Comparing twist-drill drainage with burr hole drainage for chronic subdural hematoma

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Abstract Objective: The surgical management of chronic subdural hematoma (CSDH) is still a controversial issue, and a standard therapy has not been established because of the unclear pathogenic mechanisms in CSDH. The intention of this paper is to find a simple and efficient surgical procedure for CSDH.

Methods: A retrospective study of 448 patients with CSDH by surgical treatment during 2005 to 2009 was conducted in order to compare the efficiency between two different primary surgical methods, i.e. twist-drill drainage without irrigation in Group A (n=178) and one burr-hole with irrigation in Group B (n=270). The results were statistically analyzed.

Results: The reoperation rates in Group A and Group B were 7.9% and 11.9% respectively. The good outcome rate was 88.8% and 75.5%, the complication was 7.9% and 20.7% in Group A and Group B, respectively.

Conclusions: The burr-hole drainage with irrigation of the hematoma cavity is not beneficial to the outcome and prognosis. Irrigation is not important in the surgical treatment for CSDH. Thus in initial treatment, twist-drill drainage without irrigation of the hematoma cavity is recommended because it is relatively safe, time-saving and cost-effective.

Key words: Hematoma, subdural; Brain injury, chronic; Drainage

METHODS

During 2005-2009, 448 patients with CSDH received surgical treatment at the Department of Neurosurgery, Tianjin Huanhu Hospital & Tianjin Neurosurgical Research Institute in China. The CSDH was characterized as a subdural hematoma surrounded by capsule (hematoma membrane) consisting of dark reddish liquefied blood. The patients' male/female ratio in this study was 372/76, and mean age was 62 years (17-96 years). Diagnosis of CSDH was confirmed by computed tomography (CT) in 374 patients and by magnetic resonance imaging (MRI) in 74 patients. Operation was performed under local anesthesia in Group A; in Group B local anesthesia was performed in 222 patients, while general anesthesia was adopted in 48 patients. According to the surgeon’s experience and preference, two different kinds of surgical procedures were performed, i.e. twist-drill without irrigation (Group A, n=178), and burr-hole with irrigation (Group B, n=270, Table 1). Head trauma was the most common cause of CSDH in 292 patients (65%). Most traumas were mild. The average time from head injury to initial CT scan was 6 weeks (1 week to 6 months). The hematoma was located on the left side in 174 cases, on right side in 170 cases, and bilateral in 104 cases. The major symptoms were headache (n=382), hemiparesis (n=320), and deterioration.
of consciousness (n=102).

Totally 248 (55%) subdural hematoma cases showed mixed density in primary CT scan, 14 (3%) were hyperdensity, 26 (6%) isodensity, and 160 (36%) hypodensity. According to the Tuotian’s formula, the volume of haematomas was equal to \( \pi / 6 \times \text{length (the most)} \times \text{width (the most)} \times \text{thickness} \) (Table 1).

Operation was routinely performed under local anesthesia, except that 48 cases in Group B were carried out under general anesthesia. In burr-hole craniectomy the hole (12 mm in diameter) was performed on the thickest portion of the CSDH according to CT or MRI in 270 patients in Group B. Irrigation with physiologic saline solution was given as far as possible in Group B but we did not perform irrigation in Group A. In all cases, closed-system drainage was indwelled in the hematoma cavity for an average of 3 days (1-7 days).

RESULTS

In most cases, neurologic status improved after the surgical treatment. The general outcome was good; 362 patients had only mild or no neurologic deficits. The symptoms of 1 patient in Group A and 15 patients in Group B were worsened. Operative mortality rate defined as death within 90 days after surgery was 2.2% (4 patients) in Group A and 1.5% (4 patients) in Group B. The deaths were related to concomitant diseases and not the direct result of CSDH (Table 2).

Indications for reoperation were rebleeding or increasing volume of residual subdural fluid within the hematoma cavity which could compress the brain on CT scans and accompanying neurologic deterioration.

There were 46 patients who underwent reoperation within 3 months after the first operation, including 14 patients (7.9%) in Group A, and 32 patients (11.9%) in Group B (Table 2). The twist-drill drainage was performed in Group A during reoperation. In Group B, 22 cases were treated by twist-drill drainage in reoperation, and the other 10 cases treated by burr-hole drainage. The complications in Group B included 4 cases of infection, 6 tension pneumocephalus, 5 brain injuries, 9 epilepsy besides 32 recurrent hematoma. The complications in Group A included 14 cases of recurrent hematoma.

