

## **MORPHOLOGICAL AND MORPHOMETRIC VARIATIONS IN THE SUPRAORBITAL NOTCH OF SOUTH INDIAN POPULATION**

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### **ABSTRACT:**

**BACKGROUND:** The junction between medial one third and lateral two third of the supraorbital margin presents with supraorbital notch, which may be sometimes bridged into foramen. The precise location and morphological variations of the supraorbital notch are important while performing surgeries and for treating intractable cases of migraine.

**AIM OF THE STUDY:** The present study aimed in studying these possible variations and to calculate mean distance of the supraorbital notch from the midline.

**METHODS:** The study has been conducted in the Department of Anatomy, of Government Medical College, Kadapa, Andhra Pradesh. **RESULTS:** 45% skulls showed bilateral supraorbital notch while, 39% skulls showed bilateral supraorbital foramen, 16% skulls showed the presence of unilateral supraorbital notch, where the other side notch is bridged into foramen. The average distance of the supraorbital notch from nasal midline was 24mm on right side and 25mm on left side.

**CONCLUSION:** The knowledge of these morphological variations of the supraorbital notch are important for physicians, surgeons, cosmetic and maxillofacial dentists and anesthetists.

**KEY WORDS:** Supraorbital notch, supraorbital foramen, supraorbital neuralgia.

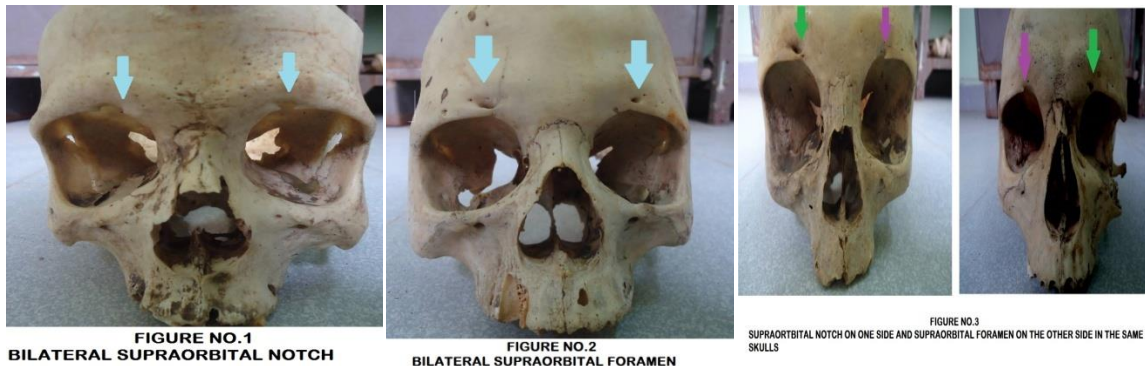
### **INTRODUCTION:**

Supraorbital notch is studied in the anterior aspect, of external features of human skull. Supraorbital notch is seen along the superior margin of the orbit, formed by squamous part frontal bone usually at the junction of it's medial one third and lateral two third . It is bridged by a ligament, which may be sometimes ossified converting it into supraorbital foramen which may

be complete or incomplete. This ligament is named as supraorbital ligament. The supraorbital notch transmits supraorbital vessels and Supra orbital nerve. Supraorbital artery is a branch of ophthalmic artery, which after passing through notch divides into terminal branches and supplies the medial part of forehead and anterior aspect of Scalp. Supraorbital nerve is a branch of Frontal division of ophthalmic branch of Trigeminal nerve. The nerve carries general sensations from greater part of forehead, Scalp as far as up to the vertex and upper eyelid including conjunctiva.[1] Because of its superficial location the nerve is susceptible to trauma and compression

**AIM OF THE STUDY:** The present study aims, to study the morphological variations of supraorbital notch on both sides in south Indian population and to calculate the mean distance of the supraorbital notch from nasal midline on both sides in the skulls of south Indian population.

**MATERIALS AND METHODS:** 108 dried human skulls (irrespective of sex) from the collections in the Department of Anatomy from Government Medical Colleges of Kadapa and Kurnool were used in this study. Skulls with fractures and deformities were excluded from the study. Morphological variations of supraorbital notch were studied on both sides using naked eye observation. The distance between supraorbital notch from nasal midline was measured using a measuring tape and the average distance was calculated on both the sides.



### **OBSERVATIONS AND RESULTS:**

In this study, the presence of supraorbital notch on both sides was observed in, 48 (45%) skulls, (FIGURE NO. 1), presence of foramen on both sides was observed in 42 (39%) skulls (FIGURE NO. 2), presence of supraorbital foramen on Right side and supraorbital notch on left side was observed in 10 (9%) skulls and the presence of supraorbital notch on Right side and supraorbital foramen on left side was observed in 8 (7%) skulls(FIGURE NO. 3). In total, the incidence of supraorbital notch is 55.3%on right side and 53.9% on left side and the incidence of supraorbital foramen is 44.7%on right side and 46.1%on left side.

The average distance of supraorbital notch or supraorbital foramen from nasal midline was 24mm on right side and 25mm on left side (FIGURE NO. 4).



**FIGURE NO.4**  
**MEASUREMENT OF DISTANCE BETWEEN SUPRAORBITAL NOTCH AND NASAL MIDLINE**

## **DISCUSSION:**

The average incidence of supraorbital notch supraorbital notch is 55.3% and 53.9% on right and left sides respectively, and the average incidence of supraorbital foramen is 44.7% on right side and 46.1% on left side respectively. This is close to the observations made by Beeret al[2], who reported the incidence of supraorbital foramen as 45% on both sides Henry Hollinshead [3] and Duke Elder[4] described the incidence of supraorbital foramen as only 25%, this differs from the observations made in the present study.

