Ossification of interclinoid ligaments and their clinical importance

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Abstract
Ossification of the interclinoid ligaments is a rare anatomical finding. Because of its proximity
important neurovascular structures, it may produce serious clinical complications, as well
causing difficulty in surgical procedures for treating aneurysms and tumors in structures
neighboring the sella turcica. This report consists of an anatomical and morphometric study
on interclinoid ligament ossification, seen in superior view of the base of two dry human crania
belonging to the Anatomy Laboratory of Tiradentes University (one 38-year-old male and one
45-year-old female). It was observed that in one of them, the ossification occurred bilaterally
and completely, while in the other, the interclinoid ossification was only completed on the right
side, with incomplete ossification on the left side. The mean length, width and thickness of the
ossifications were 4.72 mm, 2.14 mm and 1.94 mm, respectively.


Key words [anatomy] [ligament] [base of cranium] [sphenoid bone] [sella turcica]

Introduction
In superior view of the base of the cranium, the body of the
sphenoid bone presents two bony prominences located
laterally to the optic canals: the anterior clinoid processes
(ACPs). Similarly, the posterior clinoid processes (PCPs) are
located on each side of the lateral portion of the dorsum of
the sella turcica. These processes are usually connected
by the fibrous interclinoid ligaments (ICLs). However, they
may undergo an ossification process, thus giving rise to an
anatomical variation that is considered by some authors to
be rare [1–6]. Its nomenclature in the literature is still vague,
and it has been named variously as the interclinoid tenia, sella
bridge or interclinoid bony bridge [1]. On the other hand, it
has been highlighted that the proximity of these processes to
neurovascular structures may produce clinical symptoms and
interfere with surgical procedures in the region, depending
on their size [2]. In view of the great importance of detailed
anatomical knowledge of the paraclinoid region, the aim of
the present study was to describe occurrences of ICL ossification
in two dry human crania.

Case Report
Anatomical descriptions of two dry human crania (cranium-1:
38-year-old male; cranium-2: 45-year-old female), both
belonging to the Anatomy Laboratory of Tiradentes
University, were made. The occurrences of ICL ossification
were documented by means of photographs obtained using
a digital camera (Sony DLSR-A100K). Using Vonder digital
calipers, the following measurements were made: length
(distance between the apices of the ACP and PCP); height
(distance between the upper and lower faces of the ICL; width
of ossification (distance between the medial and lateral
margins of the ICL); and the height and length of the interclinoid
foramen delimited by the ICL ossification. In cranium no. 1,
the ICL ossification was complete, and the ACP was fused to
the PCP bilaterally, in the form of a suture-like joint (Figure
1). In cranium no. 2, there was complete ossification of the ICL
on the right side and incomplete ossification in the left side
(Figure 2). On the same side, a very prominent bone spicule
was observed, inferolaterally to the middle clinoid process,
going towards the apex of the ACP. The morphometric data
are presented in Table 1.

Discussion
In the present observations, there were three occurrences
of complete ossification of the ICL. Two of them were
bilateral occurrences in a single cranium, while in another
cranium, there was complete ossification on the right side
and incomplete ossification on the left side. The complete
ossifications described here were similar to other reported
cases [2, 3], including the format of bone bridges joining the
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ACP to the PCP. On the other hand, no detailed descriptions of the morphology of incomplete ossifications were found. Studies on this type of ossification have evaluated their occurrence in different populations, such as in Turkey (6% of the crania evaluated presented complete bilateral ossification, without any significant correlation with the ages of the crania) [1]; in the United States (8% with complete ossification and 39% with incomplete ossification; weakly correlated with age but not with sex) [4]; in Brazil (complete bilateral ossification in around 2.21% of the sample) [5]; and in India (complete ossification in around 4% of the crania evaluated) [6]. The data on the frequency of occurrences of interclinoid ligaments do not form any pattern between different studies, which shows that ossification of these ligaments is still a rare anatomical finding.

These structures often do not trigger any clinical symptoms of any nature [3]. However, surgical removal of the ACP, which is necessary in order to expose the structures of the cavernous sinus, is a highly complicated process because of its relationship with neurovascular structures. Thus, because ossification interferes with this structure, the presence of an ossified ligament between the ACP and the PCP may make intracranial surgical procedures such as removal of meningiomas from the tubercle of the sella and treatment of paracloidal aneurysms even more difficult and risky [1, 3, 6]. For this very reason, descriptions of occurrences of ossification of the ICL continue to be important because of their applicability, especially in cases that require surgical intervention in regions neighboring the sella turcica.

References


Table 1. Morphometry of the interclinoid ligaments. (Units in mm)

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Cranium no. 1</th>
<th>Cranium no. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Side</td>
<td>Side</td>
</tr>
<tr>
<td>Height of interclinoid foramen</td>
<td>Right 3.66</td>
<td>Left 5.47</td>
</tr>
<tr>
<td></td>
<td>Right 5.47</td>
<td>Left 5.92</td>
</tr>
<tr>
<td>Length of interclinoid foramen</td>
<td>Right 12.96</td>
<td>Left 13.72</td>
</tr>
<tr>
<td></td>
<td>Right 18.20</td>
<td>Left 18.59</td>
</tr>
</tbody>
</table>

Figure 1. Interclinoid ligament ossified bilaterally. (ACP: anterior clinoid process; PCP: posterior clinoid process; COIL: complete ossification of interclinoid ligament; HF: hypophyseal fossa)

Figure 2. Interclinoid ligament ossified completely on the right side. (ACP: anterior clinoid process; PCP: posterior clinoid process; COIL: complete ossification of interclinoid ligament; IOIL: incomplete ossification of interclinoid ligament; HF: hypophyseal fossa)