

Bilateral Osseous Interclinoid Bridges Associated with Foramina of Vesalius: A Case Report

GEORGE PARASKEVAS¹, ZOI NITSA², KONSTANTINOS KOUTSOFLIANIOTIS³

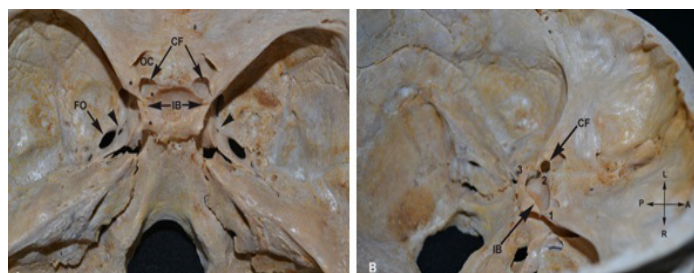
ABSTRACT

The current study displays a very rare combination of ossified interclinoid ligaments at the sella turcica region associated with bilateral foramina of Vesalius. In a macerated skull four osseous bars interconnecting the clinoid processes bilaterally were detected. Specifically, two bilateral osseous bars were observed bridging the gap between the anterior and middle clinoid processes forming the so called caroticoclinoid foramen on each side and two additional osseous bridges linked the anterior and posterior clinoid processes, bilaterally. Furthermore, two distinct bilateral foramina of Vesalius were documented just anterior and medial to the foramen ovale. The awareness of the osseous sellar bridges is crucial for the physician and especially the neurosurgeon since their presence may complicate the removal of clinoid processes and induce damage of the internal carotid artery and oculomotor nerves. Furthermore, the likely existence of the foramen of Vesalius may lead to transfer of an infected thrombus into the cranial cavity and complicate a percutaneous trigeminal rhizotomy.

Keywords: Clinoid processes, Cranial foramina, Osseous bridges, Turcica sella, Variations

CASE REPORT

During the routine osteology demonstration course in our Department of Anatomy, in a dry human skull of unknown gender and age we came across a combination of osseous variants located at the intracranial aspect of the middle cranial fossa. Particularly, on either side an osseous bar extended between the anterior and middle clinoid process forming the caroticoclinoid foramen (CF). The transverse diameter of CF was 6.14 mm on the right side and 5.85 mm on the left side. In addition, on each side an interclinoid bridge (IB) was present in which a suture like joint was detected. Its length was estimated as 7.58 mm on the right side and 7.56 mm on the left side. Furthermore, a Foramen of Vesalius (FV) was noted bilaterally situated anterior and medial to the foramen ovale with the maximum diameter being 1.12 mm on the right side and 2.14 mm on the left side. The distance of FV from the anterior edge of the foramen ovale was estimated as 3.97 mm on the right side and 1.45 mm on the left side [Table/Fig-1A,B]. The morphometric study was conducted with the aid of a digital vernier caliper with an accuracy of 0.01 mm, whereas photographic documentation was taken by Nikon D3100 digital camera.



[Table/Fig-1A,B]: A) Photograph demonstrating the internal view of the skull base. Note the bilateral presence of caroticoclinoid foramina (CF), as well as the bilateral interclinoid bridges (IB) interconnected with a suture-like joint. In addition a foramen of Vesalius (arrow heads) is located just anterior and medial to the foramen ovale (FO), on each side (asterisks: clinoid processes, OC: optic canal). B. Right view of the skull base demonstrating the turcica sella area with the osseous bridges extending between the clinoid processes (1: anterior clinoid process, 2: middle clinoid process, 3: posterior clinoid process, CF: caroticoclinoid foramen, IB: interclinoid bridge, A: anterior, P: posterior, R: right, L: left)

DISCUSSION

The anterior and middle clinoid processes are united by the so called caroticoclinoid ligament that occasionally becomes ossified forming the CF, whereas the anterior and posterior clinoid processes are rarely fused giving rise to the so-called IB [1]. FV is a small variable foramen of the floor of the middle cranial fossa situated between the foramen ovale and the foramen rotundum [2]. Keyes very early in 1935 classified the CF into the complete type with a distinct bony ring, the contact type with a line or suture at the site of junction between the anterior and middle clinoid process and the incomplete type where the two previous processes do not touch each other [3]. The bilateral documentation of CF of the complete type is very rare, with its incidence ranging between 1.75% and 2.5% [1,4]. Nevertheless, Ozdogmus et al., reported a high incidence (18%) for the bilateral CF without providing an explanation whether such CF belongs to complete or contact type [5]. As regards the presence of bilateral IB of contact type an incidence of 1.17% [1] or 0% [6] was mentioned. Kanjiya et al., noticed the bilateral complete type of IB with a frequency of 4.5% [6], or 6% according to research work of Ozdogmus et al., [7]. Moreover, the bilateral occurrence of the FV is ranged between 5% [8] and 35% [9].

The combination of bilateral CF and IB was detected in 0.8% [10], 2.68% [11] or 3.5% [6] of the investigated material, as well as in some single case reports [12,13]. Those ossified interclinoid ligaments are laid down in cartilage at an early stage of development and ossify in early childhood [14], whereas Kier mentioned that these ossified ligaments constitute a developmental anomaly [15]. Removal of the anterior clinoid process could be hazardous for the internal carotid artery, especially in the case of an aneurysm [16] or lead to iatrogenic injury of the adjacent oculomotor nerves [17].

