Treatment of fusiform aneurysms of the peripheral cerebral arteries

Report of two cases

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Two patients with fusiform aneurysms and at least one previous subarachnoid hemorrhage were treated by excision of the aneurysms and reconstruction of the arteries. The first case presented with two fusiform aneurysms, the larger of which involved the angular and the smaller one the temporal branch of the left middle cerebral artery (MCA). Both aneurysms were totally excised. The angular artery was reconstructed with a 1.5 cm long arterial graft taken from the left superficial temporal artery. Excision of the temporal aneurysm was followed by an end-to-end suture of the central and distal parts of the vessel. The second case had a fusiform aneurysm involving the temporal branch of the left MCA. The aneurysm was excised and an arterial graft 1 cm long cut from the superficial temporal artery was used in reconstruction of the affected vessel. In each case left carotid angiography was done 1 week postoperatively. In the first case the angiogram showed that the angular artery reconstructed with a graft was patent, whereas the temporal artery reconstructed without a graft was not visualized. In the second patient, whose temporal artery was reconstructed with a graft, angiography did not show the reconstructed artery. Left carotid angiography was repeated 1 year after the operation in both cases, and all the reconstructed vessels were well visualized.

KEY WORDS ~ aneurysm, mycotic ~ cerebral aneurysm ~ cerebral angiography

Intracranial aneurysms situated on the peripheral cerebral arteries are usually mycotic in origin. Management of fusiform aneurysms is controversial. If there are signs of an infective disease, such as subacute bacterial endocarditis, antibiotic administration is the therapy of choice. Whenever a fusiform aneurysm, regardless of its origin, is combined with a severe hemorrhage, excision of the aneurysm and ligation of the artery are necessary.

The purpose of this paper is to present the courses of two patients with fusiform aneurysms involving the peripheral cerebral arteries. They were both treated by excision of the aneurysms and reconstruction of the arteries.

Case Reports

Case 1

This right-handed 26-year-old woman had a sudden onset of severe headache on July 12, 1976, which gradually subsided. On July 17, she experienced a recurrent headache which was followed by two successive grand mal
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Fig. 1. Case 1. Preoperative left carotid angiogram. Left: Anteroposterior view. Both aneurysms (arrows) are visualized mostly laterally on the surface of the left hemisphere. Right: Lateral view. Both aneurysms and the corresponding arteries are visualized.

seizures the next day. Aphasia and hemiparesis of the right extremities were observed. The patient's condition began to improve 24 hours later.

Examination. On admission to the hospital on July 18, the patient was fever-free and normotensive, but complained of moderate headache. She was lethargic and inattentive, and showed hemiparesis of the right extremities. She tended to use words inappropriately and was unable to write or calculate. Neither neck stiffness nor papilledema were observed. Tendon reflexes of the right extremities were slightly brisker than those on the left. Superficial abdominal reflexes were normal on the left side, but absent on the right. There was a normal plantar response on the right side. Testing of sensation revealed a mild hyperalgesia of the right extremities.

Erythrocyte sedimentation rate was 95 mm/hr. Lumbar puncture revealed 90/3 cells, mostly lymphocytes and 46 mg% protein. Chest and skull films and electrocardiogram recordings were normal. Radionuclide brain scan showed a slightly intensified accumulation of the tracer in the left temporo-parieto-occipital region. Electroencephalogram (EEG) showed a focus of delta waves in the left temporo-parietal region. A left carotid angiogram on July 29, 1976, revealed two aneurysms on the left angular and left temporal arteries (Fig. 1). The patient was then transferred to the Department of Neurosurgery, University Medical Centre of Ljubljana, on July 30.

Her condition had improved considerably since the onset of illness. She was cooperative during the examination, with some residual dysphasia. Only a slight paresis of the right extremities was observed. The severity of headaches was markedly reduced. Tendon reflexes of the right extremities were slightly hyperactive and the right abdominal reflexes were still considerably decreased.

