Diagnostic and Interventional Imaging (2016) **97**, 681—685

LETTER TO THE EDITOR /*Neuroradiology*

Ethylene vinyl alcohol copolymer (Onyx®) embolization of cranial dural arteriovenous fistula via the ascending pharyngeal artery

Keywords Dural arteriovenous fistula; Onyx®; Endovascular; Ascending pharyngeal artery; Embolization

Dear Editor,

Treatment of ruptured cranial dural arteriovenous fistula (DAVF) is mandatory, and the therapeutic goal is to occlude the proximal draining vein and the site of the fistula itself, which may be achieved by surgery or endovascular embolization [1]. Endovascular embolization has become the primary treatment of intracranial DAVFs, however, the presence of an access as close to the site of the fistula as possible remains a primary concern for a successful endovascular treatment. We present a patient who had a safe, complete and successful embolization of a posterior fossa DAVF via the ascending pharyngeal artery (APA) and summarize currently available data on this specific approach.

A 71-year-old man was suffering from worsening headaches and nausea episodes for about two weeks. Magnetic resonance imaging revealed a sub-acute cerebellar hematoma along with enlarged vessels (Fig. 1). Cerebral angiography revealed a DAVF of the posterior fossa with cortical reflux to the deep venous system, and venous drainage ectasia (i.e., type IV Cognard classification). The fistula was supplied mainly by the posterior meningeal artery via the left vertebral artery and the neuromeningeal trunk of the APA. Considering the impossibility to navigate through the posterior meningeal trunk via the vertebral artery or using a venous approach, selective catheterization of the posterior meningeal artery via the neuromeningeal trunk of the APA was achieved by using a Marathon® 1.5-F microcatheter (ev3 Inc., Irvine, CA, USA) with further distal navigation toward the fistulous point (Fig. 2). Embolization with ethylene vinyl alcohol copolymer (Onyx®, ev3 Inc.) without significant reflux allowed a complete occlusion of the fistula and the proximal draining vein (Fig. 3). No neurological deficit was observed after embolization, and cerebral angiography at 3 months confirmed complete obliteration.

Successful endovascular obliteration of cranial DAVF requires an access (arterial or venous) as close to the site of the fistula as possible, especially with Onyx® embolic agent [1—3]. In some cases, as shown here, the microcatheter navigation through the APA represents the only favorable access for endovascular treatment. However, the microcatheter must be placed as distally as possible, allowing a safety margin from the neuromeningeal branches supplying the lower cranial nerves IX, X, XI, and XII [4]. In this situation, the APA represents a safe and efficient intra-arterial approach. However, we highlight the importance of awareness to the anatomy and clinical significance of the APA during planning and performance of neuro-endovascular procedures since it supplies the lower cranial nerves and superior cervical ganglion, and is part of an anastomotic vascular network to the supratentorial and infratentorial circulations [4]. If the APA is damaged or occluded, paralysis of cranial nerves IX, X, XI, and XII can occur.

A literature search disclosed 16 patients with cranial DAVFs who received endovascular treatment through the APA [5—9]. The site of the DAVFs is variable (cavernous sinus, jugular foramen, clival), and in the majority of patients (71%) Onyx® was used. No procedural complication or neurological deficit was observed and all patients experienced complete remission of their symptoms. The major risk of Onyx® embolization is a significant reflux occluding the neuromeningeal trunk branches. The use of endovascular balloon could be an option to improve the penetration of Onyx® within the arteriovenous shunts and limits the risk of reflux [8]. Two authors reported the use of cyanoacrylate without clinical complication.

In conclusion, the APA may provide a safe and efficient alternative route for intra-arterial approach in the embolization of cranial DAVF. However, the operator should have thorough knowledge of this specific anatomy and possible anastomoses to avoid inadvertent neuromeningeal trunk branches embolization.

