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Complete embolization of large dural AV
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glue embolizing agent (Squid 12)

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ABSTRACT

Dural arteriovenous fistulas are rare intracranial vascular malformations with a propensity for haemorrhage. The Cognard classification system is the most widespread classification system, wherein type IIB through V must be promptly treated to avoid the risk of haemorrhage. The case presented herein reports a 34-year-old male presenting with vague nonspecific headache found to have a Cognard type I dural arteriovenous fistula with multiple arterial feeders.

INTRODUCTION

Cranial dural arteriovenous fistulas (dAVFs) are defined as an abnormal connection between dural feeding arteries and a dural sinus and/or leptomeningeal vein. The current hypothesis conjectures that the pathogenesis of dAVF is based on their association with venous outflow obstruction, i.e. the resultant increase in venous pressure causes enlargement of the physiologic shunts between the dural arteries and sinuses that promote angiogenesis through regional venous ischemia. They manifest with myriad signs and symptoms that differ based on their anatomical location and may be diagnosed incidentally.[1] These unusual lesions are estimated to account for 15% of all intracranial vascular abnormalities.[1] Borden et al [2] and Cognard et al [3] proposed the two most commonly used classification systems for dAVF. These systems function by stratifying dAVFs depending on the presence or absence of cortical venous reflux and venous drainage patterns. Clinically stable patients can be managed through observation with repeated enhanced cross-sectional imaging; however, prompt endovascular embolization or surgical intervention should be considered in unstable patients or those with debilitating symptoms, as successful treatment can significantly ameliorate symptoms and improve the quality of life. We report the case of a patient who initially ignored right-sided occipital headache and was diagnosed with dAVFs involving the transverse sinus. The patient was successfully managed with a single uneventful session of endovascular embolization.

Keywords
embolization,
dural AV fistula,
glue embolizing agent,
squid 12



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Case

A 34-year-old man without any past medical history of chronic illness, such as hypertension, diabetes mellitus, or dyslipidemia, came to us in our patient department with complaints of persistent headache only temporarily relieved by medication. NCCT head was done which was unremarkable, later patient underwent CT angio which revealed a large right occipital entangled mass suggestive of right occipital dural fistula unruptured which was later confirmed on DSA. It was cognard type 1. patient was taken up for embolization as the patient had persistent headache only temporarily relieved by medication. Patient DSA and embolization was planned in the same setting. Access was taken through right femoral artery, 9fr femoral sheath introduced in femoral artery using seldinger technique. DSA showed Dural fistula of right transverse sinus with feeders from right occipital artery, right MMA, right SCA, right PICA, left occipital, left post auricular, and left MMA artery with large venous sac. The multidisciplinary treatment plan prescribed endovascular treatment using the transarterial, which was performed under general anaesthesia, to occlude the dAVF.

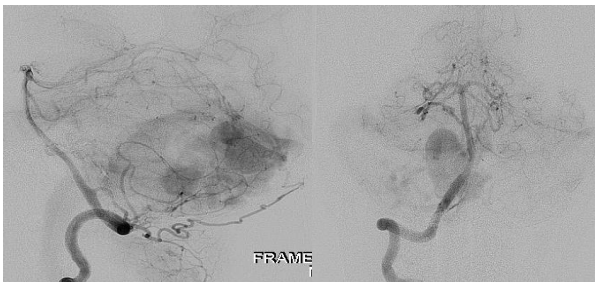


Figure 1, Figure 2. Shows dural arteriovenous fistula in AP and LAT view if injection vertebral artery respectively.

The procedure was initiated by administering an intravenous bolus dose of unfractionated heparin to achieve an activated clotting time of 1.5 to 2 times the baseline value, depending on the patient's weight (as per the hospital's protocol), after positioning the guiding catheter within the right proximal external carotid artery. We decided to embolize the right TS-SS junction dAVF. we passed the right petrous branch of the middle meningeal artery and right occipital artery, followed by injection of Squid 12 under continuous fluoroscopic guidance, to achieve complete occlusion of the fistula which was confirmed post embolization DSA. No

complications were observed during or immediately after the procedure, and the patient's symptoms were resolved. The patient was followed in routine and the patient also confirmed that the symptoms did not reappear during the last follow-up visit and that he was satisfied with the management plan.

