Endovascular Retrograde Cortical Venous Approach to Disconnect Retrograde Leptomeningeal Venous Reflux in a Patient with Dural AVF

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Summary

We report a case of dural arteriovenous fistula (DAVF) with cortical venous reflux in whom disconnection of the refluxing cortical vein was achieved by using a retrograde transcortical venous approach through the cortical vein itself.

Introduction

Aggressive intracranial DAVFs present a management challenge. The aim of treatment is prevention of cortical venous reflux. An endovascular arterial or venous approach although preferable is not always feasible for a variety of reasons.

We present a case, in which we could achieve disconnection of the cortical venous reflux, by going retrogradely in the cortical vein to reach the cortical venous exit of the DAVF.

Case Report

A 62 year old male who had undergone resection of a left sided acoustic schwannoma two years ago presented to our hospital with sudden onset of headache followed by a decreased level of consciousness.

A detailed history and examination was not possible as the Glasgow Coma scale was found to be 8. However, the patient had been on regular follow-up at the neurosurgery clinic and

from his records, there was no history of tinnitus, proptosis or red eye. A clinical diagnosis of subarachnoid haemorrhage was entertained and the patient underwent a CT scan which revealed an intraparenchymal haematoma in the left posterior temporal lobe (figure 1).

Post-operative changes were seen in the left petrous temporal bone. There was no evidence of residual or recurrent tumour. As the cause of the haematoma was not obvious on the CT scan the patient underwent an MR examination. There was no evidence to suggest a lesion in the brain parenchyma to explain the bleed although a single prominent vascular channel was seen in the vicinity of the bleed. MR venogram showed a narrow, irregular left transverse sinus (figure 2).

Subsequently, an intra-arterial cerebral angiogram was performed which revealed a dural AVF in the wall of the left transverse sinus with near complete thrombosis of the sinus itself. Multiple small arterial feeders supplied the AVF from branches of the left posterior auricular and occipital arteries (figure 3A). There was obvious cortical venous reflux into a large venous channel refluxing towards the left temporal lobe which finally drained into the sigmoid sinus and suboccipital venous plexus (figure 3B). The location of this refluxing vein was found to correspond to the vascular channel seen on the MR examination adjacent to the haematoma.

An endovascular approach was planned

Figure 1 Non-contrast CT scan shows an intraparenchymal haematoma in the left temporal lobe.

aimed at curing the cortical venous reflux. An arterial approach was deemed to be not definitive because of the size and multiplicity of the feeders although embolisation with polyvinyl alcohol (PVA) (size: 250-350 microns) was performed to diminish the inflow into the DAVF.

Access from the left transverse sinus proved not feasible as the sinus itself was nearly obstructed and the draining vein could not be

Figure 2 MR venogram using 2D-time-of-flight technique with reconstruction of angiographic projection using MIP algorithm. The left transverse sinus is narrow and irregular (arrows).

entered retrogradely. Hence, it was decided to try and approach the refluxing vein by a trans-venous approach in a retrograde fashion.

A microcatheter (Fastracker 18, Target Therapeutics, Fremont CA) with a guidewire (Dasher 14, Target Therapeutics, Fremont CA) was advanced into the left internal jugular vein and then into the cortical vein via the suboccipital venous plexus through a 5F guiding

Figure 3 Intra-arterial angiogram, left occipital artery injection, lateral view. Multiple small feeders are seen to supply a dural AVF in the wall of the left transverse sinus (arrow). The drainage of the AVF is through a cortical vein (curved open arrow) which finally exits to the suboccipital vein after a circuitous course. Note partially thrombosed transverse sinus (straight open arrow).

catheter. An arterial access was maintained with the catheter tip in the left occipital artery to serve as a road map. The microcatheter could be advanced retrogradely into the refluxing cortical vein close to the nidus of the dural AVF (figure 4).

Eight complex helical fibered platinum coils (3 x 30 mm, Target Therapeutics, Fremont CA) were deployed resulting in an absence of cortical venous reflux on the post-embolisation angiogram (figure 5).

A left internal carotid artery injection revealed preservation of drainage of the left temporal lobe through the previously catheterized vein (figure 6).

Injection into the left occipital artery showed no opacification of the DAVF. The patient developed a transient atrial fibrillation most likely due to the presence of the venous catheter in the right atrium but had an otherwise uneventful course after the procedure.

Discussion

The natural history of dural AVFs is dependent on the presence or absence of cortical venous drainage¹. The prognosis and risk of adverse events is significantly higher for patients in whom there is cortical venous reflux^{1,2}. Various classifications have been proposed^{3,4} and have been validated^{1,2} and can be correlated with the natural history of the disease. The natural history of the disease in the absence of

Figure 4 Lateral non-subtracted image showing the course of the microcatheter through the vertebral vein and retrogradely through the cortical vein (arrows). The coils were deposited adjacent to the AVF nidus. Note the presence of the arterial catheter in the left occipital artery to serve as a road map.

cortical venous reflux is quite benign requiring no treatment other than for symptom relief. In the presence of cortical venous reflux most often the aim of treatment is to prevent such reflux rather than curing the AVF itself. This

Figure 5 Post-procedure left external carotid artery injection, lateral view shows complete obliteration of the shunt with absence of cortical venous reflux.

Figure 6 Post-procedure left internal carotid artery injection, lateral view shows patency of the refluxing vein which is now draining the brain parenchyma rather than the AVF (arrows).

may be accomplished by surgical or endovascular means^{2,5}. When possible the endovascular route is preferable being less invasive.

In the present case the drainage of the DAVF was through a cortical vein which in turn drained into a partially obstructed transverse sinus further distally. This represented a high risk situation with a more than 20% chance of future intracerebral adverse events².

The therapeutic options included surgery to clip the vein at its junction with the AVF or to approach it retrogradely through an endovascu-

lar route as access to the vein proved to be not possible through the arterial route or through the transverse sinus. To the best of our knowledge, this is the first description of using the retrograde transcortical venous route to cure cortical venous reflux in a dural AVF.

We feel, that with the development of sophisticated microcatheter and guidewire systems, this novel approach can be used in those circumstances where the angioarchitecture would allow access to the site of cortical venous reflux from the DAVF.

References

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Since the submission of this paper, a similar report appeared in the literature:

- Deasy NP, Gholkar AR, Cox TCS, Jeffree MA: Tentorial dural arteriovenous fistulae: endovascular treatment with transvenous coils embolisation. *Neuroradiology* 41(4): 308-312, 1999.

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