The mean distance of suprascapular notch from the midline in the present study is 24mm and 25mm respectively on the right and left sides. This observation is close to those made by, Gupta et al[5], who reported the same as 25mm on both sides, Jeong Sm et al, Agthug,[6,7] who reported as 24 and 25mm on right and left sides. The observation differs to those made by Cheng et al [8] who mentioned the distance as 22mm which is less than the present study. Cutright[9], observed the same as 27mm which is higher than the present study.

**SUMMARY AND CONCLUSION:** Morphological variations and exact location of supraorbital notch on the supraorbital margin has got many medical and surgical implications as discussed below,

**MEDICAL SIGNIFICANCE:** Supraorbital neuralgia refers to the injury of the supraorbital nerve, as the nerve can be easily damaged by an acute trauma, like getting hit on the eye with a baseball, or a repetitive injury, like wearing swim goggles that are too tight. This condition in swimmers is often referred as swimmer's headache. Supraorbital nerve damage may result even from minor injuries as the nerve is superficial and not protected by muscle or fascia. The nerve injury causes pain in the areas of cutaneous distribution of the nerve which includes forehead and eye lids. The pain may be continuous or intermittent and is associated with tenderness over the supraorbital notch. Associated Migrainous features of the syndrome includes nausea, vomiting and photo-phonophobia, local autonomic disturbances, such as conjunctival injection,

lacrimation or rhinorrhea are also seen in supraorbital neuralgia. Supraorbital nerve entrapment refers to partial or complete occlusion on the nerve by the surrounding tissues mostly a scar tissue after forehead surgeries. These conditions require surgical decompression of the nerve, or acupuncture or injection of Botulinum toxin to ameliorate the symptoms. [10] Supra orbital nerve block is also performed for reliving the intractable pain in the forehead due to Herpes zoster or Trigeminal neuralgia. [11]

**SURGICAL SIGNIFICANCE:** The location and exit of supraorbital nerve and vessels from the supraorbital notch on the facial skeleton is subjected to many variations. The knowledge of these possible variations is required while performing craniofacial surgeries. It has been shown from the study that, supraorbital notch and foramen may coexist in the same skull i.e., in the same person. Effective and precise localization of the nerve is important for giving cutaneous nerve blocks. If the palpable methods could not properly localize the supraorbital nerve, preoperative imaging is recommended for accurate location of the nerve exit. Even ultrasound guided nerve block may be unsuccessful or incomplete without proper anatomical knowledge of the notch or foramen. This morphometric analysis also provides a mean distance of supraorbital notch from the nasal midline which acts as a guide for cosmetic surgeons in localization of the exit of the nerve on the face. The term Epigenetic characters is used for describing the morphology of supraorbital notch or foramen as the morphology of the same is determined by the growth of the surrounding blood vessels, nerves and muscles. [12]

It is imperative to have Knowledge of supraorbital nerve anatomy not only for plastic surgery but also for dermatological and neurosurgical procedures. The supraorbital keyhole approach is frequently utilized in for tumor excision and aneurysm clipping . Excessive dissection and retraction near neurovascular bundles can cause fibrosis, neuroma formation, and debilitating neuralgia. [13,14]

#### **REFERENCES:**

1. Standring S, Ellis H, Healy JC, Johnson D, Williams A, Collins P, et al, eds. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 39th Edition, Elsevier, Churchill Livingstone, London. 2005: 511-513.
2. Beer GM, Putz R, Mager K, Schumacher M, Keil W. Variations of the frontal exit of the supraorbital nerve: an anatomic study. *Plast Reconstr Surg* 1998 Aug;102(2):334-341.
3. Henry Hollinshead, Textbook of Human Anatomy. 5<sup>th</sup> Edition
4. Duke Elder SS. System of Ophthalmology , 1st edition. Henry Kimpton ; Volume II ; 401.
5. Gupta T. Localization of important facial foramina encountered in maxillo-facial surgery. *Clin Anat* 2008 Oct;21(7):633-640
6. Jeong SM, 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 Apr;25(4):517-522.

7. 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 Jun;63(6):800-804.
8. Cheng AC, Yuen HK, Lucas PW, Lam DS, So KF. Characterization and localization of the supraorbital and frontal exits of the supraorbital nerve in Chinese: an anatomic study. *Ophthal Plast Reconstr Surg* 2006 May-Jun;22(3):209-213.
9. Cutright B, Quillopa N, Schubert W. An anthropometric analysis of the key foramina for maxillofacial surgery. *J Oral Maxillofac Surg* 2003 Mar;61(3):354-357.
10. Pareja JA, Caminero AB. Supraorbital neuralgia. *Curr Pain Headache Rep* 2006; 10: 302–305.
11. Perloff MD, Chung JS. Urgent care peripheral nerve blocks for refractory trigeminal neuralgia. *Am J Emerg Med* 2018; 36:2058-2060.
12. Nishtha Singh et al; A study of the supraorbital notch and foramen in North Indian human crania; *Eur. J. Anat.* 18 (1): 21-25 (2014)
13. Chatchai Pruksapong; The anatomical variations of the emergence routes of supraorbital nerve: A cadaveric study and systematic review; *Asian Journal of Surgery*, vol 45, issue 1, Jan 2022, Pages 220-225.
14. Smith JD, Surek CC, Cortez EA. Withdrawn. Localization of the supraorbital, infraorbital, and mental foramina using palpable, bony landmarks. *Clin Anat* 2010 May;23(4):495.