ORIGINAL ARTICLE

# Supraorbital foramen or notch and its relationship with the supraorbital nerve in human

*Forame supraorbital ou entalhe e sua relação com o nervo supraorbital em humanos*

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ABSTRACT

*Currently, interventions with anesthetic substances have been an alternative for headache treatment. There are some regions that are targeted for the application of anesthetics, such as the upper margin of the orbit, where two critical nerves, supratrochlear and supraorbital, pass. The objective of this study is to present some anatomical features characteristic of the superior orbital border and passage of the supraorbital nerve through a foramen or more often notch. Dry skulls from male and female individuals were used, measures were taken to compare the distance between the foramen and the median line of the skull. The length was measured and compared between the sexes, obtaining the following results in men (2.27 ± 0.29 cm) and women (2.18 ± 0.41 cm). The collected data are of extreme importance to understand the anatomy of the region and intervention in procedures of infiltrations and treatment of headache.*

Keywords: *Supraorbital nerve; Supratrochlear nerve; Anatomy; Infiltration; Orbit*

## INTRODUCTION

Recently, with the growing use of nerve infiltration with anesthetic/corticoid substances to treat different types of head pain, including primary (e.g. migraine and cluster headache) and secondary headaches, the study of the anatomy of the nerves situated in close contact with the skull is of utmost importance to enable specialists to treat their patients satisfactorily.[1,2]

The frontal region is probably the commonest location where the pain is experienced by the large majority of patients with headache.[3] Two important nerves innervate this region: the supraorbital and supratroclear nerves. Both these nerves originate in the frontal nerve, branch of the ophthalmic nerve (the first trigeminal branch), within the orbital cavity and, to reach the frontal area, they pass over the superior orbital rim.[4] In the superior orbital rim, they usually cross from the orbital space to the frontal region through a foramen or notch, named supraorbital foramen or notch. There are many anatomical variations in these structures that need to be studied further, particularly those associated with sex. A spectrum from absence of a notch to a foramen, including different degrees of tunnelization and an almost complete foramen, can be seen in the orbitofrontal region of the skull.[5,6]

The purpose of this study is to present some anatomical features of the superior orbital rim and the passage of the supraorbital nerve through a foramen or more frequently a notch.

## MATERIAL AND METHOD

### Study population

Forty adult human skulls of both sexes (20 males and 20 females) were used in this study, belonging to the Human Adult Bone Collection of the Academic Center of Vitoria, Federal University of Pernambuco, Brazil. A foramen was defined as a canal connecting the orbital space to the frontal region, including the orbital rim (=360°). A partial foramen was identified when a notch presented an arc of at least 180 degrees, creating an open tube. A notch was identified when the arc was smaller than 180 degrees.

### Measurements

After identification of the structure (notch, partial foramen or foramen), the distance between the median line of the skull and the medial and lateral border of the identified structure was measured. To mark the midline of the skull, a straight line was drawn with cotton thread # 10, attached to the medial palatine suture to the glabella in the frontal bone. The measurement was then performed using a 150 mm stainless steel digital caliper - Lee Tools® (Figure 1).

### Statistical analysis

To test the distribution of values in the population, the samples were combined between the sexes, using the Mann-Whitney statistical test, or the Student t-test, depend on the distribution evaluated with the K-S test, with the program GraphPad Prism 7.02. The mean value was compared with the paired sample, and a P value $<0.05$ was considered significant in all analyzes.

## RESULTS

Table 1 shows the data comparing male and female skulls in relation to foramina or notches. The different forms of foramina can be seen in Figure 2 (A and B). Figure 2 shows the different variations encountered in the notches. A vascular foramen (arrow) is shown in Figure 3. Note that there is no orbital orifice to form a supraorbital foramen.

The distance between the median line of the skull and the medial border of the supraorbital foramen was measured in men (2.27 ± 0.29 cm; minimum 1.72 cm – maximum 2.92 cm) and women (2.18 ± 0.41 cm; minimum 1.36 cm – maximum 3.20 cm), with no statistical difference between sexes ($p>0.05$, Figure 4), Student t-test.

