Traumatic middle meningeal arteriovenous fistula caused by three-point skull fixation

Case report

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Traumatic middle meningeal arteriovenous (AV) fistulas are rare complications of head injury. An unusual case of a middle meningeal AV fistula is presented which resulted from three-point fixation with a skull clamp to stabilize the head during surgery for an anterior communicating artery aneurysm.

**KEY WORDS**  middle meningeal artery • arteriovenous fistula • head injury • three-point skull fixation • external carotid artery • head holder

First Operation. On October 8, 1982, the patient was positioned supine with the head stabilized by means of a three-point fixation device (Mayfield-Kees), and the ACoA aneurysm was clipped through a left pterional approach. On November 4, repeat bilateral common carotid angiography was performed to confirm the clipping of the ACoA aneurysm and to reexamine the right MCA aneurysm before surgery. Angiography revealed the presence of a middle meningeal AV fistula with a tubular configuration draining into the pterygoid venous plexus in the middle fossa (Fig. 1 right). Since nothing suggestive of such a vascular abnormality had been demonstrated on the previous angiogram, and the patient had not sustained injury to the head after admission, this vascular lesion was considered to have occurred during the surgical intervention. A computerized tomographic scan revealed no abnormality, and no bruit was heard over the head.

Second Operation. On the next day, a right fronto-temporal craniotomy was performed, and the dural AV fistula and the involved dura mater were excised. At the same time, the MCA aneurysm was clipped. A conical perforation, the tip of which was consistent with the dural AV fistula, was noted in the meningeal

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**Case Report**

This 70-year-old woman was admitted to the Shimane Prefectural Central Hospital on September 6, 1982, with a diagnosis of subarachnoid hemorrhage.

**Examination.** She was bright and alert, and general physical examination revealed no abnormalities. Bilateral common carotid angiography on September 8 (Fig. 1 left) revealed two aneurysms, one arising from the ACoA and the other from the right middle cerebral artery (MCA). There were no other vascular anomalies. The site of hemorrhage was considered to be the ACoA aneurysm. It was decided to perform surgery for the two aneurysms separately.
FIG. 1. Right common carotid angiograms. Left: Preoperative angiogram showing the anterior communicating artery (ACoA) and middle cerebral artery aneurysms. There are no other vascular anomalies. Right: Angiogram after ACoA aneurysm surgery revealing an arteriovenous fistula of the anterior branch of the middle meningeal artery. The dilated middle meningeal vein which flows into the pterygoid venous plexus has a tubular configuration.

Discussion

Traumatic middle meningeal AV fistula is not extremely rare, but the number of cases reported is comparatively few. Since the first case was reported in 1951 by Fincher,1 37 additional observations have been reported.2 According to Freckmann, et al.,2 cerebral angiography in 446 cases of head trauma has revealed the presence of AV fistula of the middle meningeal artery in 1.8%. However, all cases reported heretofore were due to head injuries caused by trauma and there have been no cases reported as a complication of surgery.

The temporal bone is thinner than other parts of the skull, and the middle meningeal arteries and veins groove the inner table of the skull.5 In our case, the AV fistula was caused by penetration of the middle meningeal groove by one of the cone-shaped pins of the three-point fixation device used during head surgery. It is well known that damage to the middle meningeal artery can cause an AV fistula (which may prevent formation of a hematoma), but, more seriously, it can also produce an epidural hematoma or a pseudoaneurysm.5 Therefore, when performing surgery using a three-point fixation device as a head holder, it is important to be aware of this possible complication. Care must be taken to avoid injuring the middle meningeal groove.
Middle meningeal arteriovenous fistula

FIG. 3. Photomicrographs of the middle meningeal arteriovenous fistula. Elastica van Gieson, × 25. Left: The middle meningeal artery and the middle meningeal vein are in communication and form an abnormal connection with the lumen of the aneurysm. Right: In this more distal section, the two vessels are not affected and run side by side. The thick-walled vessel with the internal elastica is the artery, and the thin-walled vessel with the wider lumen is the vein.

References

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