Operation. On August 4, 1976, a left temporo-parietal osteoplastic craniotomy was performed. The two aneurysms were
FIG. 2. Case 1. Operative diagrams. a: The aneurysm was drawn into the cortex. b: After excision of the aneurysm both stumps of the temporal artery were lifted and brought together. c: Due to minor tension at the suture line, a funnel-shaped narrowing was created.

found adherent to the dura mater. The aneurysm of the temporal artery, 4 mm in diameter, was adherent to the cortex (Fig. 2 a). The surface of the brain adjacent to the aneurysm was yellowish. This aneurysm consisted of a fusiform dilatation of the artery. The aneurysm was excised; then the proximal and distal stumps of the artery were lifted and approximated by end-to-end suture. Due to minor tension at the site of the suture line, the reconstructed artery was narrower, that is, funnel-shaped, but appeared patent (Figs. 2 b and 2 c). A small silver clip was attached to the arachnoid at the level of the suture line for later follow-up review. The second aneurysm, which involved the angular artery, consisted of two successive circular dilatations attaining a three- to fourfold increase in the diameter of the artery. The aneurysm was excised and the central and peripheral stumps of the artery were coapted by a graft taken from the superficial temporal artery (Fig. 3). The central stump and the graft were sutured first, and the distal anastomosis was assessed. Next, silver clips were attached to the arachnoid at the level of the proximal and distal suture lines for further observation. After we ascertained the presence of blood flow in both reconstructed arteries, the final routine part of the operation was carried out. The patient woke up 2 hours after the surgical procedure. The degree of dysphasia and paresis of the right extremities was unchanged.

Postoperative Course. On the fifth day postoperatively, the patient was able to walk, was free of hemiparesis, and had a very slight dysphasia. On the ninth postoperative day, control left carotid angiography revealed the angular artery reconstructed by grafting to be patent for blood flow although the graft itself was narrower than the central and peripheral parts of the artery. The temporal artery, however, where an end-to-end anastomosis under a lesser tension was done, was not visualized (Fig. 4 left). Fourteen days after surgery, the patient showed no neurological deficits and she was discharged home. Due to the pathological EEG findings she was placed on 0.4 gm of Tegretol (carbamazepine) and 0.25 gm of primidone daily during the following 6 months. Her EEG improved and the antiepileptic medication was withdrawn.

One year postoperatively, the EEG recordings were normal and a repeat left carotid

FIG. 3. Case 1. Operative diagrams. a: Excision of the aneurysm involving the angular artery. b: Reconstruction of the angular artery with the arterial graft taken from the superficial temporal artery.
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Fig. 4. Case 1. Left: Postoperative left carotid angiogram 9 days after the operation, lateral view. The part of the left angular artery reconstructed with the inserted arterial graft is slightly narrower (parallel arrows). Silver clips are placed at the site of the proximal and distal suture lines. The temporal artery reconstructed directly with an end-to-end suture is not visualized (single arrow). Right: Left carotid angiogram 1 year postoperatively, lateral view. The part of the left angular artery reconstructed with the inserted arterial graft is slightly wider (parallel arrows). The temporal artery reconstructed directly with an end-to-end suture is clearly visualized (single arrow).

angiogram showed both the angular artery (reconstructed with a graft) and the temporal artery (directly sutured) to be patent for blood flow (Fig. 4 right). Cerebral blood flow in the left hemisphere was found to be slightly lower in the region supplied by the reconstructed two arteries (Fig. 5). At present the patient is free of neurological deficits and subjective symptoms. She has resumed her previous work.

Case 2

This 36-year-old right-handed man fell down stairs on May 31, 1976, and lost consciousness for half an hour. Two hours later he was admitted to the hospital, where x-ray films showed a simple fracture on the left side of the skull. On admission he was reported to be slightly drowsy but free of any sensory or motor deficits. He was admitted for observation.

Examination. One day after admission, the patient fully recovered consciousness. He had no neurological deficits, but complained of a bad headache unrelied by analgesics. Left carotid angiography showed a small avascular space (epidural hematoma-like) beneath the fracture line (Fig. 6). As the patient was feeling better and his headache subsided, he was discharged home on June 25.

