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Original Research Article

Occipital intracranial dural arteriovenous fistula with giant venous aneurysm and ruptured temporal arterial aneurysm with intra cerebral haemorrhage – a case report

S. Venkatesan[1], **S. Balaji**[*]

[1]*Dept. of Neurosurgery, Meenakshi Mission Hospital, Madurai, Tamilnadu, India*

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ABSTRACT

As we all know 10% of all cerebral vascular anomalies are caused by a dural arteriovenous fistula (dAVF). While these lesions may be benign, the existence of retrograde venous drainage and cerebral venous reflux puts patients at risk of bleeding, neurological impairment, and death. Endovascular therapy is commonly utilized as the first-line treatment for dAVF. Both trans arterial and transvenous techniques are utilized to treat dAVF. The treatment strategy employed is dictated on the dAVF's angioarchitecture, location, and venous flow direction. Surgery and, to a lesser extent, stereotactic radiosurgery are used when endovascular procedures are ineffective or unsatisfactory, as well as when an AV fistula is associated with a ruptured aneurysm with cerebral bleeding.

1. Introduction

Dural arteriovenous fistulas (dAVF), also known as dural arteriovenous malformations (AVM), are abnormal shunts between the arterial and venous systems found within the dura. dAVF is caused by trauma, surgery, venous stenosis, or sinus thrombosis. The most common cause of cranial dAVFs is dural venous sinuses.[1,2] Several ways of classifying dAVFs, specifically by venous flow pattern, have been developed.[3,4] Borden and colleagues divided dAVFs into three groups, whereas Cognard and colleagues divided dAVFs into five. dAVFs without cerebral venous reflux (CVR) are generally regarded benign, with a 2% probability of developing CVR.[5] dAVFs with persistent CVR are risky, with a 10.4% yearly mortality, an 8.1% annual haemorrhagic risk, and a 6.9% annual non-haemorrhagic neurological impairment risk. Symptoms may include pulsatile tinnitus, bruit, headaches, visual abnormalities, changes in mental status, seizure, myelopathy, cranial nerve palsies, and motor or sensory deficits, depending on the location of the fistula.[6] A CT scan can commonly reveal the presence of bleeding or oedema. MRI can also detect indirect indications of venous hypertension or CVR, such as pial vein engorgement, dilated venous pouch, or abnormal vascular enhancement.On brain CT angiography (CTA)/CT venography or MR angiography (MRA)/MR venography, asymmetric sinus, engorged arterial or venous arteries, and enlarged trans osseous vessels might be detected. Cerebral digital subtraction angiography (DSA) is the gold standard imaging method for detecting and assessing dAVF. To control aggressive dAVFs, endovascular techniques, surgery, radiosurgery, and other treatments are used.

1.1. Case description

55 years old male known case of anaplastic astrocytoma post-surgery and post radiotherapy status presented with headache, giddiness, vomiting and altered sensorium. On

* *Corresponding author.*
E-mail address: narayanasmrithi@gmail.com (S. Balaji).

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examination GCS was E2V3M5 with PERL. MRI brain with contrast was done showing AV fistula seen in left temporal and occipital lobe, a prominent feeding artery is arising from branches of left middle cerebral artery and left occipital artery respectively with an arterial aneurysm noted in the left temporal lobe, aneurysm measures 8.0*6.0 mm, the dilated fistulous tract extends into left occipital lobe with a venous aneurysm in the left occipital region, draining into the torcular herophili and straight sinus and thrombosis of left transverse and sigmoid sinus.

