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Case Report

Case Report: Positional Variation of Supraorbital Foramen

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Abstract

The supraorbital notch and foramen in the frontal bone transmit the supraorbital neurovascular complex, containing the supraorbital nerve and vessels. The skull of an adult person of unknown sex showed an unusual location of the supraorbital foramen. Two canals were found on the left side of the skull. One of them is bigger, the other is smaller. These canals probably conduct the lateral and medial branches of the supraorbital nerve. It was established that the maximum distance from the supraorbital foramen to the median line of the face was 39.45 mm, and to the nasion - 42.11 mm. Our case aims to alert surgeons for the possibility to encounter an unexpected the place of appearance of the branches of the supraorbital nerve on the squamous part of the frontal bone. Knowledge of topographical anatomy of the supraorbital neurovascular complex and its variations is essential to avoid possible complications after interventional procedures.

Keywords: *Anatomy; Supraorbital Foramen; Supraorbital Notch; Variation*

Abbreviations

FM: Facial Midline; FZS: Frontozygomatic Suture; Nz: Nasion; SOF: Supraorbital Foramen; SOM: Supraorbital Margin; SON: Supraorbital Nerve; TL: Temporal Line of Frontal Bone

Introduction

The supraorbital foramen (SOF) is a foramen on the frontal bone, which is located on the border of the medial and middle third of the supraorbital rim [1-6]. The hole contains the supraorbital neurovascular complex, which contains the supraorbital artery (branch of the ophthalmic artery), same name vein and the supraorbital nerve (branch of the frontal nerve) (SON) [7,8]. SON under the upper wall of the orbit is divided into two branches: the lateral, which, passing through the supraorbital incision (opening), forks in the skin of the forehead, reaching the parietal and temporal areas, and the medial, thinner, which passes through the frontal cutting, ends in the skin of the forehead [9-11]. In recent years, some works confirm the presence of 4 variants of fascial bands that complete a carpal tunnel-like ring around the SON. The nerve may branch into the superficial (medial) and deep (lateral) division either proximal or distal to the supraorbital exit, thus the intraconal branching pattern can account for multiple compression sites [12].

Variation in the location of the SOF has been reported in the past [13-15]. Besides it was reported a horizontal range from the nasion to the supraorbital notch or foramen and a vertical range from the supraorbital rim in a sample of 507 skulls dated from the prehistoric era to the twentieth century [16]. With such a large range of variation, it is perhaps not surprising that injury to the nerve occurs despite appropriate surgical technique. Here, the authors present the evaluation of the skull remains that show one of the unusual variations in the location of the SOF.

Case Reports

This article is a report compiled from the evaluation of the skeletal remains of a deceased individual from the Anatomy Collection at St. Luke University of Lugansk. The study was ethically cleared by the Health Research and Ethics Committee of St. Luke University which conforms to the principles within the Declaration of Helsinki (1964). Specimen 1-C-37 is the skull of an adult of unknown sex and age. Some signs indicate that this is skull of old subject. A caliper was used to measure the distances between the foramina and other important anatomical landmarks such as nasion (Nz), facial midline (FM), temporal line (TL) of frontal bone, supraorbital margin (SOM) and frontozygomatic suture (FZS). Distances were recorded to the nearest 0.01 mm. We discovered two canals (large and small), which had inlets on the orbital surface of the frontal bone, and outlet openings on the external surface of the frontal scale left side.

There were both supraorbital notch and SOF on the right side and double SOF on the left side on the skull (Figure 1 and 2). It was observed two canals left side with corresponding inlets and outlets. First one is bigger and second one is lesser. These canals are probably missing the corresponding branches (lateral and medial) of the SON. Both canals start on the orbital surface of same name part of frontal bone and finish on the external surface of squamous part of the bone. The distance between the small canal inlet and SOM is 4.28 mm, and the distance between the large canal inlet and SOM is 7.72 mm. Well recognized sulci begin at the level of outlet of larger canal. Measurement data is shown in table 1.

	Large canal (outlet), SOF	Small canal (outlet)
Nz	42.11 mm	27.73 mm
FM	39.45 mm	25.62 mm
TL	9.15 mm	16.82 mm
SOM	15.17 mm	6.44 mm
FZS	23.26 mm	24.51 mm

Table 1: *Distances from the left holes to nasion, facial midline, temporal line of frontal bone, supraorbital margin and frontozygomatic suture.*

