# Treatment of bilateral mycotic intracavernous carotid aneurysms

Case report

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 $\checkmark$  A case of bilateral mycotic intracavernous carotid aneurysms is reported. Because of progressive bilateral ophthalmoplegia, the internal carotid artery (ICA) was ligated on both sides, combined with bilateral extracranial-intracranial arterial bypass. A superficial temporal artery-middle cerebral artery anastomosis was performed first on the right side followed by ligation of the right ICA at the neck. After an interval of 20 days, a bypass and ICA ligation was carried out on the left side. The patient developed mild hemiparesis and dysphasia during and immediately after the second operation, but these neurological deficits disappeared after elevation of systemic blood pressure.

KEY WORDS · carotid aneurysm · mycotic aneurysm · cavernous sinus · internal carotid ligation · STA-MCA anastomosis · extracranial-intracranial bypass

**B** ILATERAL intracavernous carotid aneurysms are rare<sup>10,17,19,21</sup> and almost always inaccessible for direct operation.<sup>13</sup> We have found only 27 cases of such aneurysms reported in the literature. Five were treated surgically; two cases with partial carotid ligation on one side, another two by internal carotid artery (ICA) trapping on one side, and one by ICA ligation on one side and wrapping on the other side.<sup>7,10,14,17,18</sup>

In the present report, we describe a case of bilateral mycotic intracavernous carotid aneurysms in which bilateral ICA ligations combined with bilateral extracranial-intracranial (EC-IC) bypass procedures were performed. The feasibility of this combined procedure and precautions to be taken are examined.

## **Case Report**

This 22-year-old man had been in excellent health until a week before admission, when he experienced a phlegmon at his nose and developed a toothache. Four days later he developed a high fever of 39.8°C, sore throat, and neck pain.

*Examination.* On admission to the Teraoka Memorial Hospital in Fukuyama on May 18, 1980, the patient's body temperature was 39.7°C, pulse 96/min, and blood pressure 140/60 mm Hg. Physical examination revealed signs of meningeal irritation, right exophthalmos with chemosis, axillary and inguinal lymphadenopathy, and painful induration along the right jugular vein. No bruit was audible over the eyes or head. Heart sounds were normal. The neurological examination of this conscious patient revealed anisocoria (greater on the left than the right), diplopia, and slight visual impairment in the right eye. No ptosis was noted at this time. This clinical picture seemed to come from meningitis and a possible thrombophlebitis of the cavernous sinus and jugular vein.

*Preoperative Course.* On May 28, 1980, bilateral total ophthalmoplegia developed; the patient could not open or move his eyes, the pupils were maximally dilated and did not react to light. Visual acuity was still preserved. Hypesthesia and paresthesia were noted in the distribution of the first division of both trigeminal nerves.

A lumbar tap showed an initial pressure of 210 mm  $H_2O$  with turbid cerebrospinal fluid (CSF). Analysis of CSF showed 847 cells/cu mm (almost all polynuclear cells), 76 mg/dl of protein, and 43 mg/dl of sugar. Leukocytosis was noted, with up to 19,300

leukocytes/cu mm. No bacteria were cultured from the blood nor from the CSF, since antibiotic therapy had already been started before the patient was transferred to our clinic. He also had polyuria, with a urine output of up to 8500 ml/day. The high fever persisted until May 30, 1980.

Cerebral angiography (Fig. 1) revealed bilateral intracavernous carotid aneurysms. The right ICA was also moderately narrowed, probably because of angiitis of the carotid artery, which was believed to originate at the cavernous portion of the right ICA.<sup>9</sup> Ophthalmic venography showed that the cavernous sinus was thrombosed. On computerized tomography (CT) scan, partially thrombosed aneurysms were visualized in both parasellar regions. The patient's focal neurological signs progressed during the course of his hospitalization, so it was decided to treat these aneurysms surgically.

First Operation. On July 5, 1980, a right-sided superficial temporal-middle cerebral artery (STA-MCA) anastomosis was performed under general anesthesia, and the right ICA was completely ligated in the neck at the same time. No cerebral ischemic complications resulted. Only a mild reactive hypertension (about 150/80 mm Hg) developed and continued for 2 weeks.

Postoperative right carotid angiography (Fig. 2) showed a patent anastomosis and a good bypass circulation. Hypesthesia and paresthesia of the right forehead diminished and the right palpebral fissure opened to 2 mm in width. Right abducens nerve weakness subsided. Right visual acuity had improved; however, the pupils remained nonreactive to light.

Second Operation. On July 25, 1980, 20 days after the first operation, the carotid bifurcation in the left side of the neck was exposed under general anesthesia, and an STA-MCA anastomosis was performed. The patient was thereafter awakened and extubated. The operation was continued under local anesthesia, in full communication with the patient. The ICA was temporarily clamped for 30 minutes under induced hypotension to check whether any cerebral ischemic signs occurred.

When the systolic blood pressure was below 100 mm Hg, tachycardia (160/min) appeared and a slight right hemiparesis developed, but no speech disturbance was recognized. This hemiparesis disappeared immediately after the systolic blood pressure was raised above 120 mm Hg, and tachycardia was controlled.

