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# Clipping of bilateral supply to a midline ethmoidal dural arteriovenous fistula at the origin of the superior sagittal sinus using a bifrontal approach☆

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ABSTRACT

Dural arteriovenous fistulas (dAVFs) in the anterior cranial fossa represent only 10% of all dAVFs. Anterior fossa or ethmoidal dAVFs have a unique angioarchitecture, with cortical vein drainage, associated with a significant risk of hemorrhage. Treatment of ethmoidal dAVFs is challenging due to the ethmoidal artery origin and branch of the ophthalmic artery (OpA), which makes this lesion a difficult target for endovascular route.

We present management of a 59-year-old female with a recent history of migraine. Angiography demonstrated bilateral supply with shunting directly into the superior sagittal sinus (SSS) at its origin adjacent to the crista galli via ethmoidal arteries arising from both OpA, and a 5 mm basilar tip aneurysm projecting postero-superiorly. Since the fistula had a higher risk of hemorrhage, aneurysm occlusion was deferred for treatment at a later time. Endovascular occlusion of the dAVF was not feasible due to the high risk of catherization of OpA, and the patient agreed to microsurgical treatment. A bifrontal craniotomy with ligation of SSS in its proximal third was required to allow access to the crista galli. After occlusion of the arterial feeders, clips were placed to occlude the origin of SSS and avoid fistula recurrence. The patient was discharged without complications, and post-operative angiography showed complete occlusion of the fistula and no further shunting into the SSS. This facilitated future antiplatelet therapy for endovascular treatment of the basilar aneurysm.

Dural arteriovenous fistulas (dAVFs) in the anterior cranial fossa represent only 10% of all dAVFs. Anterior fossa or ethmoidal dAVFs have a unique angioarchitecture, with cortical vein drainage, associated with a significant risk of hemorrhage [1]. Treatment of ethmoidal dAVFs is challenging due to the ethmoidal artery origin and branch of the ophthalmic artery (OpA), which makes this lesion a difficult target for endovascular route [2].

We present management of a 59-year-old female who underwent MRI for recent history of migraine. Imaging revealed an incidental basilar tip aneurysm. Later angiography demonstrated bilateral supply with shunting directly into the superior sagittal sinus (SSS) at its origin adjacent to the crista galli via ethmoidal arteries arising from both OpA, and a 5 mm basilar tip aneurysm projecting postero-superiorly. Since the fistula had a higher risk of hemorrhage, aneurysm occlusion was deferred for treatment at a later time. Endovascular occlusion of the dAVF was not feasible due to the high risk of catherization of OpA, and the patient agreed to microsurgical treatment. A bifrontal craniotomy with ligation of SSS in its proximal third was required to allow access to the crista galli. After occlusion of the arterial feeders, clips were placed to occlude the origin of SSS and avoid fistula recurrence. The patient was discharged without complications, and post-operative angiography showed complete occlusion of the fistula and no further shunting into the SSS. This facilitated future antiplatelet therapy for endovascular treatment of the basilar aneurysm.

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None.

*Abbreviations:* dAVFs, dural arteriovenous fistulas; OpA, ophthalmic artery; SSS, superior sagittal sinus

☆ The authors declare no conflicts of any kind related to the materials or instruments shown in this video.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.inat.2019.04.018.

## References

[1] N.A. Martin, W.A. King, C.B. Wilson, S. Nutik, L.P. Carter, R.F. Spetzler, Management of dural arteriovenous malformations of the anterior cranial fossa, J. Neurosurg. 72 (5) (1990) 692–697.

[2] B.A. Gross, K. Moon, M.Y. Kalani, et al., Clinical and anatomic insights from a series of ethmoidal dural arteriovenous fistulas at Barrow Neurological Institute, World Neurosurg. 93 (2016) 94–99.