Intracranial vertebral artery aneurysm treatment

Intracranial vertebral artery aneurysm treatment and approaches of VA aneurysms are different from anterior circulation and posterior circulation aneurysms.

Microsurgery is a feasible treatment for VA aneurysms, although cranial nerve deficits are more common than in endovascular surgery. Despite the challenge of an often severe hemorrhage, of challenging morphology, and risk for laryngeal palsy, most patients surviving the initial stage return to normalize [1].

Microsurgical treatment should be discussed when the PICA originates from the aneurysmal neck, particularly in patients with a ruptured small aneurysm, in order to obtain a reliable and long-term exclusion of the aneurysm [2].

Tjahjadi et al. describe a 10-year experience using a simple lateral suboccipital approach and its modification by the senior author (J.H.) to treat VA and proximal PICA aneurysms. Unfavorable outcome was related to the poor preoperative clinical grade, preoperative intraventricular hemorrhage, and postoperative pneumonia [3].

Endovascular teatment

Although endovascular intervention is commonly applied as therapeutic modality for patients with vertebral artery aneurysm, researchers have also emphasized that saccular vertebral aneurysms with fusiform extension can also be surgically treated in suitable cases [4].

Although multiple treatment options are available, including surgery, endovascular approaches, coil embolization and parent artery occlusion, there is limited clinical evidence regarding which approach is most optimal.

In consideration of their surrounding regional anatomy, they present a formidable surgical challenge to the neurosurgeon using traditional techniques. Recent advances in endoscopic transnasal surgery have provided an additional approach for the treatment of these difficult lesions.

Initial treatment consisted of endovascular trapping of the aneurysm; however, because of concerns that the remaining aneurysm and intraluminal thrombus was causing mass effect and continued brainstem compression, a decompressive procedure was required.

In consideration of their surrounding regional anatomy, aneurysms of the vertebral artery present a formidable surgical challenge to the neurosurgeon. Although endovascular techniques have proven to be extremely valuable for the treatment of these lesions, they are limited when patients have significant mass effect with brainstem compression or cranial neuropathy.

Advances in endoscopic transnasal surgery have provided an additional approach for the treatment of these difficult lesions.

OA-PICA bypass with obliteration of the aneurysm is one of the optimal treatments for intracranial

aneurysms that occur at the VA and its branches because it can preserve the perforators and distal blood flow from the PICA [5].

Case series

Twenty-two patients with posterior inferior cerebellar artery (PICA) aneurysms were treated in our department from 1965 to 1982. Except for six cases with peripheral PICA aneurysms, all aneurysm were located on the vertebral artery at the origin of PICA (VA-PICA aneurysm). Direct approach to the aneurysm was carried out in 11 cases out of 16 with VA-PICA aneurysm. We encountered difficulties in access to the aneurysm in 5 cases (case 2,4,6,13,15) and in clipping procedures in 4 cases (cases 6, 7, 10, 15). Surgical procedures through either bilateral (case 2,4) or unilateral suboccipital craniotomy included exploration in 1 case; wrapping in 1, proximal vertebral artery clipping in 3 and neck clipping in 6. These difficulties encountered during operation were evaluated in relation to angiographical findings. The aneurysms located between 0 to 5 mm from the midline or more than 21 mm from the lateral point of the foramen magnum could be reached with difficulty through unilateral suboccipital craniotomy (Figure 3,4). The aneurysms with the dome directed posteriorly had to be treated carefully because of their possible adhesion to or invagination into the medullar oblongata. The aneurysms with the dome directed medially were difficult to be clipped because they existed on the opposite side of the vertebral artery. Although all aneurysms overlying the lower third of the clivus, even on the midline, can be exposed through unilateral suboccipital craniotomy, great care should be taken especially to the aneurysms located in high position, with the dome directed medially or posteriorly, and with the distal vertebral artery running medially [6].

Thirteen cases of vertebral aneurysm at the origin of PICA (VA-PICA aneurysm) were operated on at the Department of Neurological Surgery of Kitano Hospital from March, 1970 through July, 1975. Those included 9 cases of saccular aneurysm and 5 cases of fusiform aneurysm.

The incidence of VA-PICA aneurysms among the whole series of intracranial aneurysms was 4.2%. Patients with subarachnoid hemorrhage were subjected to a routine 4 vessel angiography. For those with suspected vertebral aneurysm vertebral angiography was performed in a transoral projection. In this method, when the angle between the film and the horizontal plain of Frankfurt is fixed at 50 degrees, the origin of PICA is projected on the film between the upper and lower teeth line. Since X-ray beam falls vertically on the origin of PICA, the resultant vascular shadow is free from shortening, elongation and distortion, leading to precise demonstration of anatomical arrangement of the vessels. At surgery a lateral suboccipital incision was made. With the position of VA-PICA junction the surgical approach was slightly different. When the junction was located higher than the line between the lowest point of the occipital bone and the basion by 1 cm or more, the approach was made through the middle of the sigmoid sinus which was exposed by suboccipital osteoclastic craniectomy (mid-lateral cerebellar approach). When the VA-PICA junction was situated lower than the line by 1 cm or more, the operation was initiated at the upper limit of the lower one-third of the sigmoid sinus (lower-lateral cerebellar approach). Since VA-PICA junction is ventrally situated to the lower cranial nerves, surgical attack to the junction can be attained only through the space among the nerves. Two spaces are available for this direct attack. One is the space between the facial nerve, acoustic nerve and the group of vagal nerves. The other is between accessory nerve bundles or between the group of accessory nerves and the hypoglossal nerves. The former procedure is employed for reaching the aneurysm by mid-lateral cerebellar approach and the latter by lower-lateral cerebellar approach. In

the patients in acute stage of ruptured VA-PICA aneurysm, hemisuboccipital craniectomy and laminectomy of the atlas were carried out for the purpose of decompression. Surgical procedures used included coating in 2 cases, trapping in 2, proximal ligation of the vertebral artery in 2 and neck clipping in 6. Two patients died due to grastrointestinal bleeding. Surgical complications noted were hypoglossal nerve palsy in 1 case mild sensory disturbance contralateral to the aneurysm in 3 cases. Those symptoms were thought to be caused either by direct injury to the lower cranial nerves or circulatory disturbance in the medullary branches of the vertebral artery. To eliminate those postoperative complications it is desirable to devise smaller aneurysm clips and smaller clip forceps [7].

1)

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