After confirming that the hemiparesis had resolved, we ligated the ICA completely. The systolic blood pressure was kept at 130 mm Hg.

Postoperative Course. Immediately after the operation, right hemiparesis and dysphasia developed again without disturbance of consciousness, although blood pressure was 130/90 mm Hg. Blood pressure was raised to 160/100 mm Hg, and the ischemic signs



FIG. 1. Preoperative angiograms, anteroposterior (*left*) and lateral (*right*) views. Upper: Left cerebral angiography revealing a giant intracavernous carotid aneurysm. Lower: Right cerebral angiography showing an intracavernous carotid aneurysm (arrows) which was opacified even in the films of the later phase. The right internal carotid artery was moderately narrowed.

immediately disappeared again. Four hours postoperatively, systolic blood pressure stabilized spontaneously at about 160 to 180 mm Hg systolic, and hypertensive drugs were discounted. This moderate reactive hypertension continued for about 2 weeks, then subsided spontaneously.

Postoperative left carotid angiography (Fig. 3) showed that the anastomosis was patent and there was a good bypass circulation. Contrast-enhanced CT scans (Fig. 4) revealed that the left intracavernous carotid aneurysm was thrombosed postoperatively and progressively decreased in size.

The bilateral ophthalmoplegia improved remarkably. Only slight residual anisocoria (with the left pupil larger than the right), sluggish light reflex of the left pupil, and moderate left abducens palsy remained at the 1-month postoperative examination. No cerebral ischemic complications were noted. The patient no longer felt dizzy when standing or walking, as he had shortly after the second operation.



FIG. 2. Postoperative right carotid angiograms, anteroposterior *(left)* and lateral *(right)* views. The anastomosis was patent and almost all the branches of the middle cerebral artery were opacified through the dilated superficial temporal arteries *(arrows)*. The *arrowhead* shows the anastomotic site. The right anterior cerebral artery was fed mainly via the ophthalmic artery.



FIG. 3. Postoperative left carotid angiography, anteroposterior *(left)* and lateral *(right)* views, showing the remarkably dilated superficial temporal artery as a donor vessel *(arrows)*. All the branches of the left middle cerebral artery were opacified through the bypass. The left anterior cerebral artery was fed mainly via the ophthalmic artery. *Arrowhead* indicates the anastomotic site.



FIG. 4. Preoperative (upper left) and follow-up axial enhanced computerized tomography scans at 10, 17, 25, 53, and 108 days. The left intracavernous carotid aneurysm (arrow) was thrombosed postoperatively and decreased in size continuously. The right-sided aneurysm was not shown on these scans.

At his 4-month follow-up review, the patient was in good condition and had returned to his previous job as a woodworker. Blood pressure was 132/74 mm Hg, and pulse was 72/min.



FIG. 5. Graph showing intraoperative intra-arterial pressure measurements in a 61-year-old woman with a right cavernous internal carotid artery (ICA) aneurysm. The pressure gradient between the superficial temporal artery (donor vessel) and the middle cerebral artery (recipient vessel) rose from 4 to 64 mm Hg after ICA clamping.

#### Discussion

Bilateral intracavernous carotid aneurysms are rare, and only 27 such cases have been reported in the literature.<sup>10,19,21</sup> The present case was treated with bilateral ICA ligations combined with EC-IC anastomosis, with a successful result.

In the past, intracranial aneurysms which are inaccessible for direct operation due to their size or location were treated by simple carotid ligation, sometimes using a Selverstone clamp.<sup>2,11</sup> However, cerebral ischemia may develop after this operative procedure.<sup>8,15,16,22</sup> According to the Cooperative Study in 1966, 59% of the patients with ICA ligation and 32% of those with common carotid artery ligation developed cerebral ischemia.<sup>12</sup> The combination of the EC-IC bypass with the ICA ligation may reduce such fatal complications. The effectiveness and safety of these combined procedures for inaccessible carotid aneurysms were reported by Hopkins and Grand<sup>6</sup> in 1979, and Gelber and Sundt<sup>3</sup> and Spetzler, et al.,<sup>20</sup> in 1980. Gelber and Sundt used intraoperative cerebral blood flow measurement to detect possible postoperative ischemic complications. Spetzler, et al., used a Selverstone clamp for staged ICA occlusion.

In our case, we performed the combined procedures in one stage, with abrupt complete ICA ligation and EC-IC bypass. In this manner, we obtained an increased pressure gradient between the STA (donor vessel) and the MCA (recipient vessel), which is favorable for the patency of the bypass.<sup>6</sup> Figure 5 shows the intra-arterial pressure measurements in another case with an intracavernous carotid aneurysm. It is clearly seen that the pressure gradient was remarkably increased from 4 to 64 mm Hg after ICA occlusion.

To check the safety of the one-stage operation, we awoke the patient from general anesthesia after the bypass surgery, and observed his neurological condi-

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tions with a temporary ICA clamp under induced hypotension. This method seems to be useful for detecting postoperative cerebral ischemia.

The possibility of late cerebral ischemia and aneurysmal formation after carotid ligation has been reported.<sup>1,4,5,16,22</sup> We are following this patient attentively to see if these complications will develop even though he was treated by a combined EC-IC bypass and ICA ligation procedure.

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