A case of dural arteriovenous fistula with retrograde intracranial venous flow

Alexandros L. Georgiadis, MD1; Giuseppe Lanzino, MD2; Nazli Janjua, MD3; Jawad F. Kirmani, MD4; Adnan I. Qureshi, MD1

1Zeenat Qureshi Stroke Research Center, University of Minnesota
2Illinois Neurological Institute, University of Illinois College of Medicine at Peoria
3Department of Neurology, Long Island College Hospital
4Department of Neurology, University of Medicine and Dentistry of New Jersey

Abstract

Presentation: Dural arteriovenous fistulae are relatively rare lesions which can present a variety of different symptoms ranging from tinnitus to devastating intracranial hemorrhage. For those fistulae that require treatment, therapy is available in a wide range of options. We describe the case of a 60-year-old patient who presented with a right occipital lesion presumably secondary to a dural arteriovenous fistula of the right transverse-sigmoid junction. The patient underwent successful endovascular treatment of the fistula.

Discussion: The participants in our discussion present their thoughts on how to evaluate and when and how to treat dural arteriovenous fistulae.

Key words: Dural arteriovenous fistula, coil embolization, endovascular treatment, sinus thrombosis.

The patient tolerated the procedure very well. Neurological examination for the 24 hours following the procedure that he remained in the hospital was normal with the exception of his persisting left homonymous hemianopsia. MRI performed prior to discharge revealed an asymptomatic right hemispheric cerebellar hemorrhage (Figure 6). The timing of the asymptomatic hemorrhage was unclear.

The patient was seen again for follow up 2 months later. He had had no new symptoms. Repeat angiogram showed persisting obliteration of the right transverse sinus (Figure 7).

**Discussion**

*Dr. Georgiadis:* What is known about the pathogenesis of DAVFs, and do you believe that the fistula caused the patient’s lesion?

*Dr. Qureshi:* Both posterior cerebral arteries appeared normal.

*Dr. Lanzino:* So inspite of the arterial-looking distribution, I would wonder if this could be a venous infarct. Also, did you do a diffusion-MRI? It could be that the T2-changes that we saw were related to the altered hemodynamics, i.e. they could represent cerebral edema and not ischemia.

*Dr. Qureshi:* The MRI was obtained ten days after symptom onset because the patient did not seek medical attention earlier, and at that time diffusion MRI was negative.

I agree that there is clearly an association between sinus
If the formation of DAVFs was secondary to opening of pre-existing channels, which would be pressure-dependent, you would expect to see this occurring in the acute phase of sinus thrombosis. The fact that this phenomenon is not seen in the acute phase of sinus thrombosis supports the theory of angiogenesis through the release of vasoactive factors over a period of time.

When we were discussing this case we felt that we could not exclude that the DAVF was related to the patient’s lesion. The stroke appeared to be arterial in distribution but there was engorgement of the draining veins suggesting venous hypertension in the occipital region.

Dr. Georgiadis: Do you think that elaborate classification schemes such as those by Borden or Cognard are necessary? Dr. Lanzino: These classifications are often quite complex and difficult to remember. To me they are not that useful. I look at the factors that interest me and there are mainly two. The first factor is: is there any connection to the dural sinus? Some AV fistulas do not have a connection with the sinus and that is very important from a therapeutic point of view because such DAVFs are easily treated surgically. DAVFs with sinus involvement are usually more suited for endovascular treatment.

The other issue relates to cortical venous drainage. We know that retrograde cortical venous drainage is associated with a more aggressive clinical behavior which should prompt treatment. So these are the two factors that I look at when making therapeutic decisions.

In terms of whether this specific DAVF required treatment, I believe that it did. We had a lesion with aggressive angiographic features; i.e., the retrograde cortical venous drainage and also I would consider this fistula symptomatic.

Dr. Qureshi: I think that also in our minds, the retrograde cortical venous filling was decisive since it suggested the presence of venous engorgement and possibly also of venous hypertension. Based on that, the chance of bleeding in the future was high.

Dr. Georgiadis: How would you treat this lesion?

