Retrograde suction decompression of giant paraclinoidal aneurysms

Technical note

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Due to their thick broad-based necks, giant intracranial aneurysms are often difficult to clip directly without temporary interruption of local circulation. Giant aneurysms of the proximal intracranial carotid artery (paraclinoidal aneurysms) present two unique technical problems related to their particular anatomy. First, the acquisition of proximal control is usually not possible intracranially without directly opening the cavernous sinus, with its attendant cranial nerve morbidity. Second, brisk retrograde flow through the ophthalmic artery and cavernous carotid branches is frequently sufficient to maintain turgor within the aneurysm despite temporary trapping of the arterial segment. This aneurysmal distention can force clips off the neck, leading to encroachment upon the parent artery.

Direct puncture of the aneurysm with deflation by the surgical suction or by a butterfly needle as proposed by Flamm often occupies the surgeon’s nondominant hand. We have devised a method of retrograde aneurysmal decompression which is accomplished by the surgical assistant, allowing the surgeon the freedom to use both hands and providing an unobstructed view for dealing with the lesion.

**Technique**

The patient is positioned for a standard pterional craniotomy with the head rotated about 30° to the contralateral side. In order to simplify the surgical access to the cervical carotid artery, the head is elevated 8 to 10 cm prior to fixation. This maneuver elevates the mandible and maximizes exposure of the distal cervical internal carotid artery. Electroencephalographic (EEG) electrodes are placed for titrating administration of cerebral metabolic protectants. The frontotemporal region is prepared and draped in continuity with the anterolateral aspect of the neck. The cervical wound is dissected first, exposing 2 to 3 cm of the internal carotid artery.

A standard pterional craniotomy is then performed with aggressive resection of the sphenoid ridge. After dural opening, a microsurgical dissection of the medial sylvian fissure and carotid cistern is accomplished, yielding distal control of the aneurysmal segment. A site for distal temporary clipping is prepared immediately proximal to the posterior communicating artery (Fig. 1). The anterior clinoid process is then radically resected with a high-speed air drill and the optic canal is widely opened. This proximal exposure is pursued until the normal carotid artery wall is seen emerging from the roof of the cavernous sinus, thus exposing the proximal aneurysmal neck. Following complete aneurysm dissection, the anesthesiologist administers etomidate until EEG silence is achieved and ensures systemic normotension.

The surgical assistant then applies a vascular occlu-
FIG. 1. Diagram illustrating the technique. The patient is positioned for a pterional craniotomy, and the malar eminence is elevated by 8 to 10 cm, maximizing access to the distal cervical internal carotid artery. Temporary trapping is instituted with a vascular clamp proximally, and a temporary clip is applied proximal to the posterior communicating artery; a No. 18 angiocatheter is then inserted antegrade into the internal carotid artery. An extension set and stopcock are applied and a No. 7 French surgical suction tube is inserted into the stopcock to aspirate retrograde collateral flow, thereby deflating the aneurysm.

Discussion

The surgical treatment of giant aneurysms has been simplified by the introduction of large clips with extremely high closing pressures and the use of innovative booster clips. For giant paraclinoidal aneurysms, however, we have found that temporary arterial occlusion is frequently necessary. Drake has advocated simple digital cervical carotid artery compression by the anesthesiologist to soften the sac for clipping. In our practice this technique has proved useful for smaller aneurysms but less helpful for more difficult giant sacs as exuberant retrograde collateral flow frequently persistently distends the thick-walled lesions, preventing accurate clip closure.

While attempts at achieving proximal arterial control intracranially have usually been awkward and often unsuccessful, a policy of cervical exposure has evolved which lengthens the procedure by only a few minutes. Our early attempts at aspirating collateral flow by puncturing the aneurysm directly or by the use of a technique similar to that described by Flamm were cumbersome, and often prevented the surgeon from maximally utilizing both hands for final dissection and clipping.

The technique described in this report has proved useful in achieving aneurysmal collapse and clipping in over 40 cases. Its chief advantage over other techniques rests in the elimination of restrictions imposed on the operating surgeon and an unencumbered operative field. To date, we have had only one complication related to this technique. A 75-year-old woman with severe extracranial and intracranial atherosclerosis was treated by this technique following subarachnoid hemorrhage from a giant paraclinoidal aneurysm. Postoperative angiography disclosed severe intracranial carotid stenosis due to a complicating atheromatous sleeve. She underwent surgical reexploration to revise the clip placement. Her cervical internal carotid artery was again catheterized for suction decompression and, during this manipulation, a medial arterial dissection developed which necessitated an emergency endarterectomy. Because of this complication, we recommend that this technique be applied with caution to the elderly or severely atherosclerotic patient.

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References


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