Figure 5 shows the upper margin of the left orbit, in an adult cadaver specimen, with the following structures from medial to lateral aspect: (1) supratrochlear nerve, (2) supraorbital artery and (3) supraorbital nerve, which travels through the supraorbital incisura.

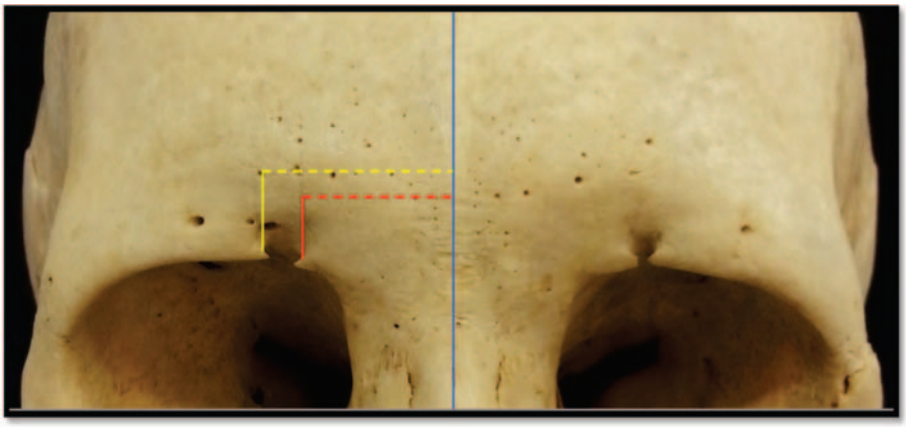

*Figure 1. Method used to measure the distance between the medial border (in red) and the lateral border (in yellow) of the supraorbital notch/ foramen to the midline of the skull (in blue).*

Table 1 - Comparison between males and females in relation to the supraorbital foramen and notch

| | Right notch (<180°) | Left notch (<180°) | Right partial foramen (>180°) | Left partial foramen (>180°) | Right foramen (=360°) | Left foramen (=360°) |
|---|---|---|---|---|---|---|
| Males | 8/20 (40%) | 6/20 (30%) | 9/20 (45%) | 11/20 (55%) | 3/20 (15%) | 3/20 (15%) |
| Females | 7/20 (35%) | 8/20 (40%) | 8/20 (40%) | 7/20 (35%) | 5/20 (25%) | 5/20 (25%) |

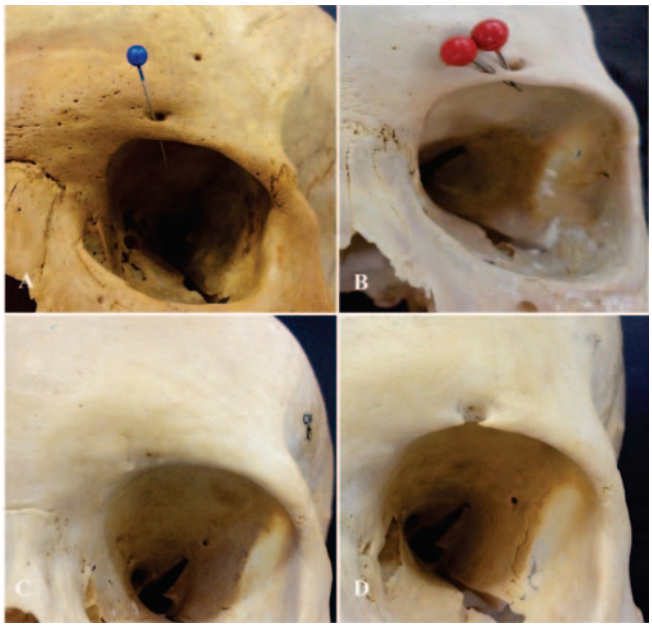


*Figure 2. Foramina/notches. A) Left supraorbital foramen; B) existence of two supraorbital foramina; C) only a slight bone depression is observed; and D) partial closure of the notch, forming a partial foramen.*