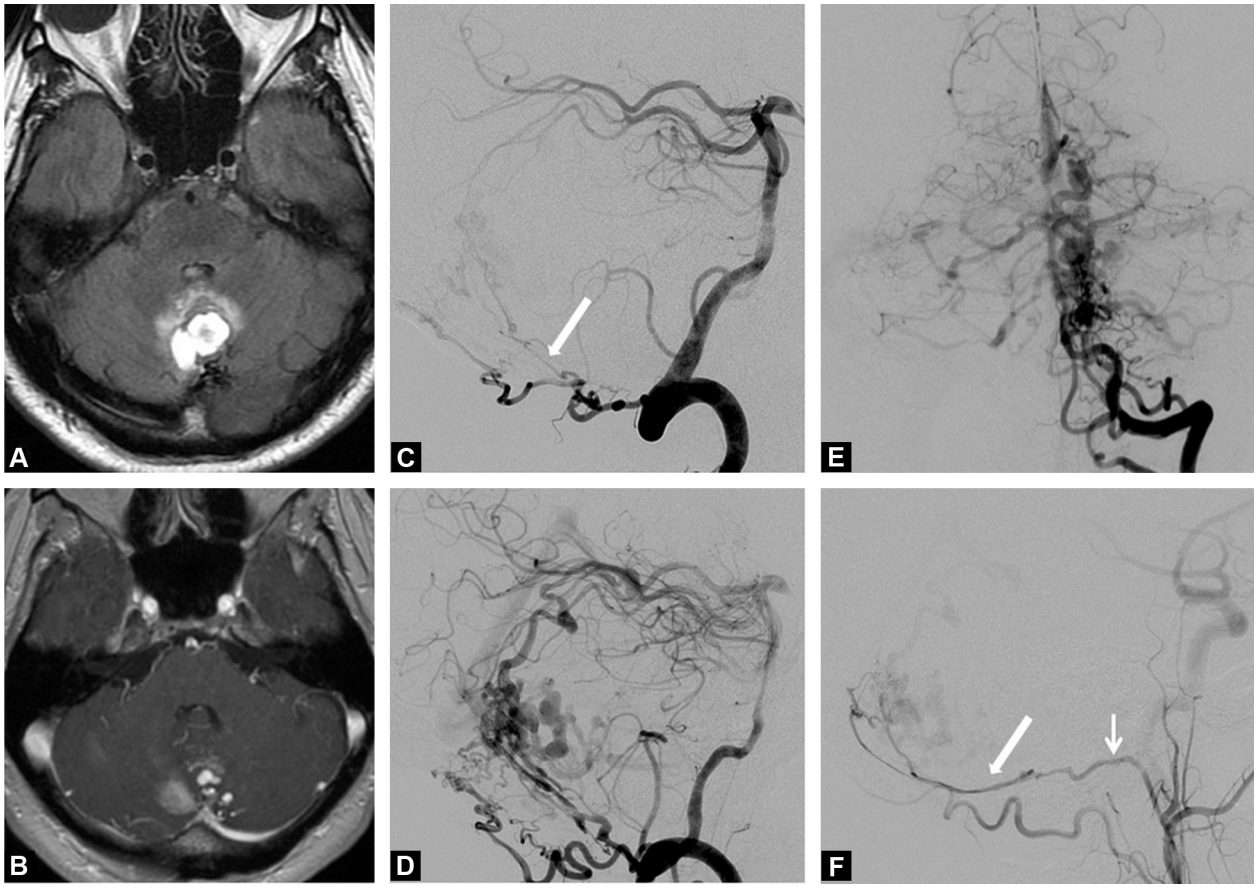

Figure 1. A. Pre-embolization T1-weighted MR image in the transverse plane shows median cerebellar hematoma. B. Pre-embolization T1-weighted MR sequence obtained after IV of a gadolinium chelate in the transverse plane shows vascular dilatations in the posterior fossa near the hematoma. C—E. Cerebral angiogram, left vertebral artery injection, shows the aggressive sub-tentorial dural arteriovenous fistula (DAVF) mainly supplied by the posterior meningeal artery (arrow) via the left vertebral artery injection. Note the hyper-tortuosity of the posterior meningeal artery. F. Cerebral angiogram using a right external carotid artery injection, shows the hypertrophic neuromeningeal trunk (thin arrow) and the arterial feeder access to the DAVF (thick arrow).

