

## Case Report

# Ossification of caroticoclinoid ligament and its clinical importance

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### Abstract

**Introduction-** The carotico-clinoid foramen is the result of ossification either of the carotico-clinoid ligament or of a dural fold extending between the anterior and middle clinoid processes of the sphenoid bone. It is anatomically important due to its relations with the cavernous sinus and its content, sphenoid sinus and pituitary gland.

**Case study-** In this study the presence of carotico-clinoid foramen has been observed in one skull out of 40 dry skulls. Authors have reported one skull in which, a foramen clinoideo-caroticum or carotico-clinoid foramen seen as a consequence of fusion of anterior and middle clinoid processes on right side while an incomplete ossified ligament on left side.

**Conclusion-** The existence of a bony carotico-clinoid foramen may cause compression, tightening or stretching of the internal carotid artery. Further, removing the anterior clinoid process is an important step in neuro - surgery; the presence of a bony carotico-clinoid foramen may have high risk. Therefore, detailed knowledge of the type of ossification between the anterior and middle clinoid processes can be necessary to increase the success of regional surgery.

**Keywords:** Skull, Sphenoid bone, Carotico-clinoid foramen, Carotico-clinoid ligament

## 1. Introduction

The medial end of the lesser wing of the sphenoid bone forms the anterior clinoid process (ACP). It provides attachment to the free margin of the tentorium cerebelli and is grooved medially by the internal carotid artery. The ACP is joined to the middle clinoid process (MCP) by the carotico-clinoid (CC) ligament, which is sometimes ossified. A dural fold extending between the anterior and middle clinoid processes or ossification of the CC ligament may result in the formation of the carotico-clinoid (CC) foramen<sup>1</sup>. The CC foramen was first described by Henle (1855), as an osseous bridge between the tip of the middle and anterior clinoid processes which transmits one of the segment of internal carotid artery<sup>2</sup>. In neurosurgical operations, the ACP is usually accessed in order to gain entry into the clinoid space. After the internal carotid artery leaves the cavernous sinus, it is related medially to the ACP. The presence of an ossified CC ligament may form a potential site for compression of the internal carotid artery. Abnormal variations in the ACP may pose a risk while it is being removed in regional surgical procedures<sup>3</sup>. Research studies have also reported the fact that an ossified carotico-clinoid ligament which makes the removal of anterior clinoid process more difficult, especially in the presence of an aneurysm<sup>4</sup>.

Due to the great caliber of internal carotid artery in this region, the possibility of headache due to compression by the foramen is high<sup>5</sup>. This feature is crucial for the choice of surgical removal of the anterior clinoid process. The formation of the carotico-clinoid foramen may cause changes in the internal carotid artery, especially in clinoid segment, when comparing the transverse diameter of these structures. Changes in the internal carotid artery may cause compression of the cavernous sinus because of its medial position<sup>6</sup>.

## 2. Case Report

During routine osteology teaching for undergraduate medical students, we observed an anomalous CC ligament in a skull bone. Anomalous ossification of the CC ligament was noted and the specimen was photographed (Figure 1). The ossified CC ligament was found to extend between the ACP and the MCP. On right side it is complete forming CC foramen while on left side it found to be incomplete.

Figure-1: CC foramen on right side (1) and incomplete ossified CC ligament on left (2)



### 3. Discussion

The ACP forms the attachment site for the free anterior margin of the tentorium cerebelli, whereas the MCP provides the attachment for the diaphragma sellae. The parts of the sphenoid bone that are usually reported as capable of ossification are the pterygospinous and interclinoid processes. As described in conventional textbooks of anatomy, the ACP may be joined to the MCP by a ligament or dural fold<sup>1</sup>. The internal carotid artery is present in the medial groove of the ACP and it may be compressed by the ossified CC ligament, giving rise to vascular complications. The presence of an ossified CC ligament is likely to cause compression and straightening of the internal carotid artery<sup>5</sup>. In clinical practice, when a paraclinoid aneurysm occurs, the anterior clinoid process is removed as treatment for this disease. This treatment is more difficult when the CC foramen is present, causing higher possibility of serious bleeding in this region.<sup>7</sup>

### 4. Conclusion

Knowledge of the prevalence of carotico-clinoid foramen helps the neuro-surgeons for pre-operative scanning and precautions can be taken to prevent fatal complications during surgery. Considering the fact that the anatomy text books do not provide a detailed description of the carotico-clinoid ligament or foramen, the present study proves especially relevant to neurosurgeons in day to day clinical practice.

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