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CASE REPORT

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The ossified interclinoid ligament

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The paper presents an anatomical description of the ossified interclinoid ligament which was found in a male human skull. In the case studied the ossified ligament exists as a bony bridge between the anterior and posterior clinoid processes on the left side of the skull. The length of this connection was measured as 5.0 mm, while its thickness was 3.2 mm. We conjecture that the presence of a considerably thick bony trabecula within the sella region might have had an impact on the course of the internal carotid artery or the oculomotor nerve, causing compression of these structures.

Key words: calcification, clinoid processes, taenia interclinoidea, sellar bridge, sphenoid bone

INTRODUCTION

Ossification of the ligaments around the sella turcica may give rise to bony bridges that connect the clinoid processes and other surrounding structures. These sellar bridges can develop unilaterally or bilaterally and vary in frequency [9]. The interclinoid ligament is potentially the background to the formation of an irregular osseous structure as a result of soft tissue calcification. Ossification of the interclinoid ligament usually leads to so-called, "bridging" of the sella, which can be complete or partial. The presence of the ossified interclinoid connection may be significant in surgical management and may manifest clinical symptoms, depending on its size [3, 6, 12].

The aim of this study was to present the ossified interclinoid ligament morphologically and to consider its possible impact on the surrounding neurovascular structures.

MATERIAL AND METHOD

A standard anatomical study was performed on a contemporary male skull of about 20 years of age housed in the Department of Anatomy of the Collegium Medicum of the Jagiellonian University. The skull is well preserved and shows normal craniofacial morphology. Anatomical structures that are observed on the external aspect of the skull are properly developed and clearly pronounced. After the calvaria had been dissected, a bony bridge between the left anterior and posterior clinoid processes was noted. In order to document the presence and image of this structure, photographs were taken using a digital camera (Canon EOS D30). Measurements of the interclinoid bony bridge were performed on the digital images using ImageJ software (public domain software written by Wayne Rasband and available from http://rsb.info.nih.gov/ij).

RESULTS

A bony bridge connecting the anterior and posterior clinoid processes was noted on the left side of the middle cranial fossa (Fig. 1). We conjecture that this structure appeared as the ossified interclinoid ligament. The bridge tapers towards the posterior clinoid process. It extends from the apex of the left anterior clinoid process and passes posteriorly and medially to the tip of the left posterior clinoid process (Fig. 2). This connection is at an angle of 45 degrees with respect to the mid-sagittal line. The length of this bony trabecula was measured as 5.0 mm and its thickness was 3.2 mm.

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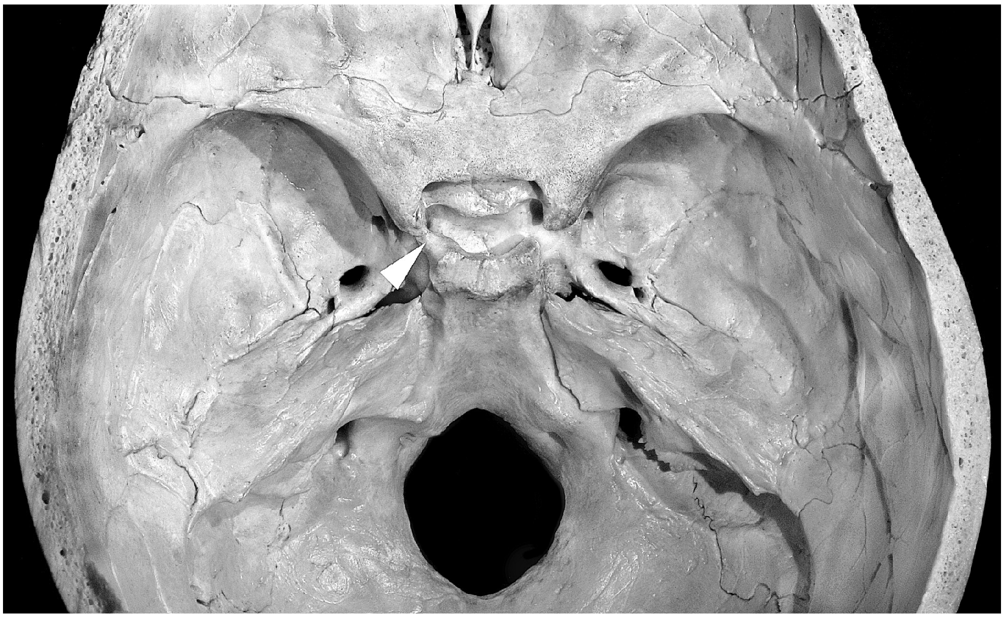
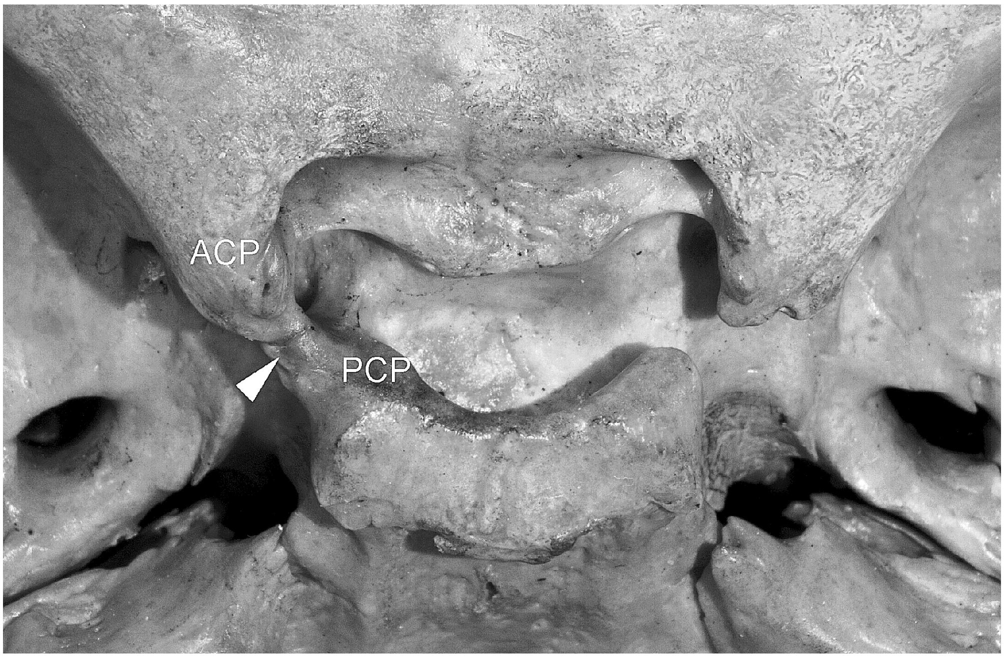