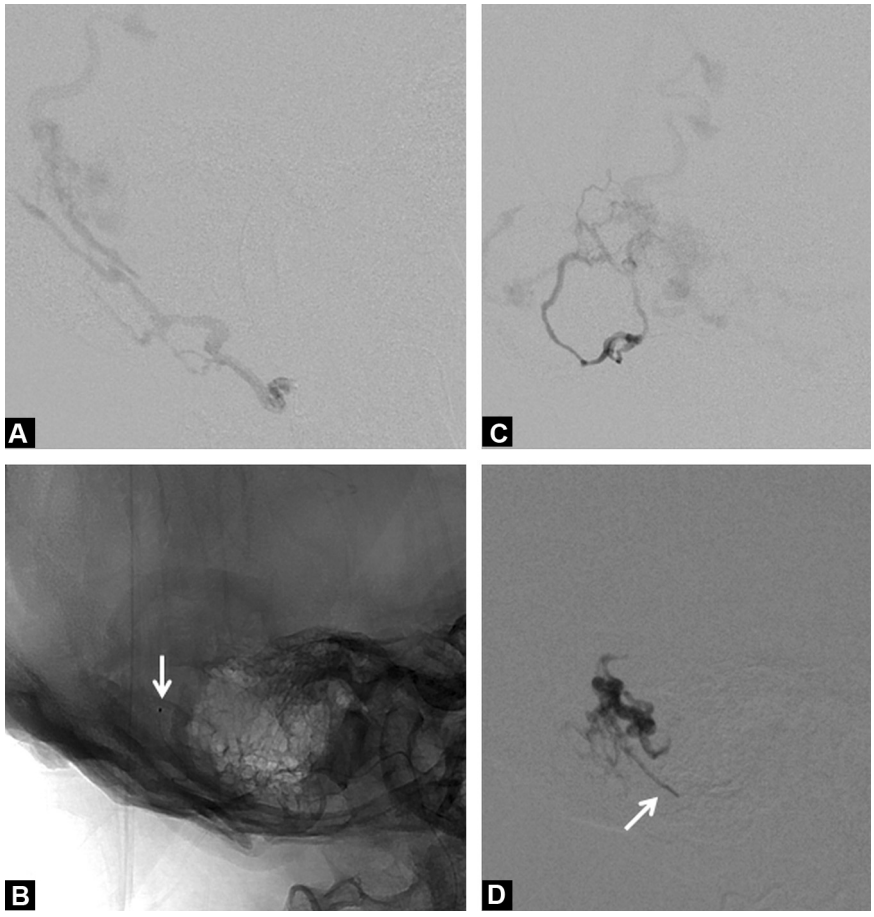

Figure 2. A—C. Superselective angiograms obtained with injection through the neuromeningeal trunk arterial feeder. Note the distal position of the microcatheter tip (arrow). D. Onyx® injection shows moderate reflux along the microcatheter and the satisfactory penetration of Onyx® inside the arteriovenous shunts.

