

Technical Notes & Neurosurgical Techniques

Endoscopic hematoma evacuation following emergent burr hole surgery for acute subdural hematoma in critical conditions: Technical note



Jun Maruya, MD, PhD^{a,*}, Satoshi Tamura, MD^a, Ryo Hasegawa, MD^b, Ayana Saito, MD^b, Keiichi Nishimaki, MD, PhD^a, Yukihiro Fujii, MD, PhD^c

^a Department of Neurosurgery, Akita Red Cross Hospital, Japan

^b Clinical Resident Training Center, Akita Red Cross Hospital, Japan

^c Department of Neurosurgery, Brain Research Institute, Niigata University, Japan

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ABSTRACT

Background: Acute subdural hematoma (ASDH) is generally managed by large craniotomy with extended operating time and high relative blood loss. Recently, minimally invasive endoscopic hematoma evacuation of ASDH has been successfully demonstrated; however, non-elderly patients, moderate or massive cerebral contusion, and enlarging hematoma are generally not accepted as indications for endoscopic surgery.

Clinical presentation: We report our experience with two ASDH patients with impending herniation successfully evacuated via an endoscopic surgery following emergent burr hole craniostomy. Case 1: A 70-year-old man was admitted to our hospital because of severe head trauma. Neurological examination demonstrated a fixed, dilated right pupil and a CT scan showed ASDH. The entire procedure was completed in approximately 2.5 h. He was transferred to a rehabilitation hospital. Case 2: A 51-year-old comatose woman was transferred to our hospital after a motor vehicle accident. Radiological examination revealed ASDH and severe multiple trauma. Acute traumatic coagulopathy was confirmed by laboratory tests. The entire procedure was completed in approximately 1.5 h. Almost complete evacuation of the hematoma was achieved.

Conclusion: If intracranial pressure becomes sufficiently low after emergent burr hole craniostomy, endoscopic hematoma evacuation of ASDH may be a safe and effective method even in critically injured patients.

1. Introduction

Operative management of acute subdural hematoma (ASDH) usually includes cranioplastic craniotomy, large decompressive craniectomy, trephination/craniostomy, or a combination of these procedures [1]. Craniotomy or decompressive craniectomy has risks because of invasive surgery, long operating time, high blood loss, and risk of infection, particularly for elderly or sick patients [2–4]. As an alternative strategy, emergency trephination has been widely accepted as an initial procedure for ASDH presented with impending herniation [1]. Recently, reports on the endoscopic hematoma evacuation technique for ASDH have been increasing, and the efficacy of these techniques is demonstrated [2–6]. Here, we report two critically injured patients with ASDH who underwent successful endoscopic evacuation following emergent burr hole surgery. To our knowledge, this is the first description of this technique to treat ASDH in critical conditions.

2. Clinical presentation

2.1. Case 1

A 70-year-old man was transferred to our hospital because of head trauma after drinking alcohol. At first, he was able to talk; however, his consciousness rapidly deteriorated in the ambulance. There was no particular medical history, but he had a habit of heavy alcohol intake. On arrival, physical examination revealed subgaleal hematoma in the left occipital region. Neurological examination demonstrated a fixed, dilated right pupil (6 mm) and Glasgow Coma Scale (GCS) score of 6 (E1V1M4). He was found to slightly withdraw his right upper extremity to painful stimuli, but other three extremities extended and rotated internally. A computed tomography (CT) scan showed a 25-mm right frontotemporal ASDH and a marked midline shift. In addition, right frontal contusional hematoma, traumatic subarachnoid hemorrhage in the right sylvian fissure, and acute epidural hematoma located just below the left occipital skull fracture were observed (Fig. 1A).

* Corresponding author at: Department of Neurosurgery, Akita Red Cross Hospital, 222-1 Nawashirosawa, Saruta, Kamikitae, Akita 010-1495, Japan.
E-mail address: jmaruya@archosp-1998.com (J. Maruya).

