package for Social Sciences (SPSS) 19 version and p<0.05 was considered statistically significant.

RESULT

The study of 100 adult skulls revealed that the SON (71% on right and 70% on left) was found more frequently than the SOF (29% on right and 30% on left). Of all the cases, 62%

had bilateral SON (Figure 3), while 21% had bilateral SOF (Figure 4). 17% of skulls showed foramen on one side and notch on the other side (Table 1).

The dimensions of SOF and its linear relationship with surrounding anatomical landmarks on the skull are summarized in (Table 2). The mean vertical and horizontal diameters of SOF on the right side are 2.75 ± 0.55 and 4.62 ± 0.83 mm, while those on the left side are 2.35 ± 0.23 and 4.31 ± 0.51 mm, respectively (Table 2). The mean distance between the right and left SON/SOF and the midline; mean distance between right and left SON/SOF

Table 1: Incidence of various types of combinations of supraorbital notches/foramina

Combinations in same skull		No. of skulls (n)	Percentage %
Right	Left		
N	N	62	62
F	F	21	21
N	F	9	9
F	N	8	8



Figure 1: Line a represents the distance between SOF and fronto-zygomatic suture



Figure 3: Bilateral supraorbital notch



Figure 2: Line b represents the distance between SOF and midline



Figure 4: Bilateral supraorbital foramen

Table 2: Distances from SOF to anatomical landmarks

Dimensions	Mean±SD (mm)		P value	Median		Range		Mode	
	Right (Rt.)	Left (Lt.)		Rt	Lt	Rt	Lt	Rt	Lt
SOF-ML	21.94±0.32	20.11±0.73	0.001	21.56	20.04	18.69-22.73	18.31-22.54	-	-
SOF-FZS	28.64±0.32	28.58±0.23	0.129	28.35	28.01	26.87-30.59	25.92-30.77	28.49	-
V D	2.75±0.55	2.35±0.23	0.001	2.66	2.25	1.89-3.67	1.73-3.05	-	-
H D	4.62±0.83	4.31±0.51	0.001	4.45	4.28	3.63-4.87	3.18-4.63	-	4.40

and fronto-zygomatic sutures are shown in Table 2. When these parameters were compared between the right and left sides, the distance between centre of SOF/SON and midline was found to be statistically significant.

DISCUSSION

In our study we observed the incidence of various combinations of SOF/SON found in Indian skulls and compared our findings with previous studies in Table 3. Our findings emphasize the ethnic variations in the occurrence of SOF/SON as supported by other studies.^{6,7} We consider that the diversity could be a result of factors such as age, sex, and race as pointed by other studies.

We measured the shortest distance between the SOF and midline which was found to be 21.94 ± 0.32 and 20.11±0.73mm on right and left sides (p<0.001) respectively. It is interesting to note that in one of the studies conducted on North Indian skulls, the average distance between the SOF/SON and the midline was 24 mm, which is slightly higher than the current observation. However, a much longer (29 mm) distance between the SOF and midline was observed in a study conducted on a Korean population.⁸

Since large variation is seen in location of SOF/SON from midline, another important landmark which is considered is fronto-zygomatic suture. This suture is easily palpable on the skin at a notch along the lateral orbital margin at the level of the lateral end of palpebral fissure.⁹ Hence, it becomes convenient for the surgeons to locate the SOF/SON from this point, which is not a point but rather a relatively elongated landmark.

The transverse and vertical diameters of the SOF displayed significant results while comparing both sides. Information regarding the size and symmetry of the skull foramina is helpful for radiologists when diagnosing difficult pathologies of the skull foramina by using computed tomography/magnetic resonance imaging.¹⁰

We additionally analysed our observations using statistical parameters [median, range, mode] to improve the accuracy for the location of supraorbital foramen. The mean distance indicates the location of foramen while standard deviation provides the variability in its position. The range

Table 3: Comparison of types of combination between present study and other studies

Types of combination		Present study % (2014)	S. Singh et al. % (2013)	D.J.Trivedi et al. (%) 2010	Bilodi et al. (%) 2002	Rao et al. (%) 1997
Right	Left					
N	N	62	32.33	35.62	4.6	38.5
F	F	21	17.5	21.42	16	6.5
N	F	9	9.17	7.72	1.5	3.63
F	N	8	1.66	9.01	3.6	3

also provides an indication for the location but depends upon sample size and the dispersion of values. Such parameters prove to be very informative in locating the position of foramen during anaesthetic block and surgical interventions. The mode is the dimension which helps us to know the value which is found in most of the subjects of same racial group.¹¹

CONCLUSION

This study helps determine the precise location of SOF in relation to various anatomical structures, particularly midline and fronto-zygomatic suture. The landmarks described could be identified and effectively applied with success in various clinical scenarios, thereby decreasing the risk of failures and complications.

REFERENCES

- Singh S, Bilodi AK, Suman P. Morphometric analysis on supra-orbital notches and foramina in south indian skull. *Int J Cur Res Rev.* 2013;5(10): 43-50.
- Last RJ. in: Eugene Wolff's Anatomy of the Eye & Orbit 6th Ed. London: H.K. Lewis & Co. Ltd, 1968; p-23.
- Preja JA, Caminero AB. Supraorbital neuralgia. *Current Pain Headache Rep.* 2006;10(4):302-305.
- Sudha R, Vasudev Anand SR, Shelvakumaran T.S, et al. Study of Supraorbital Notch and Foramen in 200 Human Skulls in South India. *Anatomical Adjuncts.* 1997;2(3):15-22.
- Bilodi AKS., Sanikop MB. Some Observations on Supra Orbital Foramina in Human Skulls in Karnataka. *Anatomica Karnataka.* 2002;1(13):17-23.
- Trivedi DJ, Shrimankar PS, Kariya VK., Pensi CA. A Study Of Supraorbital Notches And Foramina In Gujarati Human Skulls. *National J of Integrated Research in Medicine.* 2010;1(3): p 21-30.
- Ashwini LS, Mohandas Rao KG, Sharmila Saran, and Somayaji SN. Morphological and morphometric analysis os supraorbital foramen and supraorbital notch: A studt on dry human skulls. *Oman medical journal.* 2012;27(2).
- Park KJ, Kang SH, Shin HW, Kim H, Lee HK, et al. Anatomical

- consideration of the anterior and lateral cutaneous nerves in the scalp. *J Korean Med Sci.* 2010;25(4):517-522.
9. Lamit W, Chompoopong S, Methathrathip D, Sansuk R, Phetphunphiphat W. Supraorbital Notch/Foramen, Infraorbital Foramen and Mental Foramen in Thais: Anthropometric measurements and surgical relevance. *J Med Assoc Thai* 2006. May;89(5):675-682.
 10. Chung M.S. (1995): Locational relationship of the supraorbital notch/foramen and infraorbital and mental foramina in Koreans. *Acta anatomica*; 154(2):162-66.
 11. Agthong S, Huanmanop T, Chentanez V. Anatomical variations of the supraorbital, infraorbital and mental foramina related to gender and side. *J Oral Maxillofac Surg* 2005;63:800-4.

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