The caroticoclinoid foramen formation in the human skull and its clinical correlations

Alexandre Rodrigues FREIRE[1] +
Ana Cláudia Rossi[1]
Felippe Bevilacqua PRADO[1]
Paulo Henrique Ferreira CARIA[1]
Paulo Roberto BOTACIN[2]

Department of Morphology, State University of Campinas - UNICAMP, Piracicaba [1], Department of Basic Sciences, Paulista State University - UNESP, Araçatuba [2], SP, BRAZIL.

+ Mr. Alexandre Rodrigues Freire
Postgraduate Student
Department of Morphology
State University of Campinas
UNICAMP, Piracicaba, SP, BRAZIL.
(+55 19 21065200)
alefreire@fop.unicamp.br

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ABSTRACT
Numerous structures of the skull are well defined in literature. But there are some inconstant structures, which when present may be located in the sphenoid bone by the junction of the anterior and middle clinoid processes. The aim of this study was to evaluate the characteristics of caroticoclinoid foramen in Brazilian human skull. This case report shows a female dry human skull with 2 caroticoclinoid foramina. The largest diameter of this structure was found 5.5 mm on the right side and 5.4 mm on the left. Although being an uncommon foramen, the knowledge is important because it is located in the sphenoid bone, an important region for neurosurgery. © IJAV. 2010; 3: 149–150.

Key words: (caroticoclinoid foramen) (human skull) (neurosurgery)

Introduction
The caroticoclinoid foramen is an inconstant structure which is located in the anterior cranial fossa, composed by the ossification of a fibrous ligament [1] that begins on the anterior clinoid process and binds to the middle clinoid process [2]. Caroticoclinoid foramen, allows the passage of one of six segments of the internal carotid artery, the clinoidal segment [3].

The fibrous ossification of ligaments is considered a normal physiological process that occurs with aging, however this process is an exception when one considers the formation of the caroticoclinoid foramen [4]. Study by Hochstetter [5] revealed the presence of this foramen in fetuses and children skulls.

The aim of this study was to evaluate the characteristics of caroticoclinoid foramen in a Brazilian dry human skull and the clinical influences that this structure may generate, covering an area where neurosurgical operations are common.

Case Report
This work reports about caroticoclinoid foramen, on both sides, encountered in a dry adult human skull, female, belonging to the anatomy laboratory of the Department of Basic Sciences, Faculty of Dentistry of Araçatuba, Paulista State University. The anterior clinoid process was intact and there was complete ossification of the fibrous ligament between anterior and middle clinoid processes. This foramen was located in the middle cranial fossa, and related medial to the anterior clinoid process and lateral to the tuberculum of sella turcica. It was also located posterior to the optic canal and anterior to the pituitary fossa, as was observed in this case (Figure 1).

The morphometry of each foramen was performed using a manual caliper. The larger transverse diameter was measured, from the edge formed by the ossified ligament until the edge formed by the anterior clinoid process. To avoid errors in measurement, it was performed three times by the same examiner being regarded as the repeated values. The diameter of the foramen was 5.5 mm on the right side and 5.4 mm on the left.

Discussion
Caroticoclinoid foramen is formed after the ossification of the fibrous ligament that connects the anterior and middle clinoid processes. When there is no ossification of the fibrous ligament in the dry skull only a space between the anterior and middle clinoid processes is observed (Figure 2).

In this case, the foramen observed had a diameter of 5.5 mm on the right side and 5.4 mm on the left, similar to results reported by Ozdogmus et al. [4], who performed measurements of the caroticoclinoid foramen in 50 human autopsies (average of 5.14 mm on the right side and 5.25 mm on the left); there was no statistically significant difference when comparing gender and age. Erturk et al. [6] measured the diameter of the distal area of internal carotid artery in its clinoid segment and...
found an average diameter of 5.24 mm on the right side and 5.25 mm on the left, diameters were larger than the caroticoclinoid foramen.

The formation of this foramen may cause compression and narrowing of the internal carotid artery, located medially to the anterior clinoid process [4]. Changes in internal carotid artery may cause compression of the cavernous sinus because of its medial position [7,8]. The study by Das et al. [9] shows that the presence of the caroticoclinoid foramen causes morphological changes in the internal carotid artery in almost all cases. These variations occur due to the presence of foramen, which cause difficulty in performing a neurosurgical technique in the region [7].

In clinical practice, when occurs a paraclinoid aneurysm, the anterior clinoid process is removed as a treatment [8]. In this treatment there is more difficulty when the caroticoclinoid foramen is present, causing higher possibility of serious bleeding in this region [10]. Due to the great caliber of internal carotid artery in this region, the possibility of headache due to compression by the foramen is high [4]. This feature is crucial for the choice of surgical removal of the anterior clinoid process.

After the removal of the anterior clinoid process, a space is observed: the clinoid space, which has triangular shape and small size [7]. Sekhar and Akin [11] affirmed that this space varies according the dimensions of anterior clinoid process and the internal carotid artery [11]. Furthermore, their work showed the position of the caroticoclinoid foramen in an area close to the one occupied by the cavernous sinus. The formation of the caroticoclinoid foramen may change the dimensions of this area [11], considered by some authors as intracavernous [8]. Other authors consider it as an area outside the cavernous sinus [2,3].

The formation of the caroticoclinoid foramen may cause changes in the internal carotid artery, especially in clinoid segment, when comparing the transverse diameter of these structures. Thus, it is concluded that the presence of this foramen has important clinical implications, and its knowledge is required for better planning of surgical treatments that involve this region.

References