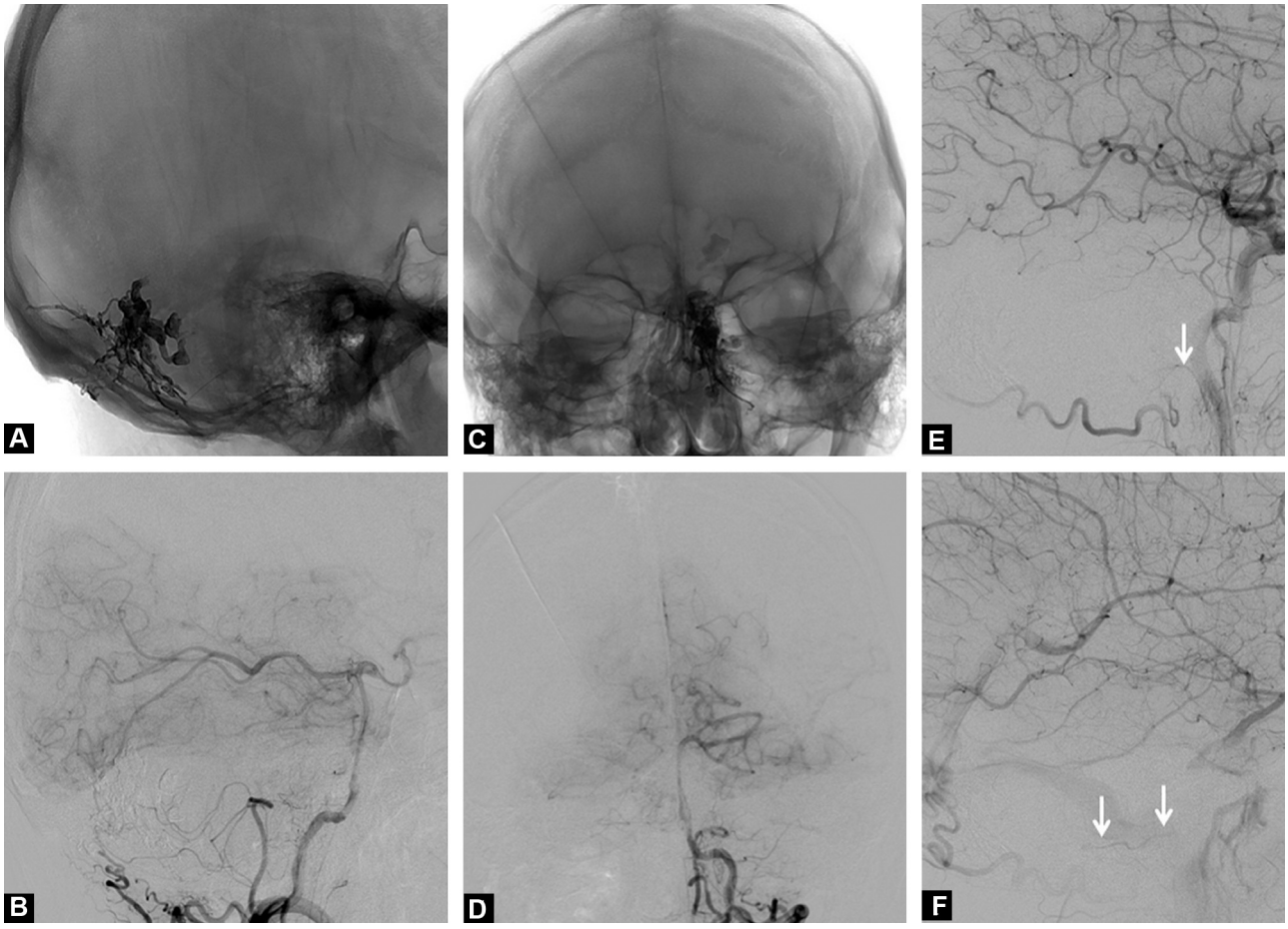

Figure 3. A—D. Final cerebral angiogram, left vertebral artery, shows complete occlusion of the dural arteriovenous fistula (DAVF). E and F. Final cerebral angiogram, right common carotid injection, shows complete obliteration of the fistula and the patency of the ascending pharyngeal artery (APA) (thin arrow).

Disclosure of interest

The authors declare that they have no competing interest.

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http://dx.doi.org/10.1016/j.diii.2016.01.004