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## CASE REPORT

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## Dural Arteriovenous Fistula Involving the Posterior Condylar Canal

**SUMMARY:** Although dural arteriovenous fistulas (DAVFs) occur in any structure that is covered by the dura mater, DAVFs at the posterior condylar canal have not been reported. We present a DAVF that involves the posterior condylar canal and drains into the posterior condylar vein and the occipital sinus, which was treated by selective transvenous embolization. Knowledge of venous anatomy of the craniocervical junction and careful assessment of the location of the arteriovenous fistula can contribute to successful treatment.

The posterior condylar canal is one of the important canals that communicate between the intracranial and extracranial space. Intracranial dural arteriovenous fistulas (DAVFs) can involve any structure that is covered by dural or meningeal matter. However, to the best of our knowledge, no case of DAVF involving the posterior condylar canal has been reported. We present the case of a patient with a DAVF that involves the posterior condylar canal. We also discuss the venous structures related to the posterior condylar canal.

### Case Report

A 54-year-old man presented with a pulse-synchronous bruit for 3 months. He had no history of head trauma or cerebrovascular disease. Neurologic examinations showed no abnormal findings except for the bruit around the left ear. MR angiography showed an abnormal signal intensity, which suggested a DAVF locating inferiorly to the sigmoid sinus and draining into the posterior cervical vein and the occipital sinus. An angiogram of the left external carotid artery showed that the arteriovenous fistula (AVF) was fed by the left ascending pharyngeal artery and the left occipital artery, and it drained through the posterior condylar vein into the sigmoid sinus and the paravertebral vein and into the occipital sinus (Fig 1A, B). The AVF was also supplied by the dorsal clival artery of the left internal carotid artery and the anterior meningeal arteries of both vertebral arteries (Fig 1C-F). Axial reconstructed images of rotational angiography of the left external carotid artery clearly demonstrated the relationship between the fistulous pouch and the draining veins of the posterior condylar vein and the occipital sinus (Fig 2).

Transvenous embolization was performed with the right femoral venous approach. A 5F/7F coaxial guiding catheter was advanced into the left jugular vein, and a microcatheter (Excelsior; Boston Scientific, Tokyo, Japan) was advanced through the guiding catheter. The microcatheter was introduced via the sigmoid sinus and the posterior condylar vein into the fistulous pouch, and then 3 detachable coils were placed in the pouch. Immediately

after the procedure, angiography showed complete occlusion of the AVF. CT after embolization showed coils at the left posterior condylar canal (Fig 3). The symptoms resolved, and no complications were observed during and after the procedure. A follow-up MR angiogram 3 months after embolization showed no recurrent AVF, and no symptoms recurred 14 months after the procedure.

### Discussion

The posterior condylar canal contains the posterior condylar vein and meningeal branches of the occipital artery. The posterior condylar vein originates from the anterior condylar confluence, the jugular bulb, or the sigmoid sinus at the most medial portion.<sup>1,2</sup> It drains through the posterior condylar canal into the suboccipital cavernous sinus or the paravertebral vein.<sup>1,2</sup> The occipital sinus is developed at the fetal period, which originates from the sinus confluence and drains mainly into the marginal sinus or the sigmoid sinus.<sup>3</sup> The occipital sinus diminishes after birth in most cases, but residual small, sinuslike structures are usually recognized on MR venography. A developed occipital sinus is occasionally found on cerebral angiography. However, the anatomic details of the occipital sinus in adults have not been investigated. In our investigation of MR venography of 23 cases without lesions affecting the venous structures at the base of the skull and craniocervical junctions, all cases showed the bilateral occipital sinuses. Among the 46 occipital sinuses, 40 continued into the marginal sinus, 3 were bifurcated into 2 venous structures and continued into the marginal sinus and the posterior condylar vein, and the remaining 3 continued into the posterior condylar vein at the origin (data not published). Knowledge of venous anatomy is important for understanding the drainage pattern of DAVFs at the craniocervical junction.

