Middle meningeal artery embolization for refractory chronic subdural hematoma

Case report

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The authors present a case of refractory chronic subdural hematoma (CSH) in a 59-year-old man with coagulopathy due to liver cirrhosis. The patient was successfully treated by embolization of the middle meningeal artery after several drainage procedures. This new therapeutic approach to recurrent CSH is discussed.

Key Words • subdural hematoma • embolization • middle meningeal artery

A traumatic CSHs sometimes occur in patients who have a coagulopathy. Burr-hole surgery with irrigation and drainage is an established treatment for this disease; however, recurrent blood collections requiring repeated intervention are sometimes encountered in this population. The conventional therapy of repeated surgery or drainage is effective and usually curative. We report on a patient whose condition was refractory to conventional approaches but who eventually was successfully treated by embolization of the MMA.

Case Report

History. This 59-year-old man was referred to our department on December 5, 1998, because he was experiencing gradual deterioration in his level of consciousness and progressive left hemiparesis. He had a 9-year history of liver cirrhosis; however, he had no history of head trauma before admission.

Examination. The laboratory examination performed at admission revealed liver dysfunction and coagulopathy (total bilirubin 6.3 mg/dl, aspartate aminotransferase 60 IU/L, alanine aminotransferase 51 IU/L, NH, 98 mg/dl, platelet count 23,000/mm³, and prothrombin time 38% of normal). Computerized tomography scans revealed bilateral CSHs with a moderate leftward midline shift (Fig. 1). The hematoma on the right side was large and required treatment. The hematoma on the left side was very small; it later disappeared spontaneously without treatment.

Operation and Postoperative Course. Local anesthesia was induced in the patient. After the patient was administered a transfusion of plasma and platelets, a right-sided burr hole was made. The hematoma was aspirated and irrigated on the right side. One hundred fifty milliliters of hematoma was evacuated. The patient’s level of consciousness and hemiparesis rapidly resolved postoperatively, and near-total removal of the hematoma was revealed on the CT scans obtained the next day (Fig. 2). The hematoma collected again quite rapidly, and we punctured and drained 100 ml of hematoma percutaneously through the burr hole twice on December 20 and again on December 28, 1998. Despite these procedures, the hematoma recurred and an Ommaya reservoir was placed on January 10, 1999. Thereafter, it was necessary to remove the hematoma through the reservoir once per week to maintain the patient’s neurological condition. We decided to embolize the MMA, which was presumed to feed the membrane of the CSH.

Superselective Angiography and Embolization. Superselective MMA angiography performed through a microcatheter revealed a diffuse abnormal vascular network that

Fig. 1. Head CT scans obtained at hospital admission demonstrating a homogeneous high-density subdural hematoma and a moderate leftward midline shift.
was consistent with the presence of macrocapillaries in the outer membrane of the CSH (Fig. 3). We embolized the artery using polyvinyl alcohol particles without complication on February 22, 1999 (Fig. 4). The CT scans obtained immediately postembolization demonstrated contrast material in the subdural hematoma cavity (Fig. 5).

Clinical Course After Embolization. After embolization of the MMA, no enlargement of the hematoma was seen. We removed small amounts of hematoma (20–30 ml) several times until removal of the hematoma through the reservoir became impossible. Serial follow-up CT scans revealed a gradual decrease in hematoma volume and almost complete disappearance 7 months after embolization (Fig. 6). The patient experienced no permanent neurological deficits, and no recurrent blood collections have been observed.

Discussion

Chronic subdural hematoma is usually treated either by creating a simple burr hole and performing irrigation or sometimes by using closed drainage alone without irrigation. It is possible to obtain good surgical outcomes in almost all cases, even when the blood collection recurs. Subdural hematoma recurrence rates of approximately 10% are reported in the literature. Repeated drainage and irrigation are usually effective and curative for recurrent cases; however, in a small number of cases, these collections are persistent, particularly in patients with marked brain volume loss or coagulopathy.

In our case, the patient had a hemorrhagic tendency due to liver cirrhosis. The platelet count was less than 50,000/μm³ and the prothrombin time ranged between 15% and 45% of normal from the time of his admission through the follow-up period. Because the hematoma recurred rapidly, an Ommaya reservoir was placed and the hematoma was repeatedly evacuated. There have been several reports of drainage therapy using reservoirs with good outcomes. Placement of the reservoir is a technically easy procedure, and hematoma can be removed with greater safety through a reservoir than via repeated needle punctures of the burr hole. In their series, Sato, et al., reported that they needed to puncture the reservoir five times at most. In our patient, however, aspiration procedures were needed so often that we were forced to consider other options.

Reports of angiographic findings of CSHs are rare. Tanaka, et al., found diffuse dilation of the MMA and scattered abnormal vascular networks, which seemed to be macrocapillaries in the outer membrane. Nagahori and colleagues studied the histological features of the outer membrane and observed the presence of two or three layers associated with capillaries with large lumens on the side of the dura mater, marked cell infiltration, and many thin new vessels on the side of the hematoma cavity. They postulated that inflammation and hemorrhage from the outer membrane play an important role in the expansion of
the hematoma. Tanaka and associates\(^7\) also made a histo-
logical study of vascular structures between the dura ma-
ter and outer membrane, and identified arteries originating
from branches of the MMA that entered the outer mem-
brane. Our angiographic findings of the MMA were quite
similar to theirs, and we presumed that embolization of
this artery might prevent or delay recurrence. Tanaka and
associates also mentioned a case in which they embolized
the MMA with Gelfoam; however, they provided no in-
formation regarding the result of this procedure.

Embolization of the MMA is an established procedure,
especially in preoperative devascularization of meningio-
mas. Our case is the first definite report in which MMA
embolization was performed successfully to treat a recur-
rent CSH after failure of conventional and, indeed, aggres-
sive surgical management.

Embolization therapy for CSH is a possible new treat-
ment. Although a single case does not establish a manage-
ment regimen, we believe that this represents a significant
addition to our therapeutic options, especially when con-
fronted with this challenging clinical situation.

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