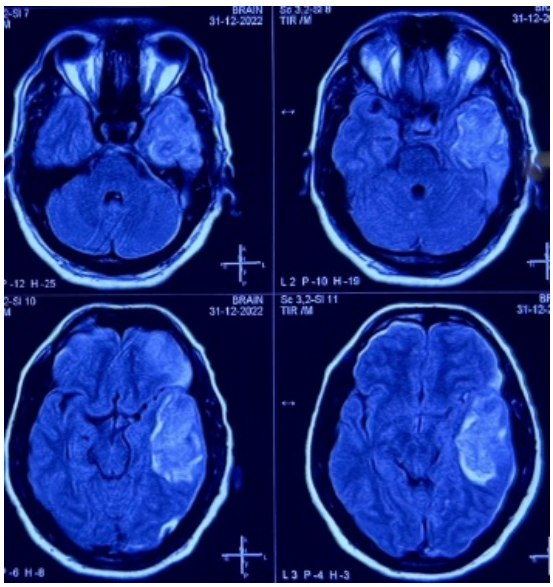

Fig. 1: MRI brain axial image showing left temporal ICH

Large intraparenchymal hematoma measuring about 6.0*4.0*4.5 cm seen in left temporal lobe(Figure 1). DSA was done which showed left occipital dural AV fistula with venous varix, feeding artery arising from left occipital artery draining into torcula and communicating into left temporal draining vein (Figure 2). Patient underwent extra cranial ligation of left occipital artery, left temporal craniotomy evacuation of ICH with excision of aneurysm and clipping of feeding and draining vessel. Post op CT image showed regression in the size of the occipital venous aneurysm and complete excision of temporal arterial aneurysm. Patient was improved clinically and discharged on 8^{th} POD without any deficits(Figure 3).

2. Discussion

Dural arteriovenous fistulas (dAVF) are aberrant shunts found within the dura between the arterial and venous systems. Several categorization approaches have been proposed to classify dAVFs, specifically by venous flow pattern. Borden and colleagues classified dAVFs into three types: those that drain directly into the venous sinus, those that drain into the venous sinus but also have

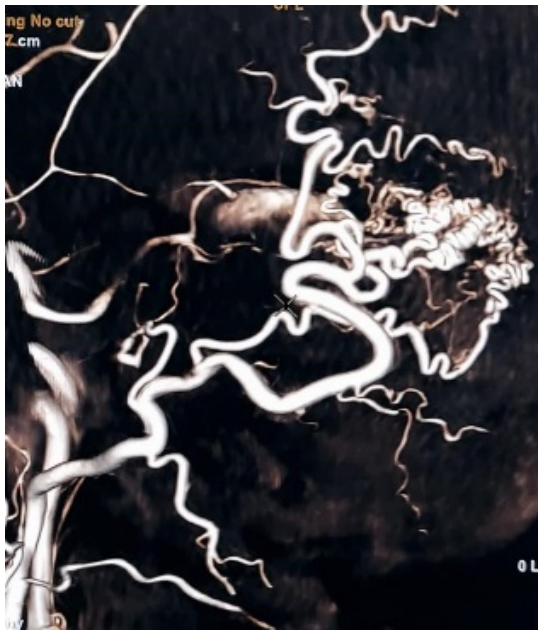

Fig. 2: DSA showing occipital dural AV fistula with venous aneurysm with feeding from left occipital artery

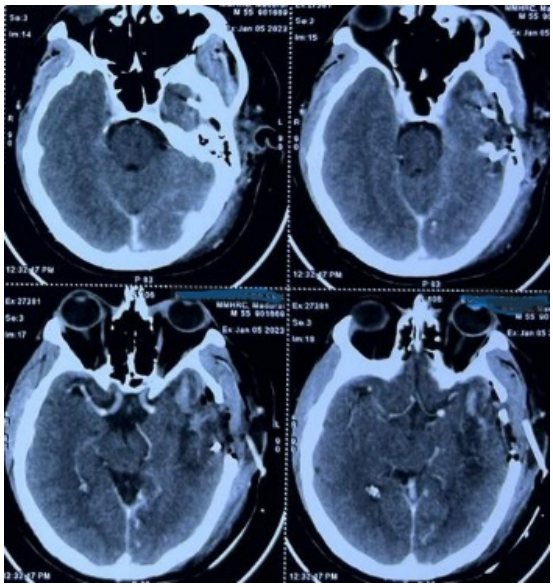

Fig. 3: Post op contrast CT image showing complete excision of temporal aneurysm with regression of occipital venous aneurysm

