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Case Report

Dural arteriovenous fistula with crista galli erosion in a patient with suspected sinusitis[☆]

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ABSTRACT

Dural arteriovenous fistula (dAVF) of the anterior cranial fossa is an aggressive entity with a high risk of intracranial hemorrhage. A 38-year-old woman presented to our institution with nasal obstruction and discharge. Computed tomography (CT) scans performed for suspected sinusitis revealed erosion of the crista galli predominantly on the left side. The frontal and ethmoidal sinuses adjacent to the crista galli were clear and did not communicate with the crista galli. Contrast computed tomography scans revealed ectatic vessels adjacent to the crista galli, coursing on the cortical surface. Cerebral angiography identified an anterior fossa dAVF supplied by the bilateral anterior and posterior ethmoidal arteries and drained by the dilated cortical veins. Based on these findings, we assumed that long-term compression by the pulsatile draining veins caused the erosion. The patient underwent successful microsurgical disconnection procedure of the dAVF with an uneventful postoperative course. We concluded that external erosion of the crista galli could be a sign of aggressive dAVF and requires careful examination.

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Introduction

The crista galli is a crest-shaped, bony spine that projects upward and is located in the midline above the cribriform plate. It is known to be an anatomical landmark of the anterior cranial fossa and can be pneumatized to varying degrees [1–4]. Diverse pathologies, including frontal and ethmoidal mucoceles, can affect the crista galli [5,6]. Dural arteriovenous fistulas (dAVFs) are abnormal arteriovenous shunts formed in

the cranial and spinal dura mater, secondary to sinus or venous obstruction. In rare instances, dAVF can arise following a head trauma [7]. dAVFs infrequently arise in the anterior cranial fossa, adjacent to the crista galli. Such dAVFs, called anterior fossa or ethmoidal dAVF, represent 6% of all intracranial dAVF cases and show an aggressive behavior with a high risk of intracranial hemorrhage [8,9]. Surgical disconnection procedure is generally considered as the standard treatment for anterior fossa dAVFs [8,10,11]. In selected cases, endovascular treatment has also been adopted with satisfactory outcomes

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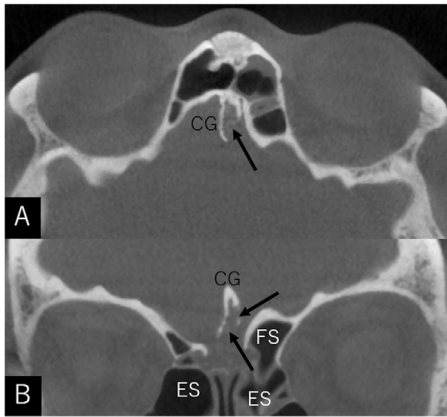


Fig. 1 – Axial (A) and coronal (B) bone target computed tomography scans showing external erosions of the CG, predominantly on the left side (A and B, arrows). Note that the frontal and ethmoidal sinuses adjacent to the CG are clear and do not communicate with the CG. CG, crista galli. ES, ethmoidal sinus; FS, frontal sinus.

[12,13]. Bone erosion associated with an intracranial dAVF is very rare. To the best of our knowledge, only one case of bone erosion due to dAVF has been documented to date [14]. Herein, we present a unique case of anterior fossa dAVF with external erosion of the crista galli that was found incidentally during evaluation for sinusitis.

Case report

Clinical presentation

A 38-year-old previously healthy woman presented to a local otorhinolaryngology clinic with a 1-month history of nasal obstruction and discharge. There was no history of previous head trauma. Computed tomography (CT) scan revealed abnormalities of the crista galli, and the patient was then referred to our department. Neurological examination was normal and there was no olfactory dysfunction.

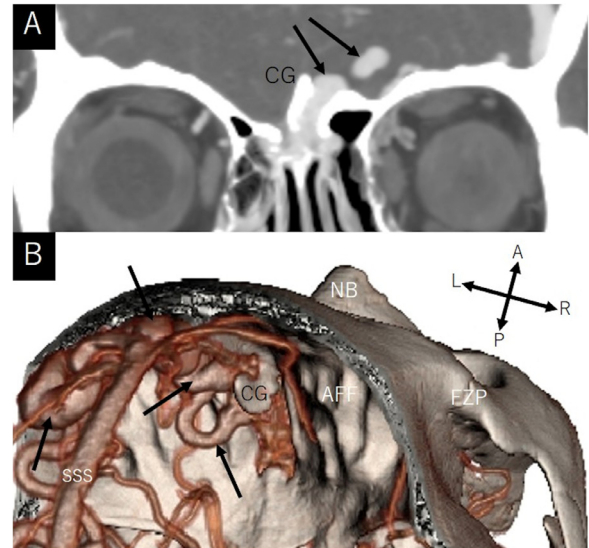


Fig. 2 – Postcontrast coronal (A) and three-dimensional (B) computed tomography scans showing ectatic vessels adjacent to the left side of the CG, coursing on the surface of the left frontal lobe (A and B, arrows). A, anterior; AFF, anterior fossa floor; CG, crista galli; FZP, frontozygomatic process; L, left; NB, nasal bone; P, posterior; R, right; SSS, superior sagittal sinus.

