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Original Article

Morphometry of Supraorbital Notches/Foramina and Surgical Relevance

Jatin B Goda*[a], Shailesh M Patel[b], Laxmi N. Chandravadiyaa, S V Patel[c]

[a]Resident, [b] Associate Professor, [c] Professor & Head of the Department, Department of Anatomy, Govt. Medical College, Bhavnagar – 364001, Gujarat, India.

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ABSTRACT

Aims: Our aim of study was to find out exact location and dimensions of supraorbital notch/foramen (SON/F) in order to facilitate safe mobilization of the supraorbital nerve during various surgeries. Methods: Supraorbital notches (SON) and supraorbital foramina (SOF) were studied on both sides in 65 dry human skulls by direct observation and measurements were taken by using digital vernier caliper. Results: SON was found in 63.85% of observations, SOF was found in 30.77% of observations, Absence of features was found in 5.38% of observations. 14.61% of observations showed accessory supraorbital foramina. The mean distance of supraorbital notch/foramen (SON/F) from the nasal midline was 22.59±3.34mm on the right side and 21.38±3.40mm on the left side, the mean distance from SOF/N to frontozygomatic suture was 27.13±2.84mm on right side and 28.12±2.12 mm on the left side, while the mean distance of SOF from supraorbital rim was 1.63±0.86mm on right side and 1.71± 0.98mm on the left side. Conclusion: The knowledge of location of the SON/F is important for clinicians while performing endoscopic surgeries, orbital roof plate surgeries and regional nerve blocks.

1. Introduction

Supraorbital notch is located at the junction of lateral two third and medial one third of supraorbital margin formed by the frontal bone. In some individuals, the notch is converted into foramen by ossification of the periosteal ligament crossing it (1). The supraorbital nerve emerges through supraorbital notch/foramen.

The supraorbital nerve blocks are required during procedures such as closure of facial wounds, treatment for migraine, supraorbital neuralgia, biopsies, scar revisions and some cosmetic facial surgeries. There might be an accessory branch of the supraorbital nerve which should be taken care during these interventions. This accessory nerve passes through the accessory supraorbital foramen. There may be incomplete analgesia if accessory supraorbital nerve is missed during the supraorbital nerve block. So the knowledge of exact location of supraorbital notch/foramen and incidence of occurrence of accessory supraorbital foramen is important.

2. Material and Method

This study was carried out using 65 dry human skulls of unknown age and sex from Department of Anatomy, Govt. Medical College, Bhavnagar (Gujarat). The parameters recorded were supraorbital notches/foramina, presence of accessory supraorbital foramina, absence of features by direct observation. The skulls were also measured bilaterally using digital vernier caliper for distance between the supraorbital notch/foramen and the nasal midline, distance between the supraorbital notch/foramen and the frontozygomatic suture and by using measuring tape for distance between the supraorbital foramen and the supraorbital rim [Figure – 1], transverse and vertical diameter of supraorbital foramen and horizontal length of supraorbital notch.

The data thus obtained were tabulated and separated with respect to sides. The mean, standard deviation, minimum and maximum for each of the measurements were calculated using Excel worksheet.

* Corresponding Author : **Dr. Jatin B. Goda**
Dhanvantari P.G. Medical Hostel – 3,
Sir – T Hospital Campus, Kalanala,
Bhavnagar – 364001,
Gujarat, India.
Phone: +91-9016580004.
Email: drjbgoda@gmail.com

3. Results

Investigation of 65 skulls revealed that the supraorbital notch (63.85%) was found more frequently than the supraorbital foramen (30.77%). Of all cases, 49.23% had bilateral SON, 18.46% had bilateral SOF, and 1.54% had bilateral absence of features. Notches were mostly seen on right side and foramina were mostly seen on left side. Absence of features was mostly found on left side (7.69%) than on right side (3.08%).

Table - 1 shows distance (mm) of supraorbital notch/foramen from various landmarks.

Parameters	Right side (mm)			Left side (mm)		
	Min.	Max.	Mean ± SD	Min.	Max.	Mean ± SD
Distance of SON/F from the nasal midline	14.68	28.2	22.59±3.34 (n=63)	15.09	28.85	21.38±3.40 (n=60)
Distance of SON/F from the frontozygomatic suture	18.22	33.11	27.13±2.84 (n=63)	23.51	34.61	28.12±2.12 (n=60)
Distance of SOF from supra orbital rim	0.4	4.1	1.63±0.86 (n=19)	0.4	4.2	1.71± 0.98 (n=21)

a) SON/F = Supraorbital notch/foramen

b) Min. = Minimum

c) Max. = Maximum

d) n = Number of observations

Table - 2: Measurement of transverse and vertical diameter of Supraorbital foramina and horizontal length of supraorbital notches.

Parameters (mm)	Right side (mm)			Left side (mm)		
	Min.	Max.	Mean ± SD	Min.	Max.	Mean ± SD
Transverse diameter of SOF	0.5	5.6	2.54±1.29 (n=19)	0.7	6.6	2.72±1.47 (n=21)
Vertical diameter of SOF	0.3	3.2	1.87±0.81 (n=19)	0.2	3.4	1.95±0.77 (n=21)
Horizontal Length of SON	2.7	6.9	4.97±1.16 (n=44)	2.2	11.1	5.1±1.98 (n=39)

a) SOF = Supraorbital foramen

b) SON = Supraorbital notch

c) Min. = Minimum

d) Max. = Maximum

e) n = Number of observations

Figure – 1: The measurements of the supraorbital notch/foramen from various landmarks. "a" shows distance of supraorbital notch/foramen from nasal midline, "b" shows distance of supraorbital notch/foramen from frontozygomatic suture, "c" shows distance of supraorbital notch/foramen from supraorbital rim.