retrograde drainage into the subarachnoid (cortical) veins, and those that drain directly into the subarachnoid veins.[7,8] The location of the fistula, as well as the disruption of normal venous drainage, might create alterations in flow dynamics, resulting in symptoms. An estimated 20%-33% of dAVFs have cerebral hemorrhage. CT and MRI scans are frequently unremarkable in dAVF diagnosis. A CT scan is frequently helpful in evaluating the presence of bleeding or oedema. Indirect symptoms of venous hypertension or CVR, such as pial vein engorgement, dilated venous pouch, or aberrant vascular enhancement, may also be seen using MRI. The gold standard imaging modality for detecting and characterizing dAVF is cerebral digital subtraction angiography (DSA). To assess dAVF, a full DSA with internal carotid arteries (ICA), external carotid arteries (ECA), and both vertebral arteries is usually necessary. A highly selective examination of minor arteries can also aid in clarification.

2.1. Endovascular approach

For the majority of dAVFs, the endovascular technique is the first-line treatment. Endovascular treatment's mainstay is embolization of the fistulous link and its venous components while avoiding adverse consequences.[9] Transarterial or transvenous approaches can be used to reach the fistulous connection. A transarterial technique is preferred for high-grade dAVFs with direct cortical venous drainage or when transvenous access is limited. The benefits of transarterial embolization include a lower risk of flow redirection into an alternate venous pathway, the ability to save a functional venous system, the avoidance of post-treatment de novo dAVF formation from venous hypertension, and a reduction in complications specific to commonly used transvenous approaches (eg, abducens nerve palsy from superior petrosal sinus catheterization, and so on).[10] This approach employs a variety of liquid embolic agents, including cyanoacrylic glue, Onyx, Squid, and PHIL. In transarterial procedures, microcatheters are tracked over microwires to distal places in feeding arteries, with the goal of getting the microcatheter as close to the fistula connection as possible. In a modern transvenous method, the affected sinus and cerebral vein are retrogradely catheterised and occluded using microcoils, liquid embolic agents, or their combination. When a dAVF is supplied by small tortuous arteries that prevent safe transarterial access to the fistulous part, when the dAVF is supplied only by branches directly from the ICA or vertebral artery, when the dAVF is supplied by arteries with dangerous extracranial to intracranial anastomosis, or when the dAVF is supplied by nutrient arteries, the dAVF is supplied by nutrient arteries, the transvenous approach is preferred.[11,12]

2.2. Stereotactic radiosurgery

Stereotactic radiosurgery (SRS) is usually considered a last-resort treatment option for dAVF. Endothelial cell death and thrombosis are assumed to be the primary mechanisms of dAVF obstruction by radiation.[13] Obliteration of a dAVF, similar to SRS for cerebral AVMs, can take months, and the risk of bleeding persists during this period. Cognard grade 1 or Borden grade are ideal SRS candidates.

2.3. Surgery

While endovascular techniques are usually considered first-line therapy for the treatment of dAVFs, surgery is still an effective and safe option.[14] Surgery for dAVF of the transverse-sigmoid sinus involves extensive exposure and skeletonization of the afflicted sinus, as well as isolation and coagulation of dural arterial feeders and arterialised cortical veins. If the affected sinus is non-functional and does not contribute to normal brain venous drainage, it can be removed entirely.

In non-sinus dAVF, the cortical draining vein is severed from the fistula location using clips or coagulation. If there is an intracerebral clot, it must be drained and the feeding veins must be cut. During surgery, indocyanine green angiography with or without intraoperative DSA is routinely used to confirm dAVF blockage.