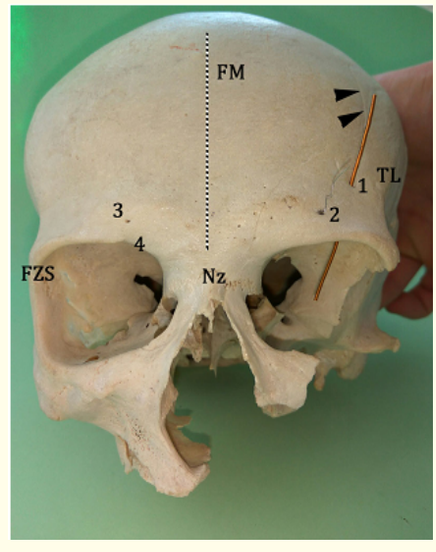

Figure 1: *Anterior norma of the skull. 1 - Large canal outlet (left side); 2 - Small canal outlet (left side); 3 - SOF (right side); 4 - Supraorbital notch (right side). FM: Facial Midline; FZS: Frontozygomatic Suture; NZ: Nasion; TL: Temporal Line of Frontal Bone; Arrowheads: Sulci that begin at the outlet of large canal.*

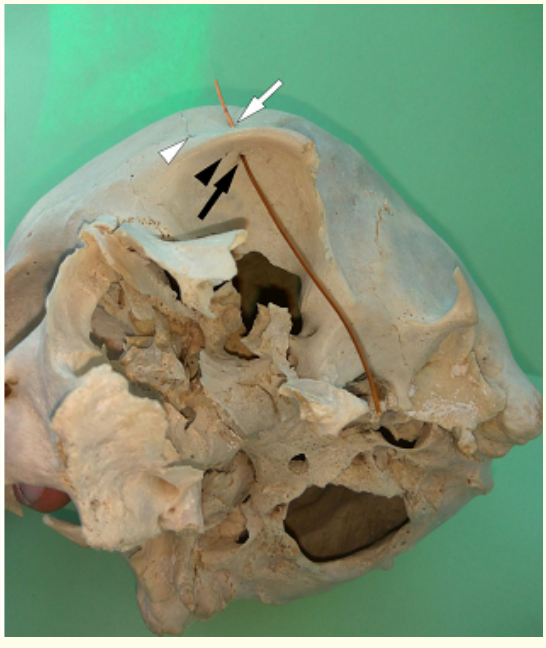

Figure 2: *Bottom and left view of the skull. Black and white arrowheads are inlet and outlet of the small canal respectively. Black and white arrows are inlet and outlet of the large canal respectively.*

Discussion

Knowledge of variations of SOF in maxillofacial surgery provides accurate approach, lessens morbidity, facilitates the surgeon's intervention [17-20] and helps to get more satisfying results [21,22]. Anatomic variations of this region, which has special considerations for oculoplastic surgery, have been reported previously in certain cadaver and computed tomography studies [23-25].

Several surgical procedures involve significant risk of motor and sensory damage for SON. Specifically, open and endoscopic forehead lifting surgery relies on a constant exit point of the SON. Thus, planning a surgical intervention for the forehead region requires detailed anatomic knowledge. Besides, awareness of the location of SOF is critical to achieve effective nerve block and avoid neurovascular injury in local anesthesia. Various cadaveric studies have been reported describing the anatomic variations of this area in different races accurately that assessed the diameters and anatomic locations of SOF. However, published reports on the anatomy of the supraorbital foramina had different methodological approaches. Beer., et al. focused on symmetry, reported a novel classification in 507 European skulls, and made a comprehensive description [16]. Saylam., *et al.* [26] used foramen and notch synonymously and did not find any nonexistent foramina in their report with 50 cadavers and 200 crania. Webster., *et al*. [15] studied 111 skulls and reported bilateral supraorbital notches in 49%, bilateral supraorbital foramina in 26%, and notches and foramina on each side in 25%.

Agthong., *et al.* [23] reported significant sex and side differences in 110 Asian adult skulls. In that report, the average distances of supraorbital foramina or notches from midline was 23.9 and 24.6 mm in right, and 24.2 and 25.6 mm in left sides, in women and men, respectively. Their reported absence rate was 5.5% in right and 10% in left.

Beer., *et al*. [16] concluded that SON exit shows numerous variations, and all surgical approaches to that area, especially the endoscopic ones, have to be done under vision and with the necessary care of the nerves. It may be suggested that preoperative imaging of the SON exit may be a good tool to avoid possible complications in endoscopic forehead surgery, especially when the palpation is inadequate. On

the represented skull, two canals are shown that probably serve for the passage of the corresponding branches of the SON. Such a large distance between the SOF and the median line of the face is extremely rare. Long distances are also described in the literature. However, we did not find confirmation in the form of photos. In similar cases, when detecting such canals, which have a significant length, the authors propose to call these structures supraorbital canals, and not foramens.

Conclusion

Report documents variation in the position of SOF. Knowledge of the positions of the SOF becomes important for diagnostic and clinical procedures such as the administration of regional anaesthesia, cleft surgeries and other invasive procedures in the frontal region. Presented report would be useful to clinicians during surgery of the orbital and frontal regions.

Conflict of Interest

The authors declare that there is no conflict of interest.

