A Treatment Option for Nontraumatic Adult-Type Dural Arteriovenous Fistulas: Transarterial Venous Coil Embolization

Seung Kug Baik[1], Yong-Woo Kim[1], Sang Weon Lee[2], Chang Hwa Choi[2], Jaechan Park[3]

Key words
- Coil
- Dural arteriovenous fistula
- Embolization

Abbreviations and Acronyms
DAVF: Dural arteriovenous fistula

From the Departments of [1]Radiology and [2]Neurosurgery, Research Institute for Convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Pusan National University School of Medicine, Yangsan; and [3]Department of Neurosurgery, Science and Engineering Institute, Kyungpook National University College of Medicine, Daegu, Korea

To whom correspondence should be addressed: Seung Kug Baik, M.D., Ph.D. [E-mail: skbaik9@gmail.com]

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OBJECTIVE: **Transvenous coil embolization of the affected venous outlet is the most effective treatment method for the management of nontraumatic adult dural arteriovenous fistulas (DAVFs). However, such an approach is not always feasible. We discuss nontraumatic adult DAVFs that were treated with transarterial coil embolization of the proximal venous outlet at our facility, as well as cases previously reported in the literature.**

METHODS: **This study included 8 patients who had undergone transarterial coil embolization of the proximal venous outlet for the treatment of nontraumatic adult DAVFs (4 cases in our series and 4 cases in the literature). All clinical, angiographic, and procedural data were retrospectively collected from medical charts or the literature and recorded on standardized forms by a physician. The DAVFs were classified according to the venous drainage pattern.**

RESULTS: **In all 8 patients, occlusion of the proximal venous site of the fistula was possible by using coils through the arterial feeders; this resulted in complete recovery in all patients. The access route for 7 of the 8 cases was the middle meningeal artery, and in 1 case was the meningohypophyseal artery. In all 8 patients the access artery was relatively smooth, with distal enlargement in the fistula region.**

CONCLUSIONS: **If a distally enlarged feeding artery is observed among the multiple feeding arteries, it suggests the existence of a large fistula and may serve as an access route for transarterial venous coil embolization. This procedure may offer a more effective and safer treatment than other endovascular approaches.**

INTRODUCTION

Intracranial nontraumatic adult dural arteriovenous fistulas (DAVFs) (spontaneous DAVFs) may cause a variety of neurological symptoms. Both the symptoms and the venous drainage patterns should factor into the choice of treatment (11, 21, 22). Several therapeutic approaches for endovascular treatment have been proposed, including surgery, radiosurgery, and embolization, the latter being most often considered as the first-line treatment. Endovascular treatment can be done via the transarterial or transvenous approach (2, 4, 23).

In endovascular treatment of nontraumatic adult DAVFs, obliteration of the venous outlet, when made feasible by the available access route, is safe and highly effective for achieving a complete recovery. Where possible, retrograde, transvenous occlusion of the most proximal venous outlet represents the ideal endovascular option for curative treatment of DAVFs; however, such an approach is not always feasible, as in the case of an isolated sinus or a dural venous sinus occlusion (13, 21). In these cases, transarterial embolization is the next best endovascular treatment option. In this procedure, the usual approach is from the arterial side, and a liquid embolic agent is used to occlude the artery, fistula, and proximal part of the cortical vein. Liquid agents, e.g., glue or Onyx (ev3, Irvine, CA), are less controllable than coils and thus may present a higher risk (1, 13, 15, 19). However, the transarterial approach in which coils are passed through the fistulous site into the sinus has been rarely performed for the treatment of DAVFs because it is thought to be difficult to navigate the microcatheter through the fine vascular network of the fistula area. To our knowledge, this method has only been used in 4 cases of DAVF (3, 9, 10, 13, 21).

Here we report 4 cases of nontraumatic adult DAVFs that were obliterated using transarterial coil embolization of the proximal venous outlet. We reviewed 8 cases (4 cases in our series and 4 cases in the literature) and propose another angioarchitectural classification and treatment option for nontraumatic adult DAVFs.

MATERIALS AND METHODS

Patients

We reviewed 8 patients who had undergone transarterial coil embolization of the proximal venous outlet for the treatment of nontraumatic adult-type DAVF (4 cases in our series and 4 in the literature). Five patients were men, and 3 were women. Their ages ranged from 18 to 71 years, with a mean of 52 years.