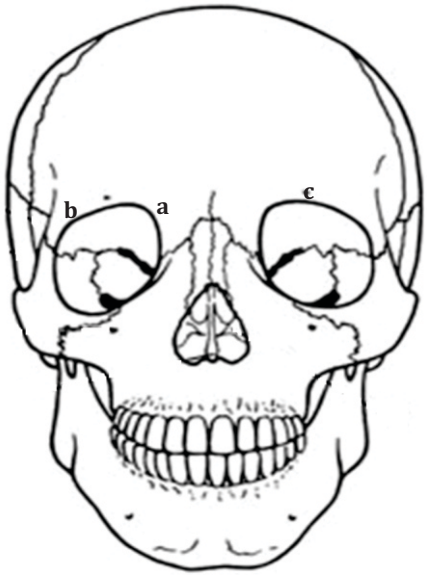

Figure – 2 shows incidence of accessory supra orbital foramina.

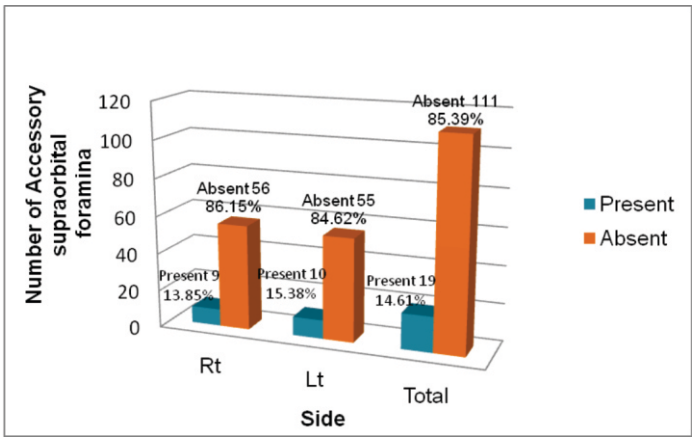

Figure – 2: incidence of accessory supra orbital foramina.

Rt = Right

Lt = Left

4. Discussion

Nerve bundles emerging from SON/F could probably be injured during surgical procedures, resulting in paraesthesia or anaesthesia. An understanding of the anatomical location of SOF/N is of increased importance with the rising popularity of endoscopic procedures with limited visibility.

Ashwini observed that incidence SOF was 69.87% and incidence of SON was 28.91% [2]. A study on Thai skulls revealed 50% bilateral SON, 17% bilateral SOF and in 33% cases there was notch on one side and the foramen on the other side [3]. Webster observed 49.07% bilateral SON, 25.93% bilateral SOF and in 25% cases, there was notch on one side and the foramen on the other side [4]. Liu et al. observed that mean distance from SOF/N to frontozygomatic suture was 20.55mm [5]. Supraorbital neurovascular bundle is more vulnerable to injury when it exits through supraorbital foramen, so we also measured the distance between SOF and supraorbital rim, so that surgeons can accurately locate the site of SOF [6]. Gupta observed that mean distance from SOF to supraorbital rim was 2.5mm [7]. Accessory supraorbital foramina have also been revealed to occur in 7.84% of skulls on the right side and 17.64% of skulls on the left side in Nepal [8].

In the present study of 65 skulls, bilateral notches were observed in 49.23% of skulls, bilateral foramina in 18.46% of skulls and 24.61% of skulls showed a notch on one side and a foramen on the other side. The supraorbital notches (63.85%) were found more frequently than supraorbital foramina (30.77%). The mean distance of SOF/N from the nasal midline was 22.59±3.34mm on the right side and 21.38±3.40mm on the left side. It is difficult to locate the midline intraoperatively. So, the distance between SOF/N and frontozygomatic suture can be a more reliable measurement because frontozygomatic suture is easily palpable on the skin at a notch along the lateral orbital margin at the level of lateral end of palpebral fissure. In our study, the mean distance from SOF/N to frontozygomatic suture was 27.13±2.84mm on right side and 28.12±2.12 mm on the left side. The mean distance between SOF and supraorbital rim was 1.63±0.86mm on right side and 1.71± 0.98mm on the left side. Sometimes, minor twigs of supraorbital nerve passes through accessory supraorbital foramina, which if missed, may lead to incomplete analgesia. In the present study, accessory supraorbital foramina were observed 13.85% on the right side and 15.38% on the left side of the skull.

5. Conclusion

The supraorbital nerve emerges either from supraorbital notch/foramen. In case absence of SON/F, supraorbital neurovascular bundle is more prone to injury by sharp supraorbital margin. There may be minor twig of supraorbital nerve passing through the accessory supraorbital foramen. The present study will help surgeons to localize the SOF/N, avoid injury to the neurovascular bundle and facilitate local anaesthetic, endoscopic and surgical procedures like Frontal sinus obliteration, orbital decompression, botox injections and exploration for the fractures and orbital exenteration.

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