Bibliography

1. Apinhasmit W., *et al*. "Supraorbital notch/foramen, infraorbital foramen and mental foramen in thais: anthropometric measurements and surgical relevance*". Journal of the Medical Association of Thailand* 89.5 (2006): 675-682.

2. Ashkenazi A., *et al*. "Peripheral nerve blocks and trigger point injections in headache management a systematic review and suggestions for future research". *Headache* 50.6 (2010): 943-952.

3. Barker L., *et al*. "Supraorbital notch and foramen: positional variation and relevance to direct brow lift". *Ophthalmic Plastic and Reconstructive Surgery* 29.1 (2013): 67-70.

4. Huanmanop T., *et al*. "Surgical anatomy of fissures and foramina in the orbits of Thai adults". *Journal of the Medical Association of Thailand* 90.11 (2007): 2383-2391.

5. Ismail AR., *et al*. "Regional nerve block of the upper eyelid in oculoplastic surgery". *European Journal of Ophthalmology* 16.4 (2006): 509-513.

6. Kazkayasi M., *et al*. "The morphometric and cephalometric study of anterior cranial landmarks for surgery". *Minimally Invasive Neurosurgery* 51.1 (2008): 21-25.

7. Booth AJ., *et al*. "The direct brow lift: effiacy, complications, and patient satisfaction". *British Journal of Ophthalmology* 88.5 (2004): 688-691.

8. Knize DM. "A study of the supraorbital nerve". *Plastic and Reconstructive Surgery* 96.3 (1995): 564-569.

9. Fang F., *et al*. "A systematic review of interethnic variability in facial dimensions". *Plastic and Reconstructive Surgery* 127.2 (2011): 874-881.

10. Gain P., *et al*. "Frontal and nasal nerve blocks in the treatment of severe pain in acute ophthalmic zoster". *Anesthesia and Analgesia* 95.2 (2002): 503.

11. Serra-Guillen C., *et al*. "Comparative study between cold air analgesia and supraorbital and supratrochlear nerve block for the management of pain during photodynamic therapy for actinic keratoses of the frontotemporal zone". *British Journal of Dermatology* 161.2 (2009): 353-356.

12. Hagan RR., *et al*. "Supraorbital rim syndrome: definition, surgical treatment, and outcomes for frontal headache". *Plastic and Reconstructive Surgery - Global Open* 4.7 (2016): e795.

13. Carolineberry A and RJ. Berry. "Epigenetic variation in the human cranium". *Journal of Anatomy* 101.2 (1967): 361-379.

14. Cutright B., *et al*. "An anthropometric analysis of the key foramina for maxillofacial surgery". *Journal of Oral and Maxillofacial Surgery* 61.3 (2003): 354-357.

15. Webster RC., *et al*. "Supraorbital and supratrochlear notches and foramina: anatomical variations and surgical relevance". *Laryngoscope* 96.3 (1986): 311-315.

16. Beer GM., *et al*. "Variations of the frontal exit of the supraorbital nerve: an anatomic study". *Plastic and Reconstructive Surgery* 102.2 (1998): 334-341.

17. Liu DN., *et al*. "Location of supraorbital foramen/notch and infraorbital foramen with reference to soft- and hardtissue landmarks". *Journal of Craniofacial Surgery* 22.1 (2011): 293-296.

18. McGuire CS and HB Gladstone. "Novel pretrichial browlift technique and review of methods and complications". *Dermatologic Surgery* 35.9 (2009): 1390-1405.

19. Pareja JA and AB Caminero. "Supraorbital neuralgia". *Current Pain and Headache Reports* 10.4 (2006): 302-305.

20. Ueda K., *et al*. "Long-term follow-up study of browlift for treatment of facial paralysis". *Annals of Plastic Surgery* 32.2 (1994): 166-170.

21. Berry AC. "Factors affecting the incidence of non-metrical skeletal variants". *Journal of Anatomy* 120.3 (1975): 519-535.

22. Turhan-Haktanır, N., *et al*. "Variations of supraorbital foramina in living subjects evaluated with multidetector computed tomography". *Head and Neck* 30.9 (2008): 1211-1215.

23. Agthong S., *et al*. "Anatomical variations of the supraorbital, infraorbital, and mental foramina related to gender and side". *Journal of Oral and Maxillofacial Surgery* 63.6 (2005): 800-804.

24. Cavalcanti MG., *et al*. "Three dimensional computed tomography landmark measurement in craniofacial surgical planning: experimental validation in vitro". *Journal of Oral and Maxillofacial Surgery* 57.6 (1999): 690-694.

25. Vannier MW and JL Marsh. "Three-dimensional imaging, surgical planning, and image-guided therapy". *Radiologic Clinics of North America* 34.3 (1996): 545-563.

26. Saylam C., *et al*. "Anatomical variations of the frontal and supraorbital transcranial passages". *Journal of Craniofacial Surgery* 14.1 (2003): 10-12.

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