An approach to a basilar aneurysm above the bifurcation of the internal carotid artery

Case report

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The authors report a case of a basilar artery aneurysm approached by the transsylvian route; the aneurysm was successfully clipped through the space distal to the carotid bifurcation and between the frontal and temporal lobes. This approach is useful when the internal carotid artery is short, sclerotic, and difficult to mobilize. Special care should be taken when retracting perforating arteries and the posterior communicating artery.

Key Words: cerebral aneurysm · basilar artery · transsylvian approach · direct retraction · surgical approach

Basilar artery aneurysms are approached via subtemporal, pterional, or transsylvian routes. In the transsylvian route, which is the one most used in our practice, the basilar aneurysm is usually approached lateral to the internal carotid artery (ICA) or the M1 portion of the middle cerebral artery (MCA). The route between the optic nerve and the ICA is taken in a limited number of cases where a sclerotic carotid artery and its bifurcation are located extremely laterally. In the present case, an approach was made to a basilar-superior cerebellar artery aneurysm through the space distal to the carotid bifurcation and between the frontal and temporal lobes.

Case Report

This 57-year-old man was admitted to our hospital immediately after a subarachnoid hemorrhage.

First Admission. The computerized tomography (CT) scan showed a high-density area in the basal cistern, most marked in the right Sylvian fissure. Right carotid angiography showed an aneurysm at the MCA trifurcation. A right frontotemporal craniotomy was performed within 24 hours of the hemorrhage, and the aneurysm was clipped. The postoperative course was uneventful except for a mild degree of liver dysfunction.

Second Admission. On the 10th postoperative day, four-vessel angiography was performed by the Seldinger technique, and the MCA aneurysm was observed to have been satisfactorily clipped. However, two more aneurysms were found in the basilar artery at the origin of the right superior cerebellar artery (Fig. 1), and in the left MCA.

Operation. An approach to the basilar aneurysm was made 1 month later, when the patient's liver function had normalized. The right frontotemporal craniotomy wound was reopened and the sphenoid ridge was further cut away close to the anterior clinoid process. The dura was opened and the Sylvian fissure was split as widely as possible. The previously clipped MCA aneurysm, which projected laterally, was embedded in the temporal lobe and was deliberately left untouched. The main trunk of the MCA was exposed only on the frontal side. The intradural portion of the ICA was found to be unusually short and sclerotic. Furthermore, the back wall of the ICA adhered to the posterior clinoid process. The space between the ICA and the optic nerve was narrow, making approach difficult in this direction, but the basilar aneurysm was partially visualized through this space. We realized that an approach either lateral or medial to the ICA was not feasible. The A1 segment of the anterior cerebral artery was freed from the base of the frontal lobe.

The anterior choroidal artery and posterior communicating artery with its branches were found running from behind the ICA to the base of the brain in the
Unusual approach to basilar artery aneurysm

Fig. 1. Left: Schematic drawing of the operative view. The approach is made through the space distal to the carotid bifurcation under the frontal and temporal lobes. Note that the bundle of fine arteries, including the anterior choroidal and posterior communicating arteries as well as the perforating vessels, is directly retracted by a 2-mm tapered retractor. Right: a and b: Pre- and postoperative left vertebral angiograms, anteroposterior view. c: Computerized tomography scan taken 2 days postoperatively showing a small low-density area in the region of the right basal ganglia.

Form of a wide bundle. Without separating these fine arteries it was possible to visualize the basilar artery, aneurysm, and all four distal branches by changing the angle of the operating microscope. The neck of the basilar aneurysm was easily dissected from the P1 segment, but dissection between the aneurysm and the superior cerebellar artery was much more difficult. The aneurysm appeared to originate from the origin of the superior cerebellar artery as well as the basilar artery.

Although we were able to visualize these structures by changing the angle of the microscope, placing a clip was difficult because of the narrow exposure, encumbered by the bundle of perforators and the posterior communicating artery. However, direct retraction with a 2-mm tapered brain retractor connected to a self-retaining retractor provided ample exposure through this opening. Dissection around the neck of the aneurysm and clipping took approximately 30 minutes, with the bundle of perforating vessels continuously retracted (Fig. 1). Clipping was performed using an 18-mm straight Sugita clip with straight applier. The first clipping trial resulted in kinking of the superior cerebellar artery at its origin. At the second trial the clip was placed slightly on the dome side, thus reducing the degree of kinking and leaving an acceptable lumen through which flow was not compromised. The wound was closed in the usual way.

Postoperative Course. Postoperatively, mild left hemiparesis and drowsiness were noted, but these cleared completely in 2 days. A CT scan performed on the 2nd postoperative day showed a small low-density...
area in the right putamen, but this was less apparent in the CT scan taken 10 days after surgery. The patient was dismissed from the hospital 2 weeks later without neurological deficits. Surgery for a third small aneurysm of the left MCA is planned for sometime in the future.

Discussion

Of 80 cases of basilar artery aneurysm treated at our clinic, 72 patients were operated on via the transsylvian approach. In four of these cases, an approach was made through the space between the optic nerve and the ICA. This route is used when the ICA is projecting laterally and is sclerotic, making it difficult to retract the ICA or the M₁ segment of the MCA medially. The difficulty with this approach is that the space is narrow and deep, and obstructed by many perforating arteries. In the present case both of the above approaches were impossible for the following reasons: 1) the ICA was sclerotic and adherent to the posterior clinoid process; 2) the ICA was unusually short; 3) the space between the optic nerve and the ICA was narrow; and 4) the MCA could not be mobilized from the temporal lobe because of the previously clipped MCA aneurysm.

The space created between the MCA and the anterior cerebral artery was wide enough to visualize all the necessary structures, including the distal basilar artery with its major branches and the neck of the aneurysm. The short intradural portion of the ICA was also a factor that created a space wider than usual, and the perforators and the posterior communicating artery were longer because of this. Despite all this, exposure was inadequate to permit a clipping maneuver, necessitating direct retraction of the bundle of perforating arteries. It is especially important to take care not to injure the perforating arteries, as in this case. The low-density area which appeared temporarily on an early postoperative CT scan corresponded to the area supplied by a perforating artery, and was most likely caused by continuous retraction of the bundle of perforators, including the anterior choroidal and posterior communicating arteries. This lesion could have been prevented if we had employed the intermittent retraction technique that is used for retraction of a major artery such as the carotid artery or the MCA, or the brain itself.

If the neck of the aneurysm had been located very high, it would have been impossible to clip the aneurysm successfully. When the MCA cannot be retracted medially, as in the present case, the subtemporal route would be another possible approach. But for surgeons who are more accustomed to the pterional approach for aneurysm surgery it is more convenient and safer to take the transsylvian approach.

References


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