DISCUSSION

Known as a curable disease in the elderly, CSDH are encountered in 10% of elderly patients with head trauma. The natural history of these lesions is still unknown, and their etiology is a controversial issue. Common predisposing factors include trauma, brain atrophy, alcoholism, seizure disorders, cerebrospinal fluid shunts, and anticoagulation. A significant degree of brain atrophy is presenting in many individuals developing CSDH. In patients older than 50 years, the mass of the brain is reduced by approximately 200 g, which results in extracranial volume increase up to 11%. This extra volume can be occupied by the hematoma before a considerable rise of intracranial pressure. In addition, a slow progressing hematoma allows the brain to adjust to a new situation by compressing the venous channels, thus providing further space for hematoma to expand.

In the past years, various surgical treatments for CSDH have been reported. However, the methodology of management varies among different clinic centers and is still a controversial issue, and a standard treat-
ment is not established. Several methods have been performed, i.e. burr hole drainage without insertion of a catheter, or more invasive procedures — craniotomy and excision of the subdural membrane. After performing a burr hole evacuation followed by irrigation of subdural cavity with saline, the rate of reoperation varies between 2.7% and 30%. Non-surgical treatment of CSDH using osmotherapy with 20% mannitol has been described in the literature. However, it may be imprudent to treat patients with severe dehydration; administration of mannitol cannot eliminate the mass lesion.

According to the experience and preference of surgeons in our department, two different surgical procedures are performed: burr-hole drainage with irrigation and twist-drill without irrigation. Due to above mentioned reasons, many doctors introduce irrigation to help draining off residual clot. Irrigation is continuing until the irrigation fluid becomes clear. They believe that this method can dislodge the fibrous tissue and high protein. But in our clinical experience and retrospective study, irrigation is not necessary in the treatment. It is considered that drainage can break down the pathophysiological course of CSDH.

Evacuation of CSDH by twist-drill and closed-system drainage without irrigation has been shown as effective as burr hole drainage with irrigation. Thus it is appropriate for elderly or weak patients with high risk of anesthesia and operation. A small scalp incision is performed over the area of maximal thickness of hematoma but should be avoided reaching the area directly over the motor strip located approximately 4 cm behind the coronal suture. The drainage is controlled within 30 minutes-1 hour to normalize intracranial pressure. The collection bag is set at 10 to 15 cm below the level of the craniostomy.

Han et al reported that patients operated on with one burr hole had a statistically significant higher rate of wound infection and longer hospital stay. The theoretical explanation for higher infection rate of one burr craniostomy is following: the non-effective operation such as irrigation and larger hole increases the danger of the infection. We suggest irrigation should be avoided. Our patients who were given twist-drill drainage without irrigation has no infection. At first we choose a maximal thick area of hematoma to drill, usually near the parietal node. A twist drill hole is made with the drill directed at 45-degree angle to the skull. The drill bit or a needle is used for perforating the skull. A small tube is then advanced into the subdural space, and the distal end is tunneled 2-3 cm to a separate stab incision. These important steps would avoid the danger of brain injury during the operation.

Group A has no complication except 14 cases of recurrent hematoma. Group B has some cases of epilepsy, tension pneumocephalus, brain injury except 32 cases of recurrent hematoma. The injury elicited by twist-drill drainage is apparently less than that by hurr-hole drainage.

In spite of the different surgical approaches, neurologic status improve in most cases after operation. The general outcome is good. The twist-drill approach seems to be similar effective and safe as the burr-hole techniques. Additionally it is more cost-effective and can be performed simply at the patient’s bedside under local anesthesia. The indication for twist-drill drainage is wide. We deem that it should be applied for every CSDH patients firstly.

In the initial treatment of CSDH, twist-drill and closed-system drainage without irrigation of hematoma cavity is recommended. It is safe and time-saving especially for elderly patients and those underlining multiple health problems. It could be performed under local anesthesia. Classification of CSDH according to internal architecture, intracranial extension and density on CT or MRI image may be useful in predicting the recurrence risk of hematoma. For patients at risk, meticulous perioperative management is also necessary to reduce postoperative recurrence or other surgical complications. It is demonstrated that irrigation is not necessary in the burr-hole procedure for treatment of CSDH.

REFERENCES


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