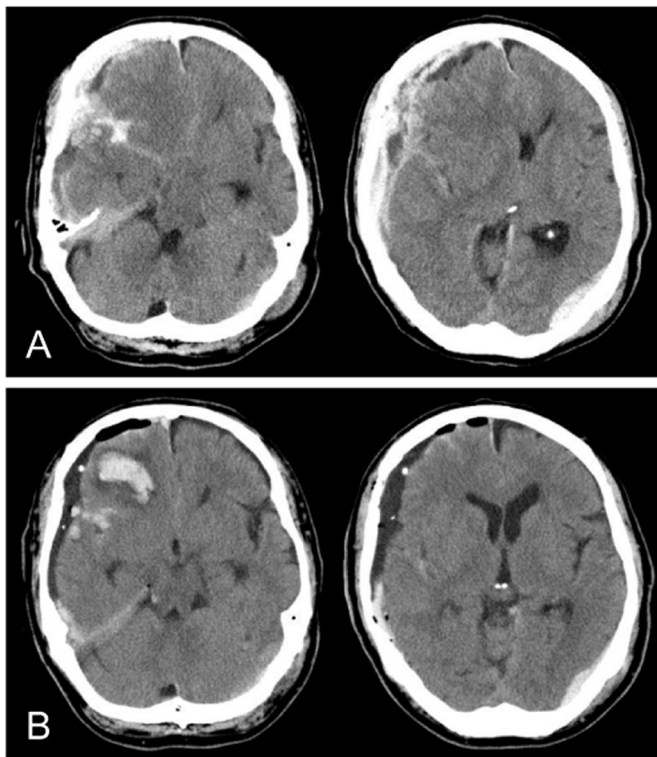


Fig. 1. A: CT scans obtained on admission showing a 25-mm right frontotemporal acute subdural hematoma and a marked midline shift. Right frontal contusional hematoma, traumatic subarachnoid hemorrhage in the right sylvian fissure, and acute epidural hematoma located just below the left occipital skull fracture are also recognized. B: Postoperative CT scans demonstrating an obvious reduction in the size of the hematoma and enlargement of contusional hematoma.

2.2. Case 2

A 51-year-old woman was transferred to our hospital after a motor vehicle accident. She had no particular past medical history. She was in a coma when she was found in her car. On admission at 50 min after the accident, physical examination revealed severe left periocular lacerations and left eyeball swelling. Her vital signs were stable, but neurological examination showed GCS score of 5 (E1V1M3) and bilateral decorticate rigidity. The right pupil was 7 mm in diameter and the left was 5 mm, and light reflex was absent bilaterally. Endotracheal intubation was immediately performed. A whole-body CT scan revealed right frontotemporal ASDH with midline shift, diffuse traumatic subarachnoid hemorrhage, intraventricular hemorrhage, and left orbital blowout fracture (Fig. 2A). In addition, left pulmonary contusion, splenic contusion, retroperitoneal hemorrhage, multiple left transverse process fractures, and pelvic fractures were found.

3. Operative procedure and clinical course

3.1. Case 1

Endotracheal intubation, mechanical hyperventilation, and rapid intravenous infusion of mannitol were performed immediately. Shortly thereafter, burr hole craniostomy was established under local anesthesia in the emergency room (115 min after the injury). The dura was opened, and the visible portion of ASDH was suctioned. A drainage tube was inserted in the subdural space, and 60 ml of uncoagulated hematoma was drained. An intracranial pressure (ICP) sensor was also inserted in the subdural space. The skin was closed with skin staples, and the ICP was 4 mm Hg. His right pupil was contracted to 4.5 mm. Subsequently, he was transferred to the operating room, and general

