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Case Report

Direct Repair of a Dorsal Wall Aneurysm on Supraclinoid Internal Carotid Artery

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Aneurysms arising at locations other than arterial division are rare and the incidence of intraoperative bleeding is far higher in such aneurysms than in usual aneurysms. The authors report a case of intraoperative rupture and laceration on internal carotid artery(ICA) wall during dissecting a dorsal wall aneurysm on supraclinoid ICA and successful repair of the laceration on the parent ICA with microsuture and a Sundt clip-graft.

KEY WORDS : Laceration · ICA dorsal wall aneurysm · Microsuture · Sundt clip-graft.

Introduction

Supraclinoid ICA dorsal wall aneurysm is focal wall defect covered with thin fibrous tissue[3] and is therefore not a true aneurysm[1]. So it has a high risk of intraoperative premature rupture and development of large lacerations on the parent vessel during microsurgery in the acute stage. When approaching complicated intracranial pathology such as a dorsal wall aneurysm of the ICA, the neurosurgeon should be prepared to deal with a potential intraoperative catastrophe before the beginning of operation.

Case Report

This 40-year-old man experienced a sudden-onset headache followed by loss of consciousness. He was transferred to our hospital by ambulance. On admission, he was stuporous without other focal neurologic deficits. Computerized tomogram (CT) demonstrated thick diffuse cisternal clots (Fig. 1A) and intracerebral hematoma in right sylvian fissure (Fig. 1B). Right carotid angiogram revealed a saccular aneurysm on the dorsal wall of the right ICA, just proximal to anterior choroidal artery and distal to posterior communicating artery (Fig. 2A, B). Good collateral circulation through anterior communicating artery was confirmed on left carotid angiogram with compression of right carotid artery (Fig. 2C).

Two days after onset of symptoms, a right frontotemporal craniotomy was performed under intravenous anesthesia using propopol. The sylvian fissure was opened widely and the right frontal lobe was elevated to expose right ICA. The supraclinoid portion of the ICA was atherosclerotic. Entire aneurysmal dome which was covered with thick and sticky blood clots. An extremely thin-walled aneurysm intermingled with thick local cisternal clots was noted on the anteromedial wall of the ICA. Despite of meticulous dissection, the base of aneurysm was ruptured, unfortunately. Because the laceration was large and it was developed on ICA wall itself (Fig 3A), it could not be repaired with commonly available aneurysm clips. Two temporary clips were applied for trapping of ICA. The first clip was applied just distal to the origin of the posterior communicating artery and the second clip was located just proximal to the origin of the anterior choriodal artery. And then two microsuture stitches with 8-0 prolene were placed on the lacerated ICA wall. After that meticulous procedures, a split artery was reformed as a tubular structure. A Sundt clip-graft (clip No. 20-1788; Codman & Shurtleff, inc.), 3.5mm in

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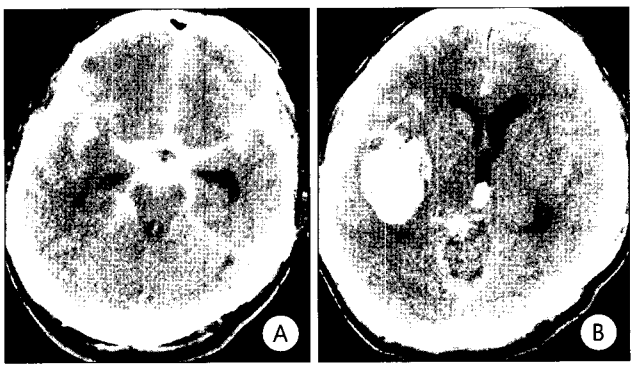

Fig. 1. Preoperative computerized tomogram demonstrating a thick diffuse subarachnoid hemorrhage in the basal cistern and both Sylvian fissures (A), and huge intracerebral hemorrhage in right temporal lobe and thin intraventricular hemorrhage (B).

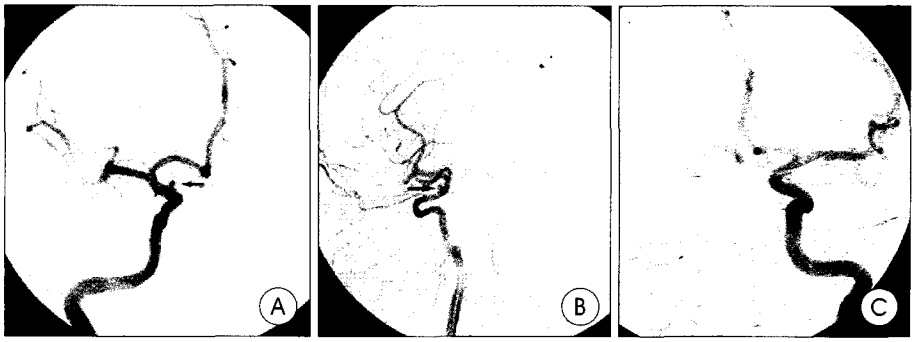

Fig. 2. Preoperative right carotid angiogram. Anteroposterior oblique view (A) and lateral view (B) show a saccular aneurysm (arrow) on the dorsal wall of the right internal carotid artery (ICA). Left ICA anteroposterior view with right ICA compression shows good collateral circulation to right side through anterior communicating artery (C).

diameter was then applied to reinforce the entire lesion (Fig. 3B). The total time of ischemia was approximately 20minutes. The patent distal ICA flow was confirmed with intraoperative doppler.

Postoperative right carotid angiogram showed complete obliteration of the aneurysm and slight narrowing of ICA but anterior and middle cerebral artery were well visualized (Fig. 4A, B). Ventriculo-peritoneal shunt operation was done 1 month later after initial attack. The patient made a progressive recovery and had returned to normal activity by 2 months after surgery.

