Editorial

Interpositional dural graft technique for the treatment of dural arteriovenous fistulas

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THE AUTHORS PRESENT what I consider a useful modification of the well-known technique of the skeletonization of dural sinuses to treat complex dural arteriovenous fistulas (dAVFs). Essentially, they skeletonize the involved sinus in a standard manner, but then they interpose a synthetic dural grafting material, Dura-Guard, which is bovine pericardium cross-linked with glutaraldehyde. They assert that this graft will prevent revascularization of the skeletonized sinus from the adjacent dura. They illustrate the technique very well. They make the important point that in the treatment of dAVFs of the transverse sinus, skeletonization must be performed above and below the sinus (and medial and lateral to the sigmoid sinus if it is involved), and the tentorium must be cut and separated from the sinus because these fistulas almost invariably acquire tentorial dural feeding vessels.

The authors explain nicely that this technique is particularly useful when there are important pial veins that drain in an antegrade fashion into the sinus and cannot be sacrificed. Obviously, when this factor is not a concern and there are no important veins draining into the involved segment of the sinus, that segment can be simply excised, which is more likely to be of permanent curative value. In this respect, I raise a word of caution from personal experience. Arterialization during the early arterial phase after a pressure injection during angiography is not sufficient criterion to occlude that vein. I have made that mistake with a resulting venous infarction. The problem is that the vein can appear to be arterialized because of the pressure injection. Indeed, sometimes it is arterialized during systole, but normal antegrade venous drainage occurs during diastole. This situation has been seen frequently during the late stages of excisional surgery for a parenchymal arteriovenous malformation. After most of the feeding vessels are occluded, one can see arterialization of the draining vein during systole and normal blue venous blood draining into the same vein from normal brain during diastole. To sacrifice an important vein, such as the vein of Labbé, one must be sure that the vein is completely arterialized during both systole and diastole and that it drains only in a retrograde fashion.

Although the authors do not discuss it in detail, it is important to note that the case that they use for illustration involved cortical venous reflux. We have learned that the natural history of these fistulas with cortical venous reflux is very bad, and therefore these lesions merit aggressive treatment such as that suggested by the authors.³ Conversely, we have learned from Satomi and colleagues¹ that the fistulas without cortical venous reflux behave in a very benign fashion over the long term and tend not to convert into the more aggressive type of fistula. Therefore, this type of aggressive surgical approach is not indicated for fistulas that appear benign, such as those with a bruit and without cortical reflux.

One must also beware of massive bleeding during opening of the craniotomy over the arterialized sinus to deal with these complex fistulas. Note that the authors used preoperative arterial embolization in the illustrated case to reduce the vascularity to the fistula, which undoubtedly made the craniotomy safer. The late Dr. Sundt pointed out the possibility of catastrophic bleeding during the craniotomy to expose such fistulas in the days before preoperative arterial embolization.² One technique that we have used to prevent this catastrophic type of bleeding on removing the bone flap from the sinus is to use multiple bur holes on each side of the sinus to be skeletonized and coagulate the dural feeding vessels that are visible through each of the bur holes before removing the bone flap. Alternatively, a strip of bone can be left over the sinus, lifting separate bone flaps above and below to allow for coagulation of dural feeding vessels before lifting the flap of bone over the sinus. These precautions are less likely to be necessary nowadays with adequate preoperative arterial embolization.

Finally, even with their technique, the authors cannot claim that these fistulas are permanently cured. In two or three cases I have used a similar technique by interposing cadaveric dura between the cut edge of the dura and the sinus, and although I have not seen late revascularization

through the graft, in one case the fistula recanalized through feeding vessels that came along the walls of the sinus itself and grew into the skeletonized segment of the sinus. Therefore, long-term angiographic follow up in these patients is mandatory.

References

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RESPONSE: We appreciate Dr. Heros' comments regard-

ing our paper and the additional technical pearls from his own experience regarding the general management of these challenging lesions. He correctly identifies several issues relating to the management of complex dAVFs. Clearly, the best means of preventing refistulization is resection of the involved sinus if possible. Nonetheless, involvement of the bilateral transverse sinuses or the sagittal sinus when antegrade pial venous drainage occurs can preclude this treatment option, because venous infarction can result with the obliteration of normal sinus drainage. We present this technique as a modest contribution to help avoid direct refistulization of the sinus following a skeletonization (disconnection) procedure. In our experience it has effectively reduced refistulization through the disconnected dura or directly from the adjacent pial blood supply.

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