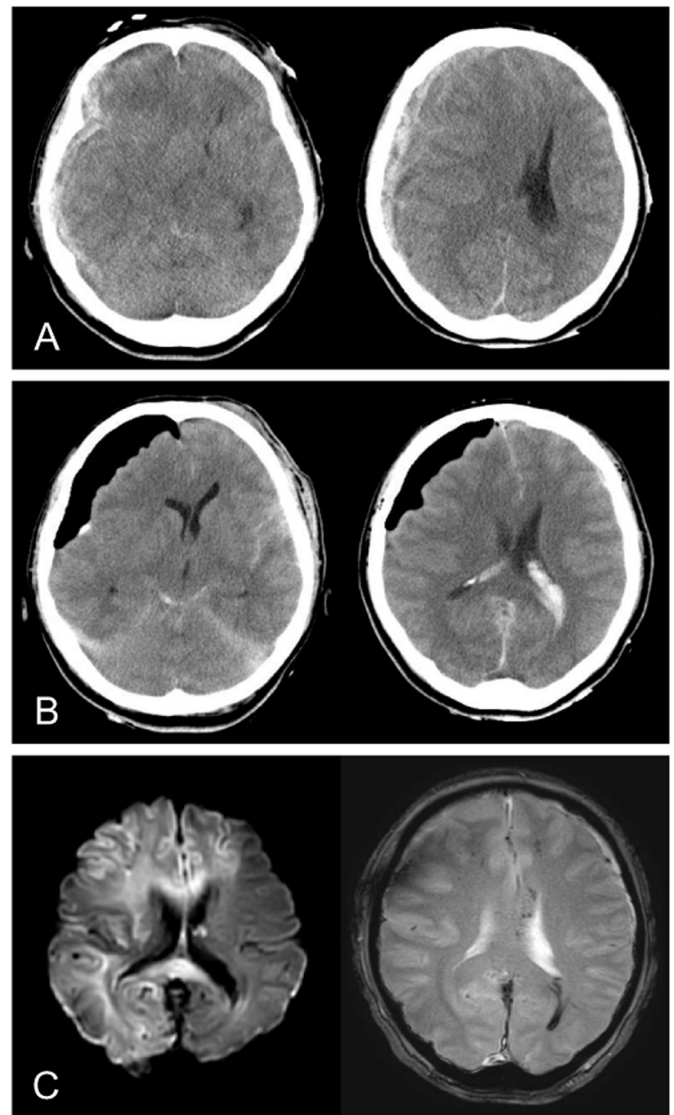


Fig. 2. A: CT scans obtained on admission revealing right frontotemporal acute subdural hematoma with midline shift, diffuse traumatic subarachnoid hemorrhage, intraventricular hemorrhage, and marked brain swelling. B: Postoperative CT scans demonstrating almost complete evacuation of the hematoma and improvement in the extent of midline shift. C: Diffusion-weighted magnetic resonance imaging performed on postoperative day 9 (left) showing large ischemic damage. T2*-weighted gradient echo imaging (right) demonstrates microbleeds in the bilateral frontal lobe and corpus callosum, indicating diffuse axonal injury.

anesthesia was administered. The skin incision was elongated, and small cranioplastic craniotomy (4 cm in diameter) was performed. In case of severe brain swelling, we simultaneously prepared for performing a decompressive craniectomy. After dural incision in a cruciate fashion, the clot beneath the craniotomy was evacuated. A flexible endoscope (Olympus VEF Type V) was introduced through craniotomy, and a malleable suction cannula was used to evacuate the hematoma. The flexible endoscope was held by an assistant, whereas the suction cannula was held by the operator's left hand. The operator's right hand was used to manipulate the forceps or brain retractor. Hard clots near the apical bridging veins were not evacuated to avoid additional bleeding. Cerebral contusions in the frontotemporal region were covered with oxidized regenerated cellulose (Surgicel). The subdural space was copiously irrigated with artificial cerebrospinal fluid. After confirming complete hemostasis, the drainage tube and ICP sensor were reinserted and the dura was closed. The bone flap was fixed with titanium plates, and the skin was closed with skin staples. The entire

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