3. Conclusion

Endovascular therapy is the standard first-line treatment for dAVF. Prior to operation, a detailed examination of the fistula angioarchitecture is required. Identifying feeding arteries, fistula connection sites, venous drainage routes, venous flow direction, and associated venous aneurysm/varix. Endovascular procedures are performed via arterial, venous, or mixed pathways, depending on the location and shape of the fistula. Surgery and, to a lesser extent, SRS remain viable therapeutic options, especially when an endovascular technique is inadequate or judged dangerous. The primary treatment for AV fistulas linked with burst aneurysms resulting in cerebral bleeding is surgery.

4. Source of Funding

None.

5. Conflict of Interest

None.

References

1. Sakaki T, Morimoto T, Nakase H. Dural arteriovenous fistula of the posterior fossa developing after surgical occlusion of the sigmoid sinus. *J Neurosurg*. 1996;84(1):113–8.
2. Mcconnell KA, Tjoumakaris SI, Allen J. Neuroendovascular management of dural arteriovenous malformations. *Neurosurg Clin N Am*. 2009;20(4):431–9.

3. Cognard C, Gobin YP, Pierot L. Cerebral dural arteriovenous fistulas: clinical and angiographic correlation with a revised classification of venous drainage. *Radiology*. 1995;194(3):671–80.
4. Borden JA, Wu JK, Shucart WA. A proposed classification for spinal and cranial dural arteriovenous fistulous malformations and implications for treatment. *J Neurosurg*. 1995;82(2):166–79.
5. Satomi J, Van Dijk J, Terbrugge KG. Benign cranial dural arteriovenous fistulas: outcome of conservative management based on the natural history of the lesion. *J Neurosurg*. 2002;97(4):767–70.
6. Van Dijk J, Terbrugge KG, Willinsky RA. Clinical course of cranial dural arteriovenous fistulas with long-term persistent cortical venous reflux. *Stroke*. 2002;33:1233–9.
7. Basha MM, Chen J, Gandhi D. Imaging of cerebral arteriovenous malformations and dural arteriovenous fistulas. *Neurosurg Clin N Am*. 2012;23(1):27–42.
8. Duffau H, Lopes M, Janosevic V. Early rebleeding from intracranial dural arteriovenous fistulas: report of 20 cases and review of the literature. *J Neurosurg*. 1999;90(1):78–84.
9. Macdonald JHM, Millar JS, Barker CS. Endovascular treatment of cranial dural arteriovenous fistulae: a single-centre, 14-year experience and the impact of Onyx on local practise. *Neuroradiology*. 2010;52(5):387–95.
10. Nelson PK, Russell SM, Woo HH. Use of a wedged microcatheter for curative transarterial embolization of complex intracranial dural arteriovenous fistulas: indications, endovascular technique, and outcome in 21 patients. *J Neurosurg*. 2003;98(3):498–506.
11. Natarajan SK, Ghodke B, Kim LJ. Multimodality treatment of intracranial dural arteriovenous fistulas in the Onyx era: a single center experience. *World Neurosurg*. 2010;73(4):365–79.
12. Suzuki S, Lee DW, Jahan R. Transvenous treatment of spontaneous dural carotid-cavernous fistulas using a combination of detachable coils and Onyx. *AJNR Am J Neuroradiol*. 2006;27(6):1346–55.
13. See AP, Raza S, Tamargo RJ. Stereotactic radiosurgery of cranial arteriovenous malformations and dural arteriovenous fistulas. *Neurosurg Clin N Am*. 2012;23(1):133–79.
14. Collice M, Arena G. Surgical treatment of intracranial dural arteriovenous fistulae: role of venous drainage. *Neurosurgery*. 2000;47(1):56–66.

Author biography

S. Venkatesan, Senior Consultant

S. Balaji, Senior Resident https://orcid.org/0000-0001-9098-1372

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