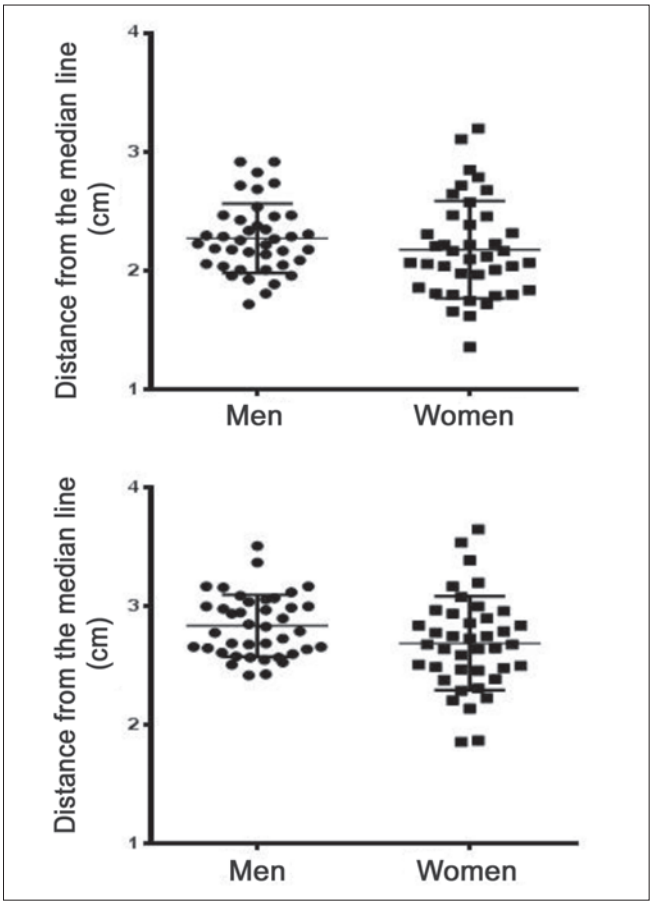


*Figure 4. The distance between the median line of the skull and the medial border (upper panel) or lateral border (lower panel) of the supraorbital foramen.*

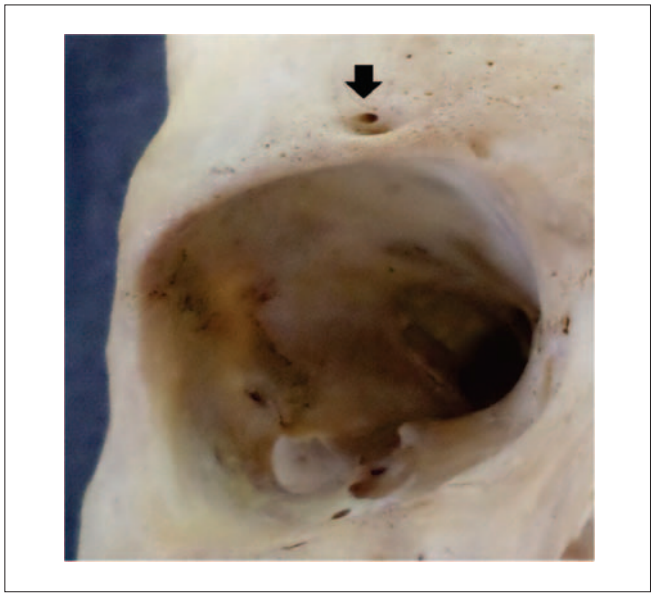

*Figure 3. Vascular foramen (arrow). Note that there is no orbital orifice to form a supraorbital foramen.*

