Mobilization of the internal carotid artery for basilar artery aneurysm surgery

Technical note

TAKESHI MATSUYAMA, M.D., TAKAHIDE SHIMOMURA, M.D., YOSHINARI OKUMURA, M.D., AND TOSHIKOE SAKAKI, M.D.

Department of Neurosurgery, Seikeikai Hospital, Sakai City, Osaka, Japan; and Department of Neurosurgery, Nara Medical University, Kashihara City, Nara, Japan

The authors describe a technique for mobilization of the internal carotid artery (ICA) for basilar artery (BA) aneurysm surgery. Using the epidural approach, the anterior clinoid process, orbital roof, and optic canal are drilled away. The ICA is made mobile to the C3 segment by cutting the dural ring and dissecting the ICA from the carotid groove. The ophthalmic artery is then dissected from the optic canal. This mobilization of the ICA secures wide operative fields on both its medial and lateral sides and permits complete clipping of BA aneurysms.

KEY WORDS • internal carotid artery • basilar artery aneurysm • ophthalmic artery • internal carotid artery mobilization
The dural ring is cut circumferentially around the ICA, and the ICA is dissected free from the carotid groove to the C3 segment in the cavernous sinus while venous bleeding is controlled by packing with Bio-bond-soaked oxycellulose. An additional 2- to 4-cm segment of free ICA can be obtained using this dissection. This procedure provides greater mobilization of the ICA, which is fixed at the dural ring and the carotid groove, and it is possible to displace the optic nerve in a transverse direction. The proximal portion of the ophthalmic artery (OA) is now recognized, and the optic sheath is cut along the direction in which the OA courses so as not to injure it. Using this procedure, the space between the ICA and the optic nerve can be increased without restriction of the OA. A wide operative field can always be obtained between the optic nerve and the ICA by displacing the ICA laterally and the optic nerve medially. This affords sufficient space for neck clipping (Fig. 2 upper left). Using our method, however, the fixed portion of the ICA is released, the ICA can be moved in its proximal portion, and the OA is separated from the optic canal. We measured the increased length of the ICA from intraoperative findings in 20 cases. By dissecting the ICA from C2 to C3, the added length of the cavernous portion ranges from 6 to 24 mm, with a mean of 17 mm. We also examined the movable portion of the ICA before and after freeing the ICA in 13 cadavers. Before freeing the ICA, the length ranged from 3 to 11 mm, with a mean of 6 mm. After freeing the ICA, the length ranged from 6 to 21 mm, with a mean of 13 mm. Therefore, the operative field that is obtained using the pterional approach is limited by the optic nerve, ICA, ACA, middle cerebral artery, and temporal lobe.

Surgery for BA aneurysms is usually performed through a space on either the medial or lateral side of the ICA. The ICA is fixed at the anterior clinoid process and at the dural ring. The length of the supraclinoid portion of the ICA ranges from 14 to 25 mm, with a mean of 19 mm. Because the mobility of the ICA is restricted, surgery cannot be performed through both spaces. The space bounded by the optic nerve, ICA, and ACA—known as the opticocarotid triangle—is a route for the BA. When the horizontal portion of the ACA or the supraclinoid portion of the ICA is short, the opticocarotid space is very small. Using this space for neck clipping or only for identifying the global environment of the BA aneurysm complex is very difficult or impossible. Using our method, however, the fixed portion of the ICA is released, the ICA can be moved in its proximal portion, and the OA is separated from the optic canal. We measured the increased length of the ICA from intraoperative findings in 20 cases. By dissecting the ICA from C2 to C3, the added length of the cavernous portion ranges from 6 to 24 mm, with a mean of 17 mm. We also examined the movable portion of the ICA before and after freeing the ICA in 13 cadavers. Before freeing the ICA, the length ranged from 3 to 11 mm, with a mean of 6 mm. After freeing the ICA, the length ranged from 6 to 21 mm, with a mean of 13 mm. These anatomically based measurements...
indicate that mobilization of the ICA would be effective for BA aneurysm surgery.

The space between the optic nerve and the ICA can always be reached and widened, so that in most cases clipping becomes possible. Approach through this space permits a direct view of the aneurysm and surrounding structures, decreases the blind space, and permits identification of perforating arteries on both sides of the aneurysm. Even if temporary clipping of the BA to avoid premature rupture is performed in one space, neck clipping can be performed without difficulty via the other space. The ability to perform neck clipping in a different operative field from that used for temporary clipping permits safe aneurysm neck clipping and confirmation of results.

We have used this technique in 23 cases of BA aneurysm surgery. All of the aneurysms were completely clipped without any adverse intraoperative events. Neck clipping was performed via the medial side of the ICA in 10 cases and via the lateral side of the ICA in the other cases. Using the usual operative approach, the ICA is sometimes injured during the surgical procedure because it is directly retracted with a spatula. In our procedure, the ICA is shifted with flexibility and there is less chance of its being injured. It appears that arteriosclerotic changes in the cavernous portion of the ICA are milder than those in the supraclinoid portion. For reasons stated above, our method of BA aneurysm surgery decreases tension on the supraclinoid portion of the ICA. Mobilization of the ICA in the dissected portion from C2 to C3 is considered preferable for use in this procedure, particularly in geriatric patients with severe arteriosclerotic changes in the ICA.

Conclusions

The procedure described here secures operative fields on both the medial and lateral sides of the ICA by increasing the mobility of the ICA in its proximal portion. This technique is very useful for clipping BA aneurysms.

References


Manuscript received January 29, 1996. Accepted in final form September 12, 1996.

Address reprint requests to: Takeshi Matsuyama, M.D., Department of Neurosurgery, Nara Medical University, 840 Shijo-cho, Kashihara City 634, Japan.