Our case report constitutes a very infrequent osseous variant since such a combination of bilateral CF and IB associated with a bilateral FV, to the best of our knowledge has never been documented in the literature. FV is located between the foramen rotundum and the foramen ovale on its medial side. It is traversed by a small vein, the so-

called emissary vein of Vesalius anastomosing the cavernous sinus with the pterygoid plexus [18]. The awareness of FV's appearance is crucial for the operating neurosurgeon since an infected thrombus can reach the interior of cranial cavity from outside it, through the emissary vein of Vesalius [2,19]. Furthermore, during percutaneous trigeminal rhizotomy for treatment of trigeminal neuralgia, the needle could be inserted into the FV puncturing the cavernous sinus or the emissary vein of Vesalius [20].

CONCLUSION

Such a rare combination of osseous variants located at the sphenoid bone should be highlighted to the physician dealing with pathology of the central base of the skull. Especially, the neurosurgeon should be aware of these bony abnormalities in order to proceed on more cautious and effective surgical interventions taking into account the adjacent vital anatomical structures, such as the internal carotid artery, the cavernous sinus, the hypophysis cerebri and the oculomotor nerves.

REFERENCES

- [1] Erturk M, Kayalioglu G, Govsa F. Anatomy of the clinoid region with special emphasis on the caroticoclinoid foramen and interclinoid osseous bridge in recent Turkish population. *Neurosurg Rev.* 2004;27:22-6.
- [2] Raval BB, Singh PR, Rajguru J. A morphologic and morphometric study of foramen Vesalius in dry adult human skulls of Gujarat Region. *J Clin Diag Res.* 2015;9(2):AC04-AC07.
- [3] Keyes JEL. Observations on four thousand optic foramina in human skulls of known origin. *Arch Ophthalmol.* 1935;13:538-68.
- [4] Freire AR, Rossi AC, Prado FB, Groppo FC, Caria PHF, Botacin PR. Caroticoclinoid foramen in human skulls: incidence, morphometry and its clinical implications. *Int J Morphol.* 2011;29(2):427-31.
- [5] Ozdogmus O, Saka E, Tulay C, Gurdal E, Uzun I, Cavdar S. The anatomy of the carotico-clinoid foramen and its relation with the internal carotid artery. *Surg Radiol Anat.* 2003;25:241-46.
- [6] Kanjiya D, Tandel M, Patel S, Nayak T, Sutaria L, Pensi CA. Incidence of ossified interclinoid bars in dry human skulls of Gujarat state. *International Journal of Biomedical and Advance Research.* 2012;03(12):874-80.
- [7] Ozdogmus O, Saka E, Tulay C, Gurdal E, Uzun I, Cavdar S. Ossification of interclinoid ligament and its clinical significance. *Neuroanatomy.* 2003;2(1):25-27.
- [8] Raymond J, Charuts A, Wysocki J. The morphology and morphometry of the foramina of the greater wing of the human sphenoid bone. *Folia Morphol (Warsz).* 2005;64(3):188-93.
- [9] Berge JK, Bergman RA. Variations in size and in symmetry of foramina of the human skull. *Clin Anat.* 2001;14(6):406-13.
- [10] Archana R, Anita R, Jyoti C, Punita M, Rakesh D. Incidence of osseous interclinoid bars in Indian population. *Surg Radiol Anat.* 2010;32(4):383-87.
- [11] Kolagi S, Herur A, Patil G, Rairam GB. Complete sella turcica bridges prevalence and dimensions. *J Anat Soc India.* 2011; 60(1):22-25.
- [12] Koshy JM, Bindhu. Bilateral carotico-clinoid foramen and inter-clinoid bars. *Recent Research in Science and Technology.* 2012;4(7):1-2.
- [13] Mrinmoy P, Sangma GTN. The ossified caroticoclinoid ligament and interclinoid ligament in specimen of sphenoid bone: a case report. *Scholars Journal of Applied Medical Sciences.* 2014;2(2B):633-35.
- [14] Lang J. Structure and postnatal organization of heretofore uninvestigated and infrequent ossifications of the sella turcica region. *Acta Anat.* 1977;99:121-39.
- [15] Kier EL. Embryology of the normal optic canal and its anomalies. An anatomic and roentgenographic study. *Invest Radiol.* 1966;1:346-62.
- [16] Inoue T, Rhodon AL, Theele D, Barry ME. Surgical approaches to the cavernous sinus: a microsurgical study. *Neurosurgery.* 1990;26:903-32.
- [17] Umansky F, Valarezo A, Elidan J. The superior wall of the cavernous sinus: a microanatomical study. *J Neurosurg.* 1994;81:914-20.
- [18] Bergman RA, Thompson SA, Afifi AK, Saadeh FA. Compendium of the Human Anatomic Variation. Text, Atlas and World Literature. Baltimore, Urban and Schwarzenberg. 1988;200.
- [19] Decker G, du Plessis DJ. McGregor's Synopsis of Surgical Anatomy. 12th Ed. Bristol, John Wright & Sons Ltd . 1986; 328-33.
- [20] Sindou M, Keravel Y, Abdennebi B. Traitement neurochirurgical de la nevrálgie trigéminal. Abord direct ou méthode percutane. *Neurochirurgie.* 1987;33:89-111.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Anatomy, Faculty of Medicine, Aristotle University of Thessaloniki, Greece.
2. Undergraduate Medical Student, Department of Anatomy, Faculty of Medicine, Aristotle University of Thessaloniki, Greece.
3. Postgraduate Medical Student, Department of Anatomy, Faculty of Medicine, Aristotle University of Thessaloniki, Greece.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. George K. Paraskevas,
Associate Professor, Department of Anatomy, Faculty of Medicine,
Aristotle University of Thessaloniki, Postal Code-54124, Greece.
E-mail :g_paraskevas@yahoo.gr

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Feb 27, 2015**
Date of Peer Review: **May 05, 2015**
Date of Acceptance: **May 19, 2015**
Date of Publishing: **Jul 01, 2015**