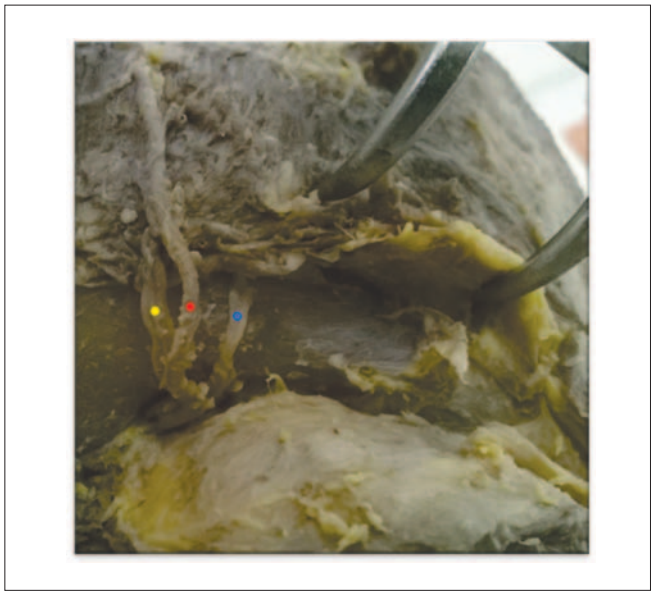

*Figure 5. Upper margin of the left orbit, showing the following structures from medial to lateral: supratrochlear nerve (yellow point); supraorbital artery (red point); supraorbital nerve (blue point), which travels through the supraorbital incisura or foramen. supraorbital artery (red point); supraorbital nerve (blue point).*

## COMMENT

The females presented a larger number of foramina that the males. Anatomical variation was frequently encountered in foramina and notches, even when the right and left sides were compared in the same individual. In a few individuals two supraorbital foramina were found. Curiously, sometimes a vascular canal may be mistaken for

a supraorbital foramen, but in this case the orbital orifice cannot be seen as in the case of the foramen where both orbital and frontal orifices are encountered.

For safe surgical approaches it is necessary to have knowledge of the access bone regions.[7] However, as seen, there is a frequent variation in the location and shape of the supraorbital foramina, since they are structures of passage of the branch of the supraorbital nerve, it is necessary that there is understanding about the anatomy of these structures, since very often the foramen has been accessed for the treatment of diseases, as is the case of the headaches.[5,8]

## REFERENCES

1. Gelfand AA, Reider AC, Goadsby PJ. Outcomes of greater occipital nerve injections in pediatric patients with chronic primary headache disorders. Pediatr Neurol. 2014 Feb;50(2):135-9.
2. Pehora C, Pearson AM, Kaushal Um, Crawford MW, Johnston B. Dexamethasone as an adjuvant to peripheral nerve block. Cochrane Database Syst Rev. 2017 Nov 9;11:CD011770.
3. Berchtold V, Stofferin H, Moriggl B, Brenner E, Pauzenberger R, Konschake M. The supraorbital region revisited: An anatomic exploration of the neuro-vascular bundle with regard to frontal migraine headache. J Plast Reconstr Aesthet Surg. 2017 Sep;70 (9):1171-1180
4. Pareja JA, López-Ruiz P, Mayo D, Villar-Quiles RN, Cárcamo A, Gutiérrez-Viedma Á, et al. Supratrochlear Neuralgia: A Prospective Case Series of 15 Patients. Headache. 2017;57(9):1433-42.
5. Woo SW, Lee HJ, Nahm FS, Lee PB, Choi EJ. Anatomic characteristics of supraorbital foramina in korean using three-dimensional model. Korean J Pain. 2013 Apr;26(2):130-4.
6. Mishra A, Shrestha S, Singh M. Varying positions and anthropometric measurement of supraorbital and supratrochlear canal/foramen in adult human skulls. Nepal Med Coll J. 2013 Jun;15(2):133-6.
7. Mehta MP, Chundury RV, Ahn ES, Mehta D, Jellema LM, Perry JD. Predictability of Optic Foramen Location From a Ray Through the Ethmoidal Foramina. Ophthalmic Plast Reconstr Surg. 2016 Nov/Dec;32(6):481-3.
8. Garg RK, Lee KS, Kohn SC, Baskaya MK, Afifi AM. Can Sonography Distinguish a Supraorbital Notch From a Foramen? J Ultrasound Med. 2015 Nov;34(11):2089-91.

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