**Combined Endovascular and Endoscopic Surgery for Acute Epidural Hematoma in a Patient With Poor Health**

---Case Report---

Tomotaka OHSHIMA,1 Hayato TAJIMA,1 Kentaro FUJII,1 Masamune NAGAKURA,1 Toshihisa NISHIZAWA,1 Kyozo KATO,1 and Shigeru MIYACHI2

1Department of Neurosurgery, Kariya Toyota General Hospital, Kariya, Aichi; 2Department of Neurosurgery, Nagoya University Graduate School of Medicine, Nagoya, Aichi

**Abstract**

A 74-year-old woman presented with right acute epidural hematoma (AEDH) associated with a skull fracture after a fall. Emergency craniotomy under general anesthesia could not be performed because of her poor medical condition. Therefore, transfemoral endovascular embolization and hematoma evacuation via a burr hole were performed using endoscopy under local anesthesia. The patient recovered and was discharged without neurological deficits. AEDH is a common traumatic disease often requiring emergency craniotomy to prevent death and restore neurological function. The present combined surgical approach was effective in treating AEDH that could not be treated under general anesthesia in a patient with poor medical condition.

Key words: acute epidural hematoma, endoscopic surgery, endovascular embolization, emergency management, local anesthesia

**Introduction**

Recent advances in the equipment and techniques of endovascular and endoscopic surgery have led to more patients undergoing such procedures for the treatment of various lesions. However, the combined clinical use of these techniques has never been described. The present study describes the successful combined endovascular and endoscopic surgery for a patient with acute epidural hematoma (AEDH) who could not be treated using conventional methods due to overall poor health condition.

**Case Report**

A 74-year-old woman was admitted to our hospital after a fall over steps on February 22, 2010. She had bilateral blindness caused by pigmentary degeneration of the retina. Her vital signs were stable at presentation, but she was drowsy and uncooperative. Physical examination revealed swelling in the right temporal area. Neurological examination found mild left hemiparesis and her Glasgow Coma Scale score was 12. Radiography revealed a right temporal linear skull fracture. Computed tomography (CT) revealed an AEDH (with a maximum thickness of approximately 3.5 cm) of homogeneous density with an overlying fracture in the right temporal region (Fig. 1). We scheduled emergency craniotomy and hematoma evacuation with further additional examinations. However, electrocardiography revealed ST-elevation and acute myocardial infarction was suspected. Ultrasonography showed acute heart failure and possible takotsubo cardiomyopathy. Cardiologists and anesthetists determined that performing surgery under general anesthesia would be risky for the patient. Therefore, we decided to perform alternative surgery under local anesthesia.

In the first step of the procedure, transfemoral endovascular embolization of the bleeding artery was performed. A 6-French guiding catheter was placed into the origin of the right external carotid artery under local anesthesia. Angiography revealed extravasation via the anterior...
branch of the right middle meningeal artery. A microcatheter was navigated into the branch. A 33% n-butyl cyanoacrylate mixture was prepared with pure NBCA and nonionic contrast medium in a 1:2 ratio. In total, 0.5 cm³ of the 33% NBCA mixture was injected using the continuous single-column technique. Complete obliteration of the bleeding artery was achieved. The length of the endovascular procedure was 40 minutes. No further neurological deterioration was observed except for slight restlessness during the procedure.

In the second step, hematoma evacuation via a burr hole was performed under local anesthesia. Consequently, if the patient became restless or intraoperative bleeding was uncontrollable, we could induce intravenous anesthesia immediately. After a burr hole was made at the right parietal convexity, we confirmed a relatively hard hematoma. Since the hematoma was too firm for wide irrigation, as often performed for chronic subdural hematomas, a flexible endoscope was inserted for removal of the hematoma. Under endoscopic guidance, almost all of the hematoma was evacuated. Oozing between the dura and bone was minimal, so could be controlled by saline irrigation and collagen hemostasis. The required time for the endoscopic procedure was 45 minutes. Postoperative CT revealed sufficient decompression.

After the procedure, the patient immediately regained consciousness and recovered from the initial left hemiparesis. CT 30 days after the operation revealed no residual hematoma. Her residual medical complications were treated by cardiologists, and no new neurological deficits were found at the 16-month follow-up examination.

Discussion

AEDH is one of the most common intracranial traumatic lesions to require emergent surgery, usually under general anesthesia. Conventionally, if general anesthesia is not suitable due to medical complications, conservative therapy is preferred. However, some patients have poor clinical outcomes. The present case suggests a novel surgical intervention for patients with AEDH complicated by worsening medical conditions and/or advanced age. General anesthesia may not have a defined age limit, but elderly
patients are at increased risk, particularly in emergency situations. Operations such as the present procedure may also be useful for patients with critical multiple organ injury, severe bleeding tendency, and other complicated medical conditions.

In addition, asymptomatic small AEDHs are usually managed conservatively. The frequency of delayed hematoma accumulation ranges from 5.5% to 65%,1,3,7,9–11 The question is how can we predict cases of delayed deterioration? A study of 35 consecutive preoperative angiographies of AEDH found that 21 (60%) patients had extravasation of contrast medium from meningeal arteries.2) Bleeding from a meningeal artery was actually observed at surgery in 20 of the 21 cases. In addition, hematoma enlargement could be roughly predicted by the extravasation of contrast medium on CT scans.10) Therefore, radiological extravasation from meningeal arteries may indicate the risk of delayed hematoma expansion. If minimum preventive intervention under local anesthesia is performed, such as the present procedure, delayed deterioration after AEDH can be prevented.

The present case indicates the efficacy of combined endovascular and endoscopic procedures for the treatment of intracranial lesions. Recently, some studies have described endovascular treatments for AEDHs.5,6,8,12) These studies showed that after extravasation was identified by angiography, endovascular surgery could achieve complete and precise hemostasis. The embolic materials included polyvinyl alcohol, microfibrillary collagen, gelfoam, and platinum balls. We used NBCA, an adhesive liquid agent. NBCA embolization provided instant and permanent occlusion of the bleeding artery prior to endoscopic surgery.

In general, acute hematomas are too firm to be aspirated through a burr hole. Emergency management of AEDH is possible through burr hole hematoma evacuation.4) The blood clot is aspirated using a bendable tube inserted through the burr hole until the dura appears clean. One or two drainage tubes are then placed in the remaining cavity and connected to a vacuum chamber with strong negative pressure. Although we agree with this method in certain emergency situations, most of the procedure must be carried out blind because visibility is limited to the area around the burr hole. In contrast, our technique, which utilizes a flexible endoscope, allows visible management even at deeper sites. Even if the hematoma is too hard to aspirate, step-by-step resection of the hematoma is possible using a water jet and a flexible ring curette under endoscopic observation.

The present case illustrates an alternative treatment modality for cases of AEDH unsuitable for treatment under general anesthesia. Both endovascular embolization and endoscopic hematoma evacuation are less invasive techniques compared to conventional craniotomies. The operative indication extends to cases of multiple organ injury, severe bleeding tendency, etc. The establishment of less invasive surgeries is particularly important as our society continues to age.

References


Address reprint requests to: Tomotaka Ohshima, MD, Department of Neurosurgery, Kariya Toyota General Hospital, 5–15 Sumiyoshi-cho, Kariya 448–8505, Japan. e-mail: tomotaka.oshima@toyota-kai.or.jp