CASE REPORT

Endovascular treatment of posterior condylar canal dural arteriovenous fistula

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SUMMARY

Posterior condylar canal dural arteriovenous fistulas (PCC DAVFs) are rare lesions that may present with pulse-synchronous bruit. In cases with venous reflux there is a risk of haemorrhage or even dementia. Diagnosis and endovascular treatment require a profound knowledge of the vascular anatomy of the craniocervical junction and comprehensive neurovascular imaging. We describe the clinical presentation, angiographic imaging and endovascular treatment of a PCC DAVF in a female patient with pulse-synchronous bruit as the presenting symptom. The fistula drained almost exclusively into the sigmoid sinus and internal jugular vein. There was no intracranial reflux. The PCC DAVF was treated with transvenous coil occlusion of the fistulous pouch in the condylar canal. Symptoms resolved immediately after intervention and the patient recovered quickly without any neurological deficits. MR angiography confirmed occlusion of the DAVF. The dural sinus was patent with normal blood flow.

BACKGROUND

Dural arteriovenous fistulas (DAVFs) of the posterior condylar canal (PCC) are very rare. To the best of our knowledge there are reports of only two cases.^{1 2} Symptoms of PCC DAVFs depend on the venous drainage of the fistula and may include pulsatile tinnitus or intracranial haemorrhage. When indicated, the PCC DAVF may be treated by endovascular occlusion of the fistulous pouch. We describe the angiographic findings and anatomical characteristics of PCC DAVFs and their endovascular treatment.

CASE PRESENTATION

A female patient was admitted to our hospital with a left-sided pulse-synchronous bruit for several years. Her case history showed that she had a left-sided PCC DAVF that had been treated elsewhere via transarterial coil embolisation 1 year previously. Her symptoms had improved somewhat after the intervention, but ultimately the tinnitus progressed with significant reduction in her quality of life.

INVESTIGATIONS

Clinical examination was normal without any neurological deficits except for the bruit around the left ear. CT angiography in the venous phase showed increased vascularisation around the craniocervical junction and a vascular cavity within the petrous bone (figure 1). Catheter angiography verified a DAVF with feeders from the left vertebral

artery, left ascending cervical artery and left external carotid artery. The ascending pharyngeal artery and occipital artery had been previously partially coil embolised but showed continued blood flow into the DAVF. The fistula drained through the posterior condylar vein (PCV) into both the suboccipital venous plexus and into the sigmoid sinus and the internal jugular vein (figure 2). The transverse and sigmoid sinuses of the contralateral side were hypoplastic with predominant venous outflow of both hemispheres via the left side.

TREATMENT

The patient was scheduled for transvenous embolisation with a right femoral arterial and venous approach. At the beginning of the procedure an intravenous bolus dose of unfractionated heparin (70 IU/kg) was administered. A 4 F diagnostic catheter (Cordis Neurovascular, Miami Lakes, Florida, USA) was placed in the left vertebral artery for repeated angiograms throughout the procedure. A 6 F guiding catheter (Envoy; Cordis Neurovascular) was placed into the left distal internal jugular vein and a microcatheter (Excelsior SL-10; Boston Scientific, Marlborough, Massachusetts, USA) was advanced via the guiding catheter through the jugular bulb and sigmoid sinus into the fistulous pouch. Adequate device placement was ensured via an integrated XperCT (Philips Healthcare, Best, The Netherlands; figure 3). Six detachable coils (Stryker Neurovascular, Fremont, California, USA) in the venous pouch completely occluded the DAVF (figure 4).

OUTCOME AND FOLLOW-UP

The bruit resolved immediately after the treatment and the patient recovered quickly without any neurological deficits. Post-interventional MR angiography confirmed the occlusion of the DAVF and regular perfusion of the sinus. The patient was left on low molecular weight heparin for 3 days and discharged 2 days after treatment. The patient lives abroad and has therefore been followed via telephone interview after 30 and 60 days. The course has been uneventful without any persistent or intermittent bruit and no headaches.

