Acute Subdural Hematoma Surgical Technique

Commonly used surgical techniques for the evacuation of ASDH include cranioplastic craniotomy, large decompressive craniectomy, trephination/craniostomy, or combination of these procedures. In reality, surgical techniques are not specified in most papers, and the effectiveness of surgical procedures is not addressed. For example, some institutes use decompressive craniectomies in all ASDH [1].

In case of high energy trauma and GCS ≤8 different neurosurgeons decided to perform most frequently decompressive craniectomy rather than craniotomy. Furthermore, even if not related to survival rate, decompressive craniectomy showed a better neurological outcome especially in patients with GCS ≤8 at admission. In conclusion, even if prospective studies are required, these results depict the current attitude about the choice between craniotomy and decompressive craniectomy [2].

While twist drill craniostomy and placement of subdural evacuating vport system (SEPS) are quick, bedside procedures completed under local anesthesia and appropriate for patients with chronic SDH or patients that cannot tolerate anesthesia, these techniques are not optimal for patients with acute SDH or chronic SDH with septations. Burr hole SDH evacuation under conscious sedation or general anesthesia is an analogous technique; however, it requires basic surgical equipment and operating room staff, with a focus on a closed system with burr hole followed by rapid drain placement to avoid introduction of air into the subdural space, or multiple burr holes with extensive irrigation to reduce pneumocephalus and continue SDH evacuation via drain for several days. Acute SDH associated with significant mass effect and cerebral edema requires aggressive decompression via craniotomy with clot evacuation and frequently a craniectomy. Chronic SDHs that fail conservative management and progress clinically or radiographically are addressed with craniotomy with or without membranectomy. Surgical SDH management is variable depending on its characteristics and etiology, patient's functional status, comorbidities, goals of care, institutional preferences, and availability of specialized surgical equipment and adjunct therapies. Rapid access to surgical suites and trained staff to address surgical hemorrhages in a timely manner, with appropriate post-operative care by a specialized team including neurosurgeons and neurointensivists, is of paramount importance for successful patient outcomes. Here, we review various aspects of surgical SDH management [3].

Craniotomy

Usually consists of a large craniotomy (centered over the thickest portion of the clot) to decompress the brain; to stop any active subdural bleeding; and if indicated, to evacuate intraparenchymal hematoma in the immediate vicinity of the Acute Subdural Hematoma.

Neurosurgeons frequently encounter bleeding from cortical arteries, which is usually controlled with bipolar coagulation. However, bipolar coagulation is associated with a risk of sacrificing the cortical artery, which may affect the prognosis of neurological symptoms when these cortical arteries supply critical areas.

Uneda et al., described microsurgical repair of damaged cortical arteries using a 10-0 nylon micro-suture in patients with arterial-origin ASDH [4].

Decompressive craniectomy

It is supported that decompressive craniectomy significantly improve outcome in patients with refractory intracranial hypertension due to extensive contusion, compared to routine craniotomy. However, as it has been known that bony decompression result in apparent exacerbation of edema, the superiority of decompressive craniectomy to craniotomy is still controversial.

Craniotomy is the preferred surgical technique for management of ASDH in the United States, being performed 10 times more frequently than craniectomy. Craniectomy was associated with significantly higher in-hospital mortality after propensity score matched analysis [5].

Trephination

Trephination is a quick and easy technique to reduce ICP by evacuating hematoma. However, hematoma evacuation may often result in partially, ICP reduction may be often temporary, and hemostasis may not be obtained occasionally. Thus, emergency trephination should be followed by craniotomy or craniectomy. In recent years, trephination has been also applied as a minimum invasive procedure for elderly or patients with certain risks for craniotomy or craniectomy. As another aspect of trephination, hematoma irrigation with trephination therapy (HITT) has been also applied [6].

Endoscopic surgery

After performing the small craniotomy, a 4-mm rigid endoscope was inserted and the hematoma was evacuated. Endoscopic surgery was performed under general or local anesthesia. The bleeding origin was a cortical artery in 2 cases, a bridging vein in 2 cases, and unknown in 1 case. The hematoma was completely removed without re-bleeding and the procedure was lifesaving in all cases. Three patients were discharged with independent gait following rehabilitation whereas 2 patients died due to causes unrelated to ASDH. Despite some surgical limitations, neuroendoscopic hematoma evacuation of ASDH is a safe and effective method that minimizes operative complications in some cases. Small craniotomy was sufficient for inserting and maneuvering ordinal neurosurgical instruments [7].

While endoscopic minimally invasive approaches to chronic subdural collections have been successfully demonstrated, this technique was reported for the first time with an 87-year-old patient presenting with a large acute right-sided subdural hematoma successfully evacuated via an endoscopic minimally invasive technique [8].

Endoscopic hematoma evacuation of acute and subacute SDH is a safe and effective method of clot removal that minimizes operative complications. This technique may be a less invasive method for treating elderly patients with acute and subacute SDHs. [9].

Videos

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