On September 29, 1976, he was admitted to the Department of Neurosurgery University Medical Centre of Ljubljana complaining of persistent headache. On examination, no neurological deficits or papilledema were found. There was no neck stiffness. Review of the left carotid angiogram of June 23 confirmed the presence of an aneurysm on the temporal branch of the middle cerebral artery (Fig. 6).

FIG. 5. Case 1. Cerebral blood flow in the left hemisphere estimated 1 year after the operation shows slightly lower values in the region of the reconstructed arteries.
Operation. The next day, the patient underwent a left-sided osteoplastic craniotomy. The aneurysm was found to adhere firmly to the dura mater. Careful dissection revealed a fusiform dilatation 1 cm long and 5 mm in diameter. The aneurysm was excised, following which a graft of 1 cm cut from the superficial temporal artery was sutured between the central and peripheral stumps of the artery. Silver clips were attached to the arachnoid at the level of proximal and distal suture lines. When we were sure that the graft and both sutured anastomoses were patent for blood flow, the dura mater was sutured and routine closure was carried out. Two hours after the operation, the patient woke up, free of any neurological deficits.

Postoperative Course. On the fourth postoperative day, he was able to walk. On Day 7, left carotid angiography was carried

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FIG. 6. Case 2. Preoperative left carotid angiogram. Left: Anteroposterior view. Both the epidural hematoma (upper arrow) and the aneurysm (lower arrow) are visualized. Right: Lateral view. The aneurysm of the temporal artery is clearly visible (arrow). Fracture of the skull can also be seen.

FIG. 7. Case 2. Left: Left carotid angiogram 7 days after the operation, lateral view. The left temporal artery reconstructed with a graft is not visualized. Right: Left carotid angiogram 1 year postoperatively, lateral view. The left temporal artery is clearly visible.
out. The reconstructed temporal artery was not visualized on the angiogram (Fig. 7 left). On the 11th postoperative day, EEG findings were within normal limits. The patient was discharged home on Day 12 postoperatively. He resumed his previous occupation 2 months later.

One year later, control carotid angiography showed the temporal artery reconstructed with the graft to be patent for blood flow (Fig. 7 right). Currently, the patient has no neurological deficits and is free of subjective symptoms. He performs the same work as before the onset of illness.

Discussion

In the first case, the histopathological findings of the excised part of the artery, namely, infiltration with lymphocytes, leukocytes, and plasma cells, confirmed the mycotic origin of the aneurysms. No microorganisms were isolated from the blood cultures or found in the wall of the aneurysm, but an increased erythrocyte sedimentation rate was noted. In the second case there were no signs suggestive of an inflammatory process.

Our study is not directed toward investigation of the origin of these aneurysms but raises the possibility that early postoperative carotid angiography may not reveal patency because of spasm of the reconstructed arteries which persisted and hindered the visualization of the arteries. It cannot be accurately estimated when the spasm subsided, but it is possible that blood flow, although very faint, was present in the reconstructed arteries all the time.

The reconstructed blood vessels, which were not visualized on the first control angiogram, could have been thrombosed, and, if so, recanalization developed later on. However, we believe that spasm and not thrombosis is more likely to account for the lack of visualization. In support of our spasm theory was the improvement of the neurological status within the first few postoperative days, which became normal 14 days later.

We consider that excision of the aneurysms and reconstruction of the arteries may be more effective than simple ligature of the arteries. Exclusion of the aneurysm from the blood circulation by clipping or ligating the terminal artery is helpful in preventing a recurrent hemorrhage. Reconstruction of the artery after excision of the aneurysm has two advantages: it reduces the possibility of recurrent bleeding, and it creates a nearly normal blood supply to the cerebral cortex. Reconstruction of the arteries (despite their being terminal) gains importance in cases involving the dominant hemisphere (as in both our cases), or where several blood vessels supplying the same hemisphere are affected (as in Case 1).

References


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