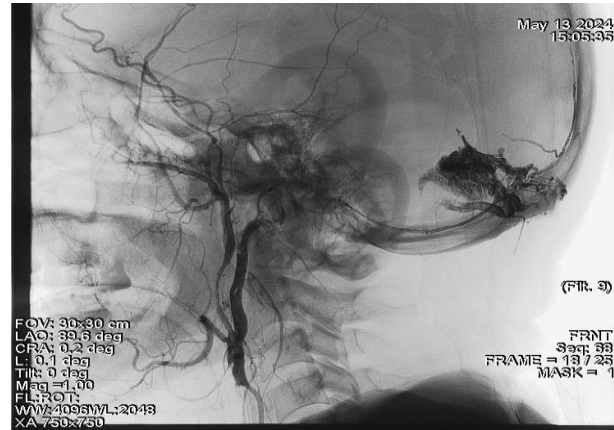


Figure 3. Shows complete embolization of dural avf with residual glue cast/

DISCUSSION

A dAVF is an abnormal arteriovenous communication that links arterial and venous channels within the leaflets of the dura mater. [4] Although the etiology of multiple dAVFs is unknown, the occurrence of cyclical sinus thrombotic occlusion and recanalization is one of the theories postulated to explain their pathogenesis. These fistulas may emerge after angiogenesis as micro-shunts within the dura; several risk factors are known to increase the incidence of such fistulas, including venous sinus thrombosis, head trauma, transcranial surgery, transsinus procedures, hypercoagulable states, and oral contraceptive use.[5,6]The etiology of pain in dAVF is attributed to the direct communication between the dural arteries and venous sinuses or meningeal venous lacunae, with antegrade venous drainage that increases flow through the dural sinuses or venous channels; dAVFs commonly produce benign symptoms such as headaches, otalgia due to pulsatile tinnitus, and painful ophthalmoplegia due to accumulated venous drainage toward the cavernous sinus that can sometimes result in painful proptosis [1].

A multidisciplinary approach with several treatment sessions should be considered as part of the treatment plan if a case of complex cranial dAVF

cannot be managed with a single session of treatment. Multiple arterial feeders, reflux into multiple cortical veins, sinus entrapment and occlusion, venous aneurysms, segmental stenosis, median or deep location, and associations with the deep venous system are specific angio-architectural considerations that can increase the complexity of the dAVF and its associated management. [7]

Natarajan *et al.* [8] described a treatment algorithm for complex dAVFs in which endovascular treatment was recommended as the first option. Transarterial ONYX embolization should be the first option for dAVFs located at any site, except cavernous DAVFs. Moreover, ONYX has unique physical properties, which facilitates prolonged injections that can be better controlled, along with a more predictable penetration and higher cure rate compared to other agents.[9,10,11]. Transvenous embolization (TVE) is based on thrombosis of the venous side of the fistula, which involves a part of the dural sinus. This procedure would be well tolerated if the pathological dural sinus is arterialized and does not serve as a site of drainage in normal circulation. Large venous sinuses can often be blocked without complications. It can benefit cavernous or transverse sigmoid sinus fistulas, or cranial dAVFs with multiple arterial feeders with a small or tortuous course, for which TAE would be difficult. Overall, TVE has a success rate of 71–87.5%.[8]. Furthermore, TVE should be considered the first-line treatment approach for condylar dAVFs, because it is safe and effective.[12] Catheterization of the cervical venous plexus is classified as a difficult procedure, owing to the tortuous venous route. The Onyx embolic material is recommended for TAE of dAVFs because it is superior to glue or coils, with respect to safety and facilitates a high rate of complete obliteration. Moreover, it is not associated with neurological morbidity or mortality.[13]

CONCLUSION

The diagnosis and treatment of multiple cranial dAVFs remain challenging, despite the rapid advancements in surgical technology and techniques. A multidisciplinary strategy should be implemented, after a thorough clinical evaluation, aided by innovative pre- and intra-operative imaging techniques. This will increase the amenability of endovascular management for treating these lesions and allow clinicians and patients to weigh treatment

risks against the expected clinical course. In our case, a single endovascular treatment session accomplished favorable long-term outcomes for dAVFs.

ABBREVIATIONS

dAVF, dural arteriovenous fistula;
PCC, posterior condylar confluence
TAE, transarterial embolization
TS-SS, transverse sinus-sigmoid sinus
TVE, transvenous embolization
MMA middle meningeal artery
PICA posterior inferior cerebellar artery
SCA superior cerebellar arter

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