DISCUSSION

Emissary veins comprise part of the normal venous drainage system of the brain. In pathological situations such as jugular vein thrombosis it can be a very important alternative route.³ The PCC is the largest emissary foramen in the human skull and

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Figure 1 (A) Venous CT angiography shows the posterior condylar canal with the posterior condylar vein (PCV) (white arrow) and the venous fistulous pouch within the left petrous bone (black arrow). (B) Reduced contrast in the confluence from the PCV into the sigmoid sinus as a sign of high flow venous drainage (white arrow). There is separate drainage of the anterior condylar vein into the jugular bulb (black arrow).

allows communication between the jugular foramen and the condylar fossa.⁴ It contains the PCV and meningeal branches of the occipital artery.^{5 6} The origin of the PCV may be the anterior condylar confluence, the jugular bulb or the sigmoid sinus with anastomosis to the suboccipital venous plexus.¹ DAVFs of the PCV are a rare phenomenon with only two reported cases in the literature.^{1 2} However, DAVFs involving the anterior condylar vein originating from the anterior condylar confluence are more common and can even be associated with ophthalmoplegia secondary to drainage into the cavernous sinus.⁷ In our case the PCV had no connection either to the anterior condylar confluence or to the leptomeningeal veins draining the brainstem. Our patient was therefore not at risk of subarachnoid

haemorrhage, unlike the case published by Mondel *et al.*² Pulsatile tinnitus might be explained by antegrade turbulent blood flow into the sigmoid sinus, anatomically close to the petrous bone.

DAVFs may be treated with an endovascular approach, microsurgery or radiosurgery. However, surgical resection of a DAVF in this location is critical due to difficult access, significant risk of blood loss, nerve damage and craniocervical instability after condylar resection.^{8 9} Radiosurgery may be less appealing due to difficulties in defining the exact location of the arteriovenous shunt and the need to reduce radiation doses in order to avoid damage to adjacent nerves. Endovascular access can be transarterial and/or transvenous.⁹ The technique has to be adapted to

Figure 2 (A) Dural arteriovenous fistula (black arrowheads) with feeders from the left vertebral artery and venous drainage into the jugular vein (white arrowheads). (B) Left occipital artery and (C) left temporal artery with additional feeders into the fistula (black arrowheads).

Figure 3 (A) Transvenous approach with positioning of the microcatheter into the fistulous pouch and (B) confirmation via XperCT.

Figure 4 Final angiogram showing complete occlusion of the posterior condylar canal dural arteriovenous fistula. (A) The fistula pouch is filled with platinum coils (white asterisk). After contrast injection into the left vertebral artery (white arrowheads), patency of the jugular vein is preserved (black arrowheads) with absence of venous congestion. (B) Feeders from the left occipital artery are no longer detectable. The ascending pharyngeal artery is barely filled with contrast (white arrowhead). (C) Regular flow conditions after injection in the left temporal artery with perfusion of mucosa of the ethmoidal cells (white arrows) and absence of feeders.

the particular vascular anatomy and the angioarchitecture of the DAVF. In this case, the decision for a retrograde transvenous approach was because of convergence of multiple feeders from different arteries into the fistulous pouch. Furthermore, venous catheterisation of the pouch was technically feasible. The previous partial transarterial coil occlusion of feeding arteries proved unsuccessful. Detachable platinum coils were considered safer than transarterial liquid embolic agents, which may cause sinus thrombosis or cranial nerve palsy. The hypoplastic contralateral sigmoid and transverse sinus made it imperative to avoid coil displacement into the ipsilateral sinus, since this could have potentially caused intracranial venous congestion.

CONCLUSION

PCC DAVFs are very rare. They may present with bruit or, if there is cortical venous reflux, with hemorrhage. Endovascular occlusion of the venous pouch draining the DAVF may be the treatment of choice. The exact technique relies on careful analysis of the vascular anatomy of the region.

Learning points

- ▶ Posterior condylar canal dural arteriovenous fistulas (PCC DAVFs) are a rare entity.
- ▶ PCC DAVFs may present with bruit or, in cases of cortical venous reflux, with hemorrhage.
- ▶ The local pathoanatomy determines the endovascular technique.
- ▶ Transvenous embolisation may be the safest and most effective treatment option.

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