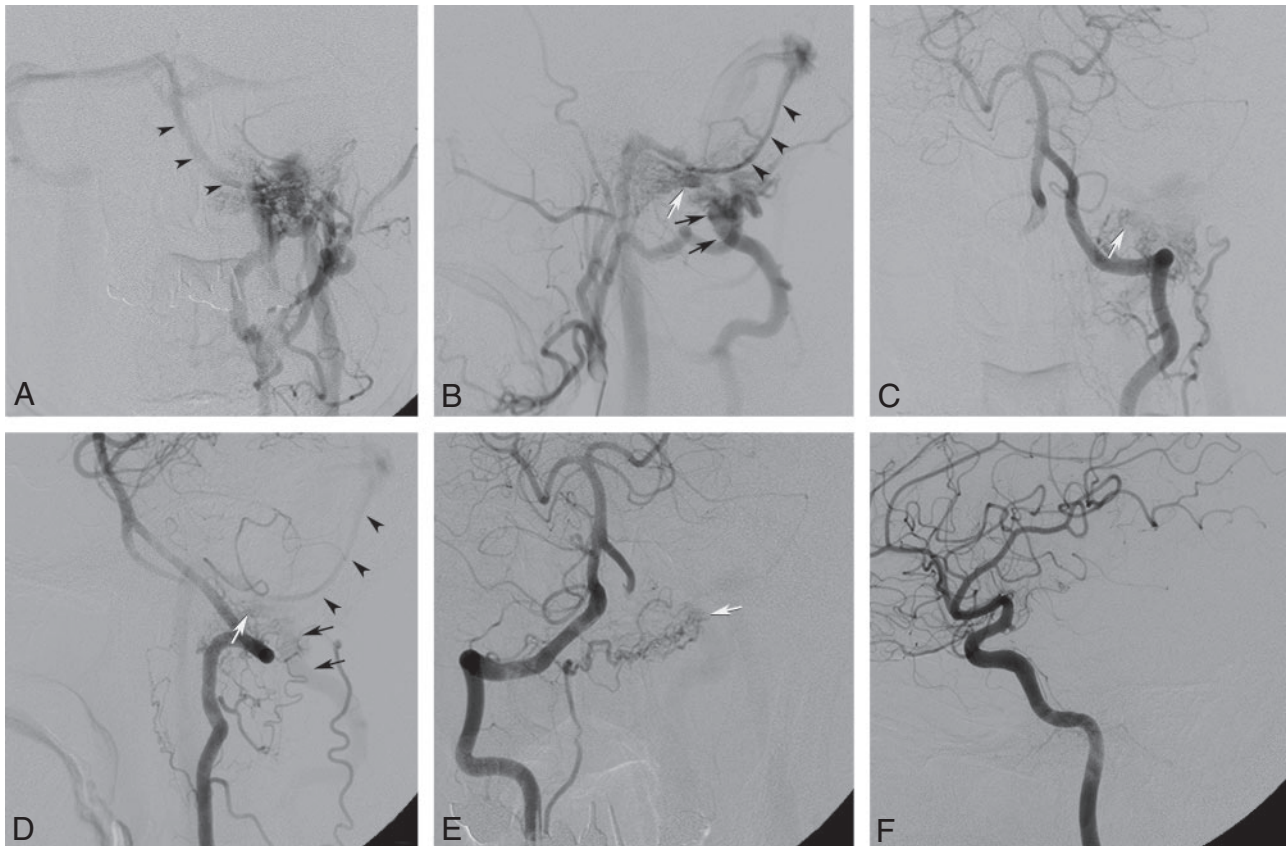
Although a few authors reported DAVFs that involve the anterior condylar canal,<sup>4-7</sup> DAVFs of the posterior condylar vein have not been reported. All published cases of DAVFs of the anterior condylar canal could be treated successfully with transvenous embolization of the fistulous venous pouch. Treatment strategy for DAVFs of both the posterior condylar and anterior condylar veins could be similar. Ernst et al<sup>4</sup> mentioned that source images of MR angiography were useful for description of the fistulous pouch. In the presented case, source images of MR angiography were useful, but axial reconstructed images of rotational angiography could demonstrate more clearly the relationship be-