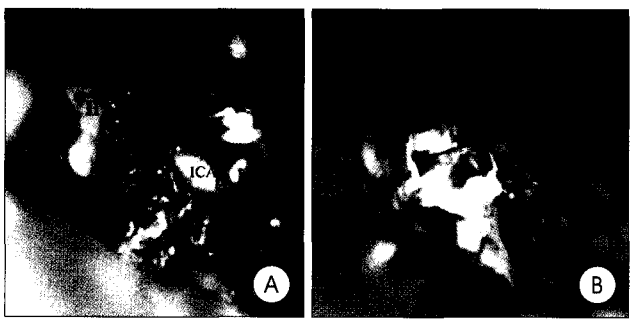

Fig. 3. The large laceration (arrow) on the medial wall of the ICA is seen in the operative view (A). A Sundt clip-graft is applied to reinforce the entire lesion (B). II : optic nerve, ICA : internal carotid artery.

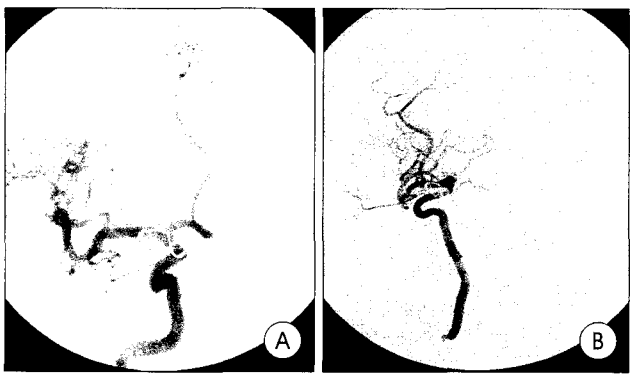

Fig. 4. Postoperative right carotid angiogram. Anteroposterior oblique view (A) and lateral view (B) show complete obliteration of aneurysm. ICA is slightly narrowed but anterior and middle cerebral artery are well visualized.

Discussion

Aneurysms arising from the dorsal wall of the ICA are rare. The reported incidence was 0.3 to 1% of all intracranial aneurysms[1,2,8]. Although their pathogenesis remains uncertain, arteriosclerosis and hemodynamic stress are known to play important roles in formation of such anerurysms[1,3,13]. In autopsy study, it was demonstrated that these lesions are focal wall defects covered with thin fibrous tissue[7] and are therefore not true aneurysms[1]. So they have high risk of intraoperative premature rupture and development of large lacerations on the parent vessel during microsurgery in the acute stage[1,6,10-12].

Various neurosurgical tactics have been proposed to treat dorsal wall aneurysm of ICA ; exposing of cervical ICA for pressure control[1], careful dissection[12], an wide opening of sylvian fissure to obtain the necessary exposure of the aneurysm complex[11], selection of an appropriate clip suitable for the physiological curve of the parent artery, parallel clipping of the parent artery and catching the arterial wall beyond lesion[8,11,13], using wrapping material to reinforce the fragile transitional zone[7-9,13] and endovascular occlusion of the cervical ICA with or without bypass surgery[1].

When approaching these lesions surgically, another important fact to be considered is that the neurosurgeon should also be prepared to deal with a potential intraoperative premature rupture and laceration on ICA wall before the beginning of the operation. This includes preparing encircling clips, wrapping materials, microsuture tools and preparations for additional extracranial-to-intracranial bypass surgery.

For accidental vascular perforation in the field of neurosurgery, several methods have been developed. Successful uses of various wrapping materials for permanent hemostasis were reported[8,10] but a strip of gauge material was not suitable[1] and the long-term efficacy of wrapping remains questionable. The suturing technique requires longer periods of occlusion time for arterial repair and may be complicated by uncontrolled bleeding because of the position of lacerated vessel, and the friable vessel wall[6] itself. Angioplasty by suturing after temporary

trapping can cause disastrous outcome due to ischemia. A Sundt clip-graft can be applied quickly in the face of uncontrolled bleeding and deep or narrow surgical fields[6] and may be useful, if it is provided that the segment of the ICA is free of branched or the branch can be preserved using the window of the clip graft. In order to avoid sacrificing small branches of injured vessels, silastic encircling clip that can be tailored intraoperatively can be also used[4,5]. However, such clips cannot be applied if the laceration is large and the tubular structure of the vessel is lost[12].

In our case, repair was not sufficient by using a Sundt clip-graft alone due to a large size of laceration and high pressure of ICA. We placed two 8-0 prolene microsuture stitches on the ICA wall rather than complete suture of the lacerated ICA wall. And then temporary clip on the distal ICA was removed for a moment so that collapsed ICA could returned to its tubular form suitable for the final application of a Sundt clip-graft. This method may have resulted in a shorter occlusion time than suturing alone, thus avoiding potentially disastrous ischemic complication. Postoperative angiogram showed complete obliteration of aneurysm and slight narrowing of ICA but the distal ICA flow was intact.

Accidental vascular laceration can be encountered unexpectedly in the neurosurgical field. In that circumstance, no single strategy is uniformly effective and method for complete hemostasis may be different according to its situation. It is important for us to have a number of Sundt clip-grafts and wrapping materials available and train our microvascular techniques. In addition, careful preoperative angiographic reading including collateral circulation for temporary occlusion is essential.

Conclusion

The ICA wall laceration encountered during dissection of dorsal ICA aneurysm could be successfully repaired with combination of microsuture and reinforcing Sundt clip-graft method. When approaching this lesion, the neurosurgeon should be prepared to deal with a potential intraoperative catastrophe.

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