Treatment of posttraumatic carotid-cavernous fistula using a detachable balloon catheter

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Five cases of posttraumatic carotid-cavernous fistula are reported. The fistulas were occluded by intravascular detachable balloons, as described by Serbinenko and later modified by Debrun. The good results obtained in three of these patients illustrate the value of this procedure, as it allows a direct obliteration of the fistula with preservation of the internal carotid blood flow.

KEY WORDS • carotid-cavernous fistula • detachable balloon catheter • embolization

TREATMENT of a carotid-cavernous fistula is aimed at directly occluding the fistula, and restoring or preserving the blood flow in the carotid artery. None of the several methods used up to now (namely, carotid ligation, trapping, use of a Fogarty catheter, or embolization) have succeeded in achieving both goals. A direct surgical approach to the cavernous sinus would fulfill both requirements, but it carries with it a high surgical risk. Only recently, Mullan proved that carotid-cavernous fistulas can be obliterated by direct surgical occlusion techniques, without complications.

In 1974, Serbinenko reported an intravascular approach, later modified by Debrun, et al., by which these fistulas could be treated successfully. This technique consists of introducing a detachable balloon into the cavernous sinus through a carotid catheter. The balloon occludes the fistula with preservation of the internal carotid blood flow.

We have successfully treated three patients with posttraumatic carotid-cavernous fistula, using the method of Debrun. In each case, the balloon was inflated with contrast material only, and then released in place. One 0.6-ml balloon was used to occlude the fistula completely; it was never necessary to inflate it to maximum capacity. The balloon site and size were afterward checked at intervals by plain skull films. In two additional patients, this technique was not successful.

Case Reports

Case 1

This 43-year-old man injured his right eye with a radio aerial on May 20, 1978. Some days later, he developed exophthalmos, conjunctival chemosis, palpebral ptosis, and extraocular muscle palsy of the right eye. He also complained of a right orbital bruit. Right carotid angiography showed a carotid-cavernous fistula (Fig. 1a and b). In November, 1978, he was admitted to the Neurosurgical Department of the Verona City Hospital. On November 23, under local anesthesia, he underwent occlusion of the fistula by a detachable balloon introduced by a catheter into the cavernous sinus through the right carotid artery. The patient’s bruit disappeared immediately. Control arteriography (Fig. 1c and d) showed that the fistula was occluded and the internal carotid blood flow was preserved. During the next few days, ocular movements, exophthalmos, and conjunctival chemosis improved. At a follow-up consultation 7 months later, the patient was asymptomatic.

Case 2

This 62-year-old woman was involved in a motor-vehicle accident on October 21, 1978. She suffered a severe head injury with a resulting right hemiparesis, and was immediately admitted comatose to our
Balloon catheter occlusion of carotid-cavernous fistula

Fig. 1. Right carotid angiography showing early opacification of the cavernous sinus due to the carotid-cavernous fistula (a and b). The fistula disappeared after the intravascular introduction of an inflated balloon, which was then detached into the cavernous sinus with preservation of the internal carotid blood flow (c and d).

department. Left carotid angiography showed a left temporal intracerebral hematoma and left carotid cavernous fistula (Fig. 2a and b). The hematoma was removed surgically. A month later, the patient showed good recovery of mentation and improvement of the right hemiparesis. She developed exophthalmos, conjunctival chemosis, palsy of the third and sixth cranial nerves, and orbital systolic bruit on the left side. On December 7, 1978, under local anesthesia, the fistula was obliterated by the detachable balloon technique, with immediate disappearance of the bruit. Left control angiography showed that the inflated balloon had completely occluded the fistula, with preservation of the internal carotid blood flow (Fig. 2c and d). All ocular symptoms disappeared within 2 days. Six months later, the patient was asymptomatic.

Case 3

This 13-year-old girl was admitted to our department on February 16, 1979, following head injury and loss of consciousness for a few hours. She had hemorrhage of the left ear and a left sixth and seventh cranial nerve palsy. Ten days after head injury, the patient presented the typical symptomatology of a carotid-cavernous fistula, the presence of which was confirmed by left carotid angiography (Fig. 3a and b). On April 27, 1979, the detachable balloon procedure was carried out under local anesthesia. Occlusion of the fistula and preservation of the internal carotid blood flow were confirmed by postoperative left angiography (Fig. 3c and d). The orbital bruit disappeared immediately and the exophthalmos and conjunctival chemosis recovered within 12 hours. At examination 3 months later, the girl was well; only a slight left sixth cranial nerve paresis was still present.

Cases 4 and 5

In two patients the technique was unsuccessful. One was a 26-year-old woman and the other was a 6-year-old child. Both suffered from a carotid-cavernous fistula, with typical clinical and angiographic pictures. Two attempts were made in each case to obliterate the

Fig. 2. Left carotid angiography showing early opacification of the cavernous sinus and markedly enlarged ophthalmic veins due to the carotid-cavernous fistula (a and b). The fistula is occluded by the detachable balloon, and the internal carotid blood flow is preserved (c and d).
fistula by detachable balloon, first using a 0.6-ml balloon and then a 0.1-ml balloon. However, catheterization of the fistulous neck failed.

Discussion

In our cases, the balloon was inflated with contrast medium only, and it gradually became deflated within 2 or 3 weeks (Fig. 4). There were no recurrences. We believe a long-lasting result can be obtained without using silicone; in this way the procedure is performed more easily and in a shorter time.

General anesthesia may not be required, in which case the patient's neurological status can be followed during the procedure. The amount of radiation given during the operation is not very different from that of a selective catheterization of the carotid arteries, and depends on both the duration of the procedure and the number of radiograms taken. This method, as Debrun, et al., have already emphasized, is not always successful because of the many different types of carotid-cavernous fistulas. In several cases, in fact, introduction of the balloon has been prevented either by the narrowness of the fistulous neck or because it goes against the blood stream; this happened in our Cases 4 and 5. Nevertheless, the excellent results obtained when the procedure is successful justify the use of this technique as the initial therapeutic measure in the treatment of carotid-cavernous fistula.

References


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