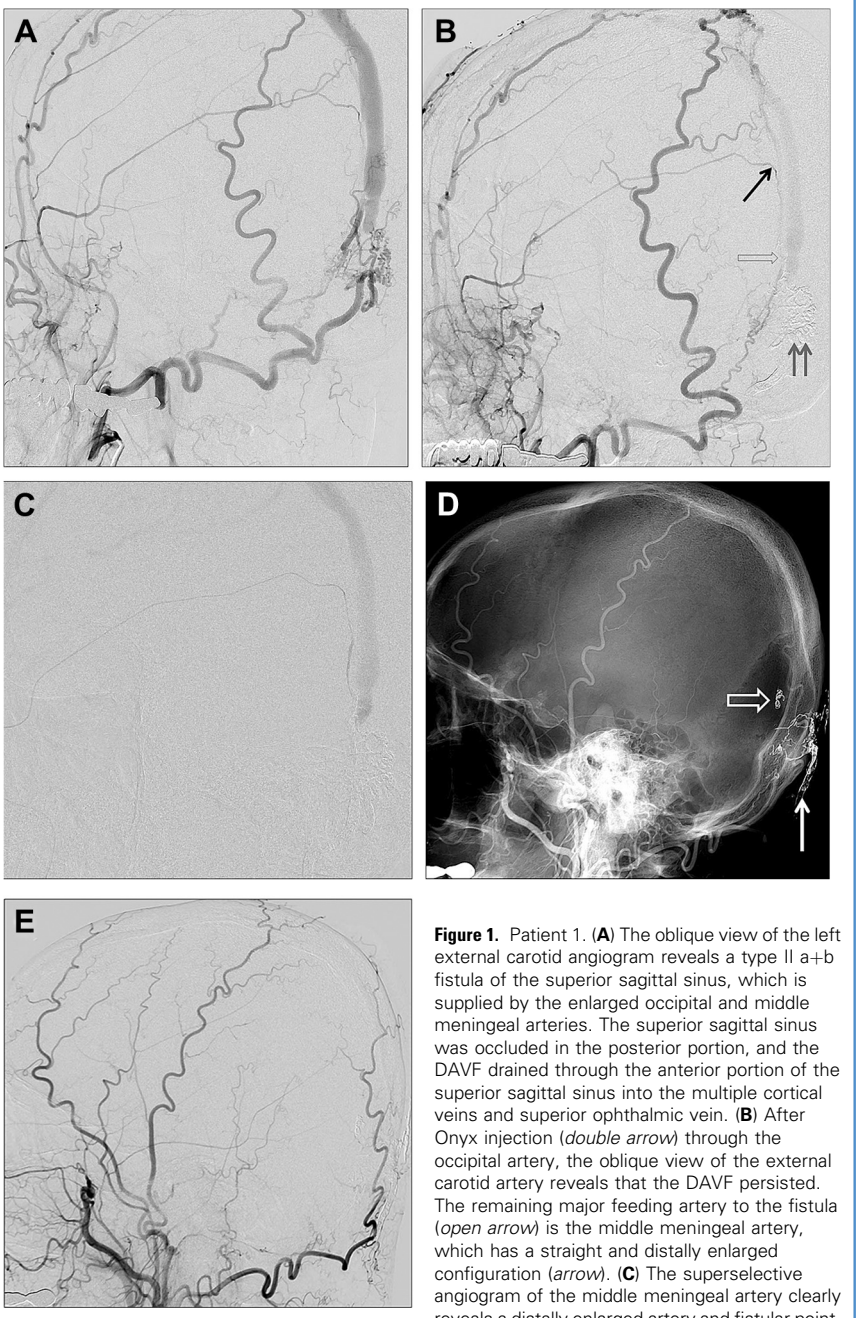

Figure 1. Patient 1. (**A**) The oblique view of the left external carotid angiogram reveals a type II a+b fistula of the superior sagittal sinus, which is supplied by the enlarged occipital and middle meningeal arteries. The superior sagittal sinus was occluded in the posterior portion, and the DAVF drained through the anterior portion of the superior sagittal sinus into the multiple cortical veins and superior ophthalmic vein. (**B**) After Onyx injection (*double arrow*) through the occipital artery, the oblique view of the external carotid artery reveals that the DAVF persisted. The remaining major feeding artery to the fistula (*open arrow*) is the middle meningeal artery, which has a straight and distally enlarged configuration (*arrow*). (**C**) The superselective angiogram of the middle meningeal artery clearly reveals a distally enlarged artery and fistular point. (**D**) Postembolization angiography (native image) shows coil packing (*open arrow*, second embolization) in the fistula point and the proximal venous outlet. The Onyx of the occipital artery (*arrow*, first embolization) is also seen. (**E**) After embolization, the final angiogram showed total occlusion of the fistula.

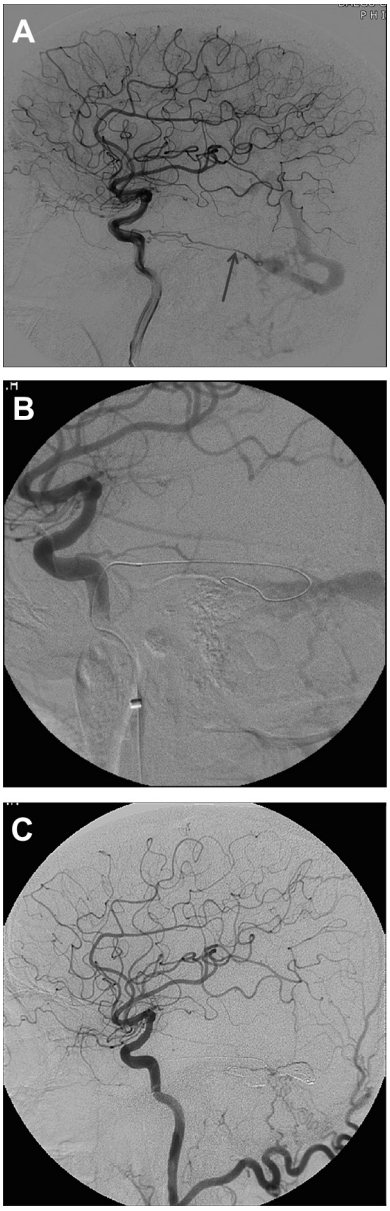

Figure 2. Patient 4. (**A**) The lateral view of the left internal carotid angiogram reveals a type III fistula of the sigmoid sinus, which is supplied by the enlarged meningohypophyseal artery, middle meningeal artery (not seen), and occipital artery (not seen). The meningohypophyseal artery is clearly seen to be straight and distally enlarged (*arrow*). The DAVF drained through the cortical vein adjacent to the sigmoid sinus into the multiple cortical veins. (**B**) Transarterial coil deposition in the venous pouch through the arterial feeder (meningohypophyseal artery). (**C**) After coil packing in the venous pouch, the final angiogram shows total occlusion of the fistula.