Imaging analysis

Cranial CT scan taken for screening sinusitis revealed external erosions of the crista galli, predominantly on the left side. The frontal and ethmoidal sinuses adjacent to the crista galli were clear and did not communicate with the CG (Fig. 1). Contrast CT scan revealed ectatic vessels adjacent to the crista galli on the left side, coursing on the surface of the left frontal lobe (Fig. 2). Cerebral angiography identified an anterior fossa dAVF supplied bilaterally by the anterior and posterior ethmoidal arteries and drained by the dilated cortical veins (Fig. 3). The patient was educated on the natural history of the condition and the treatment strategies for asymptomatic dAVF, following which she requested to undergo surgery. Microsurgical disconnection procedure was performed. The postoper-

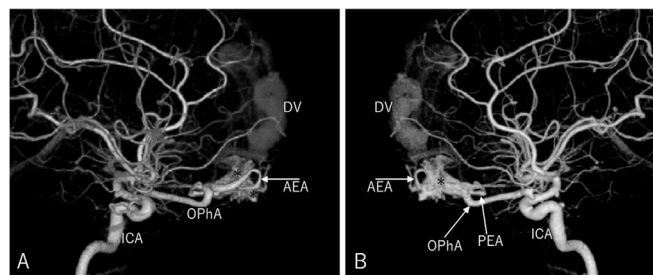


Fig. 3 – Preoperative right (A) and left (B) internal carotid angiography lateral views showing abnormal arteriovenous shunts supplied by the anterior and posterior ethmoidal arteries (A and B, asterisk) and drained by dilated cortical veins. AEA, anterior ethmoidal artery; ICA, internal carotid artery; OPhA, ophthalmic artery; PEA, posterior ethmoidal artery.

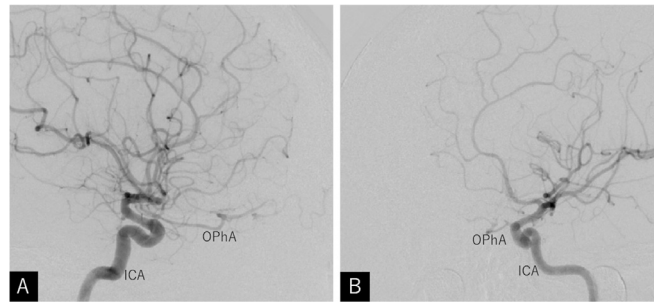


Fig. 4 – (A, B) Postoperative right (A) and left (B) internal carotid angiography, lateral views, showing elimination of the pre-existing abnormal arteriovenous shunts and dilated draining vein except for insignificant stains in the localized area of the anterior fossa dura. ICA, internal carotid artery; OPhA, ophthalmic artery.

ative course was uneventful, without any new neurological deficits. Cerebral angiography confirmed elimination of the pre-existing dAVF and the associated draining veins except for insignificant stains in the localized area of the anterior fossa dura that disappeared on follow-up angiography (Fig. 4).

Discussion

In the present case, CT scans and angiography identified an ectatic draining vein of the offending dAVF adjacent to the eroded crista galli. Furthermore, the frontal and ethmoidal sinuses adjacent to the crista galli were clear and did not communicate with the crista galli. Therefore, we assumed that long-term compression by the pulsatile, arterialized draining veins of the dAVF caused the erosion. A similar case has been described in a previous report in which calvarial erosion was caused by a dAVF supplied by the middle meningeal artery [14]. To the best of our knowledge, this is the first reported case of dAVF-associated crista galli erosion. The appearance of this erosion was different from the bone erosions caused by mucoceles, which present as expansile lesions with internal erosion of the crista galli [5,6]. In clinical practice, the crista galli is generally acknowledged as a landmark in anterior cranial fossa surgeries, and it may present with varying degrees of pneumatization [3,5,6]. Moreover, it should be regarded as an indicator reflecting symptomatic and asymptomatic pathological conditions in the intracranial cavity. Internal erosion of the crista galli has been documented mainly in association with the pneumatization of it, while the external erosion has little been mentioned [1–6,14]. External erosion of the crista galli may be a sign of underlying pathology to be managed. Such erosion can be caused by tumorous lesions that are discriminated from a dAVF on contrast examination.

In contrast with the dAVFs developing at other intracranial sites, those developing in the anterior cranial fossa are known to be more aggressive and have a high risk of bleeding, which necessitates timely management [8,9]. Therefore, although asymptomatic, our patient decided to undergo a prompt disconnection maneuver of the dAVF.

To conclude, external erosion of the crista galli may be a sign of an aggressive dAVF and requires careful examination.

Author contributions

All the authors contributed equally to the study.

Ethical standards and patient consent

We declare that the present study has been approved by the institution's guidelines for human research and performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. We declare that the patient described in this study gave informed consent prior to inclusion in this study.

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