

Endovascular balloon-assisted glue embolization of intranidal high flow fistula in brain AVM

Sir,

Intracranial arteriovenous malformation (AVM) is a very rare disease with a prevalence of 0.06-0.11% and incidence of 0.01-0.0013%.^[1-4] The annual bleeding rate of AVM is 4% and annual rates of mortality of 1%.^[5-7] The main angioarchitectural characteristic of cerebral AVMs distinguishing them from the other types of cerebral vascular malformations is the presence of nidus. The embolization of high flow intranidal fistula is a challenge. We report a case of high flow intranidal fistula in brain AVM, which was treated in a novel method.

A 41-year-old female presented with history of severe headache, vomiting, and loss of consciousness 4 months back. Patient was diagnosed as right parietal AVM with intracranial bleed and referred to our center for endovascular embolization. Cerebral angiogram showed right parietal AVM with high flow intranidal fistula. Under general anesthesia, using bilateral femoral arterial access, 6F guiding catheters was negotiated into the right carotid artery. Patient received 3000 U of heparin bolus. Cerebral angiogram showed right parietal AVM with high flow intranidal fistula [Figure 1]. The feeding artery

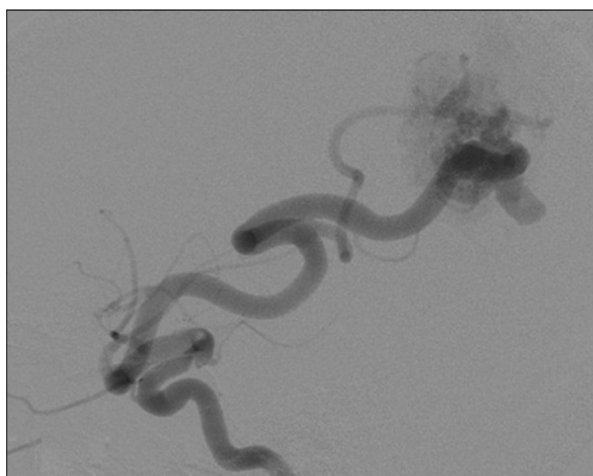


Figure 1: Cerebral angiogram showing right parietal AVM with intranidal fistula

to fistula was from the hypertrophied right Middle Cerebral Artery parietal branch, which was about 4.5-5 mm in diameter. Micro catheter (*Sonic*, Balt, France) was then negotiated into the parietal branch feeding the fistula. Micro catheter injection confirmed the intranidal high flow fistula. Then compliant balloon 7 × 7 (HyperForm, Micro Therapeutics, Irvine, CA) was negotiated into the proximal segment of the feeding artery. After inflating the balloon, micro catheter angiogram showed significant reduction in the flow of fistula [Figure 2]. Then using 75% histoacryl glue, embolization was done. After 5 minutes of embolization, balloon was deflated after confirming that the glue cast is not moving. *Sonic* micro catheter was retrieved. Postembolization angiogram showed complete occlusion of intranidal fistula and significant slowing of flow in the right parietal AVM. Following the procedure, patient was sedated and ventilated for 24 hours. There was no complication during and after the procedure.

Brain AVM can be treated using three modalities – surgery, radio surgery, and endovascular treatment. The modalities can be used either alone or multimodality depending on the grading system and other cofactors. Since the first report on embolization of a cerebral AVM by Luessenhop and Spence in 1960,^[8] there has been significant changes in the technique and materials used for embolization. Commonly used embolic material for high flow fistulas are glue, balloons. ONYX is not preferred agent in high flow fistulas. The disadvantage of detachable balloons is that they cannot be negotiated into tortuous arteries into the site of fistula. Sometimes they deflate and embolize into draining vein, pulmonary artery.^[9] Advantages of glue are good penetration, immediate thrombosis, and permanent occlusion of fistula. The main worry during embolization of high flow fistula using glue is difficulty in controlling flow and good cast formation. Glue can migrate into draining vein and pulmonary embolism can occur. Hence, in high flow situation, the



Figure 2: (a) Road map image showing microcatheter and Balloon in the feeding artery. (b) Final angiogram showing complete occlusion of intranidal fistula

flow can be modified by inflating balloon temporarily into the proximal segment of the feeding artery. In the study by Andreou *et al.*, they used balloon-assisted glue embolization in two pial AVFs, one dural AVE, one vein of Galen malformation, and one perimedullary AVF of the cervical spine with excellent results. The fistulas remained closed in all patients, as ascertained by follow-up angiograms. No new neurological deficits related to the procedure were detected.^[10]

In our case, we used Hyperform 7 × 7 mm balloon to reduce the flow temporarily and glue was injected safely. The advantage of using *Sonic* micro catheter was that its tip is detachable and so the risk of nidus rupture during retrieval of micro catheter after embolization is minimized. Balloon-assisted glue embolization is one of the techniques that can be used in patients with high flow fistulas. This technique gives more control on glue injection and minimizes distal embolization.

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