Figure 1. General view of the interior of the cranial base. Note unilateral ossification of the clinoid processes (indicated by arrow).



Rycina 2. A close-up view on the paraclinoid region. The left anterior ond posterior clinoid processes are fused (sellar bridge idicated by arrow). ACP — anterior clinoid process; PCP — posterior clinoid process.

DISCUSSION

Calcification of the ligaments that are stretched between the anterior, middle and posterior clinoid processes of the sphenoid bone may lead to the formation of sellar bridges or inconstant foramina. The caroticoclinoid foramen results from an ossified ligament that unites the anterior with the middle clinoid process. Ossification of the ligament that connects the tips of the anterior and posterior clinoid processes produces a solid interclinoid bar [2].

Formation of the sellar bridges may result directly from the pattern of sphenoid development or can be dictated by the physiological activities of chemical compounds that are involved in embryogenesis and build up the bones. Intracranial calcification is a condition in which mineral calcium and sometimes other chemical compounds are deposited on the soft tissue structures, causing it to harden. Soft tissue bone deposition may range from the minimal and inconsequential to the massive and clinically significant. Proteins play an essential role in promoting or slowing down the calcification process. Some proteins seem to start the crystallising process in tissues containing high levels of calcium. Others control the mechanism of hardening an ossifying structure or inhibit this process. For example, matrix Gla protein inhibits calcification in soft tissues, while osteopontin slows down the ossification in hard tissues [8, 13].

The ossified interclinoid ligament forms a bony bridge (sellar bridge) between the anterior and posterior clinoid processes of the sphenoid bone. The greater part of the bone develops using the endochondral method of ossification. Until the seventh or eighth month of foetal life the body of the sphenoid consists of two parts: the presphenoid (in front of the tuberculum sellae) and the postsphenoid (comprising the sella turcica and dorsum sellae). The presphenoid cartilages will form the anterior body of the sphenoid bone. Portions of the presphenoid cartilage give rise to the cartilage, which forms the central portion of the anterior skull base. The postsphenoid cartilage encloses the pituitary gland and fuses to form the basisphenoid, from which the sella turcica and the posterior body of the sphenoid bone originate. The sellar bridges can be laid down in cartilage during sphenoid development and ossify in early childhood. Further changes in anatomy of the sphenoid are related only to sequential fusing of its parts and replacement of remnants of cartilage by bone tissue [7].

The ossified interclinoid ligament is rarely found in a human population. In literature the frequency of this bony formation is given as 4–9% [3–5]. It appears unilaterally more frequently than bilaterally. Bilateral complete ossification of the interclinoid bridge was found by Ozdogmus et al. [9] in 6% of the population. The incidence of the interclinoid osseous bridge was evaluated as 8% in the Turkish population. According to Cederberg et al. [1] the degree of calcification of the interclinoid ligament does not vary by gender but shows a weak positive correlation with age. The ossified interclinoid ligament occurs as a complete or incomplete bony bar [10].

The presence of the interclinoid ligament has specific correlations to the surrounding structures, including the cavernous sinus. An interclinoid ligament bisects the wall of the cavernous sinus, dividing it into two triangles: the carotid trigone anteromedially and the oculomotor trigone posterolaterally [12, 14]. Thus ossification of this ligament may influence such structures as the internal carotid artery or the oculomotor nerve.

In our case the ossified interclinoid ligament has the form of quite a thick bony trabecula, which unites the anterior and posterior clinoid processes. It could therefore affect surrounding neurovascular structures, causing clinical symptoms. This bridge might influence the blood flow in the left internal carotid artery or cause dysfunction of the muscles of the eye on the left side owing to possible compression of the oculomotor nerve. Hence this anatomical variation is also related to difficulties in microsurgical dissection and drilling in the cavernous region.

Anomalies of the interclinoid ligament and its variation should be described and discussed in medical literature, as there is still a lack of detailed information on this structure and its prevalence. Knowledge of structural abnormalities is essential for understanding the aetiology of some clinical symptoms and for safety in surgical management [11].

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