Dr. Lanzino: For a fistula that has involvement of the sinus, the preferred treatment is through the endovascular route. When you consider endovascular treatment it is very important to study not only the angiographic picture but also to study the dynamic images. In this case you see that there is not only retrograde cortical venous drainage, but also drainage from the right transverse sinus into the left transverse sinus. That suggests that the pressure in the right transverse sinus is such that it has already lost its primary function of venous drainage. Therefore you should be able to safely obliterate that sinus. I also looked at the oblique view very carefully to identify the vein of Labbé. The sinus can be safely obliterated distal to the entry point of the vein of Labbé. In case the vein of Labbé fills in retrograde fashion, it is not important that its entry point be spared.

Once you have studied the angiogram you have two options. One is to approach the lesion from the arterial side and...
the other is to approach it via the venous side. Approaching it from the arterial side was done particularly in the past. It is helpful as a palliative measure. We often treat patients with intractable tinnitus who however have no dangerous angiographic findings. We embolize the arterial feeders with the idea of palliating their symptoms. Quite often the patients do experience symptomatic improvement. This is an easy and fairly safe method if you embolize the ECA distal to any potential connections to the posterior circulation or the internal carotid artery.

The preferred way of treating this specific fistula is through the venous side with obliteration of the sinus.9-13 The arterial approach could be helpful in this case as a way to slow down the fistula before treating from the venous side. My preferred method of treatment is with coils because I feel more comfortable with coils and I think they are safer and easier to control.

Newer embolic agents such as Onyx might in the future become the preferred way of treatment.14

Dr. Qureshi: We felt that if we treated from the arterial side only we would not get complete obliteration because the feeders were too numerous and because of the tendency towards neovascularization which means that if you shut down the arterial feeders only, new feeders develop over time.

Also of note, the right transverse sinus is occluded distally so the question came up, could we open up that occlusion even though it is chronic? There are data showing that if you open up the sinus you might cause favorable flow redistribution.15 However, we felt that the occlusion was too long so that we would be probably unable to revascularize the entire occluded segment.

We decided to proceed with obliteration of the transverse sinus. We looked carefully to locate the vein of Labbé and we found no temporal vein that was actually draining through the transverse sinus.

Dr. Georgiadis: What is the risk of a complication such as intracranial hypertension after successful treatment?

Dr. Lanzino: The risk of developing intracranial hypertension in this patient is low because the contralateral transverse sinus is patent and large and should be able to handle the flow after you have re-established normal venous outflow patterns.

Dr. Georgiadis: What is the chance of recurrence? How long would you follow the patient?

Dr. Lanzino: I would perform a repeat study in a few months to rule out recurrence; however, you got such a good result that recurrence is unlikely. Some people might even question the need for any additional follow-up angiography. Of course that would change if the patient developed symptoms that could be referable to the fistula.

Dr. Qureshi: The only other thing I would mention was that we were concerned about the drainage of the cerebellum, but it appeared at least angiographically that most of the drainage was into the torcula and not into the transverse sinus.

We performed the 2-month follow-up study to make sure that there were no new fistulous connections, because DAVFs can sometimes recur.

Dr. Lanzino: It would be interesting to repeat an MRI to see if there is any resolution of the lesion; i.e., if this was just edema and not a stroke.

Dr. Georgiadis: We did an MRI the day after the procedure looking for immediate effects of the procedure. At that time there was no resolution of the lesion.

What we did find on the MRI was an asymptomatic intracerebral hemorrhage in the cerebellum.

Dr. Lanzino: I was going to comment on this, because in a similar case a patient of mine suffered a small hemorrhagic infarction of the brainstem a week after the procedure.

I think that even though we are usually concerned about the vein of Labbé and supratentorial drainage, infratentorial veins might also be affected by our treatment, even though we would not expect the sinus to be functional.

Dr. Qureshi: We could not be sure about the age of the hemorrhage because it was asymptomatic and unfortunately T1-weighted images were not obtained. We do not know if that was related to the fistula itself or to our treatment. The patient continues to be asymptomatic after the treatment.

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