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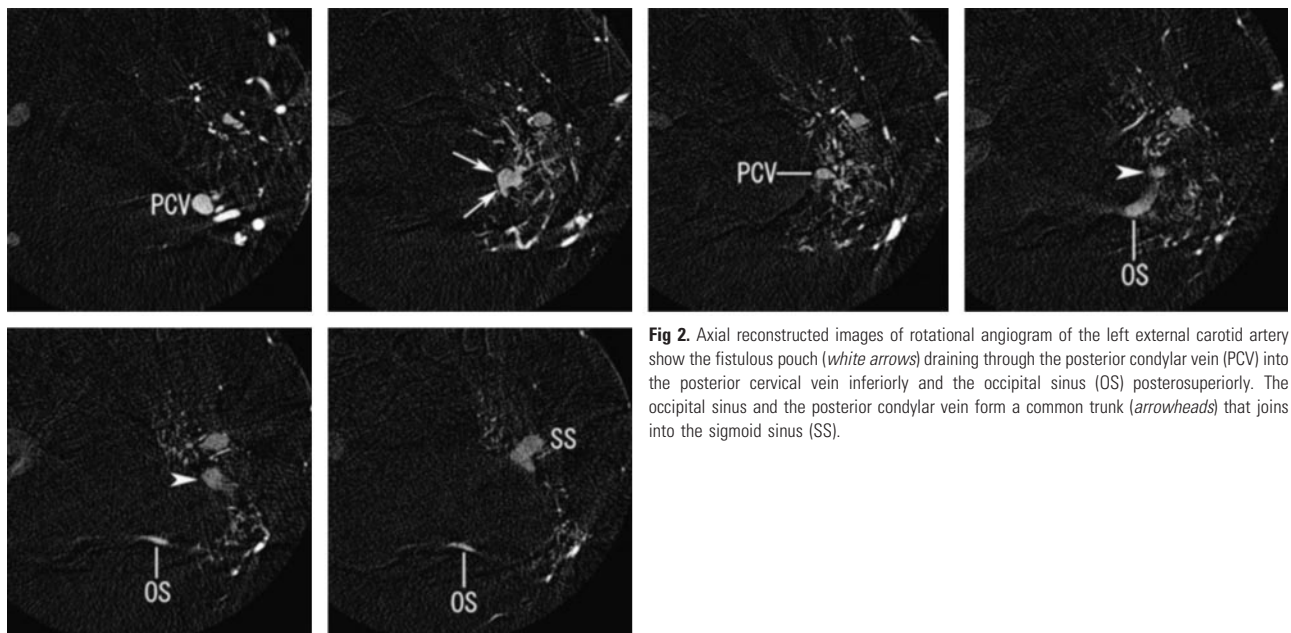
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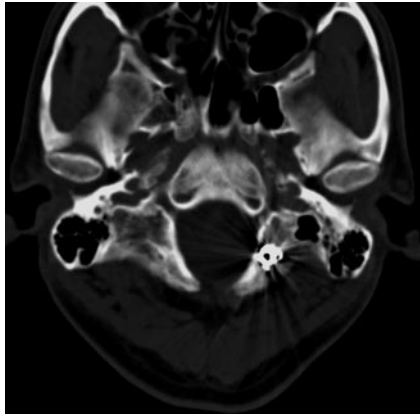
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**Fig 1.** Frontal (A) and lateral (B) views of an angiogram of the left external carotid artery show the AVF (white arrow) being fed by the left ascending pharyngeal artery and the left occipital artery, draining through the posterior condylar vein (black arrows) into the posterior cervical vein and sigmoid sinus and into the occipital sinus (arrowheads). Frontal (C) and lateral (D) views of an angiogram of the left vertebral artery show the AVF (white arrow) being fed by the left anterior meningeal artery. Black arrows indicate the posterior condylar vein, and arrowheads indicate the occipital sinus. Angiogram of the right vertebral artery (E) demonstrates the shunted venous pouch (white arrow) being fed by the right anterior meningeal artery. Angiogram of the left internal carotid artery (F) shows the AVF being fed by the dorsal clival artery.



**Fig 2.** Axial reconstructed images of rotational angiogram of the left external carotid artery show the fistulous pouch (white arrows) draining through the posterior condylar vein (PCV) into the posterior cervical vein inferiorly and the occipital sinus (OS) posterosuperiorly. The occipital sinus and the posterior condylar vein form a common trunk (arrowheads) that joins into the sigmoid sinus (SS).



**Fig 3.** CT after embolization shows coils at the left posterior condylar canal.

tween the fistulous pouch and the drainage veins and was useful for determination of the easiest route of transvenous access into the fistulous pouch. Knowledge of venous anatomy of the craniocervical junction and probing evaluation of the location and drainage veins of the DAVF can contrib-

ute to successful endovascular treatment of this AVF at the craniocervical junction.

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