Retrospective Analysis of Re-operated Patients after Chronic Subdural Hematoma Surgery

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Objective: The aim of this study is to analyze the clinical symptoms, radiological changes, interval from first operation to symptom recurrence and to propose the proper treatment method for re-operated patients following chronic subdural hematoma surgery.

Methods: Between January 1992 and April 2003, 18 of 138 patients of chronic subdural hematoma repeatedly underwent surgical treatment. The symptoms, mental status by Bender grade, radiological hematoma size and midline shifting, interval from symptom onset to diagnosis, surgical method and prognosis by Glasgow outcome scale (GOS) between the first attack and the recurrence were compared.

Results: The symptoms at the time of recurrence were nearly the same as with the first attack, but two patients (2/18, 11.1%) showed a more declined mentality. In addition, the recurrent hematoma sizes were the same or larger than those previously found. Many patients were recurred within two weeks (13/18, 72.2%). Most patients were operated on using the previous burr hole, with the exception of one patient who recurred at a different site. All patients had a good prognosis more than GOS 4 (GOS 4-4, GOS 5:12), but two died due to extracranial complication and infection.

Conclusion: These results suggest that the early diagnosis and treatment are important, mostly recurred same symptoms within two weeks. Re-operation using the previous burr hole site is a good method.

KEY WORDS: Chronic subdural hematoma · Recurrence · Re-operation.

Introduction

Chronic subdural hematoma is known as a neurosurgical disease which has a good prognosis with relatively simple surgical treatment.

The rate of occurrence of chronic subdural hematoma in males seems to be higher than that in females, owing to the different frequency of exposure to traumatic injury and estrogen's defensive effect on the blood vessels. There are several reasons why this type of hematoma occurs frequently among the aged, including the increase in antithrombotic usage, and venous fragility, the augmentation of the subdural space (6–11% of the whole intracranial space), and the increased exposure to traumatic injury resulting from frequent falls. Although bad prognosis has been reported in those cases where the patients were admitted to hospital with a decreased level of consciousness, in the case of patients with asymmetry of the pupils, large hematoma, and a previous history of antithrombotic treatment, it is considered that there is no difference in prognosis between cases of trauma and those of natural hemorrhage.

Those factors which interrupt the fast brain expansion are old age, a reduced level of consciousness when admitted to hospital, chronic alcoholism, hematoma appearing as a low density shadow on CT, bilateral hematoma, reduced brain pulsation after surgery, and a long interval between the trauma and the occurrence of symptoms. Among these different factors, the age of the patient is considered to play the most significant role. In the case of older patients, a long period of trace-observation is required. The recurrence of hematoma originates from the pressure difference between the inside and outside of the inner membrane of the hematoma, and it is also related to the increased pressure inside the hematoma, low pressure in the subdural space, and brain atrophy. The former...
occurs when there is a large amount of air remaining in the subdural space, a remnant of the subdural hematoma, or the continuous expansion of the hematoma cavity, while the latter is related to the excessive loss of water as a result of dehydration, anemia, and hemorrhage. The most well-known recurrence factors are coagulopathy and intracranial hypotension (the practice of shunting or leakage of cerebrospinal fluid), and the possibility of recurrence is high in the case where the time period between the onset of symptoms and the patient’s hospitalization is short, air remains for a long time in the operated area after surgery, or there is a mixed or layered density on CT before surgery. It was also reported that the thickness of the hematoma, the age of the patient, and a history of alcohol consumption or anticoagulant and antiplatelet agent treatments were only marginally related to the recurrence rate.

The recurrence of subdural hematoma requiring re-operation was noted in 2.3–13% of the patients. Recurrence detected on radiologic imaging without the reappearance of symptoms is not considered to be an indication for reoperation. Few studies have been conducted on patients who experience a recurrence of symptoms and need to be re-operated. Therefore, this study targeted those patients who needed to be re-operated due to the recurrence of symptoms after subdural hematoma surgery, and a comparison was made between the situation at the first diagnosis and the moment when the symptoms reappeared due to recurrence, from the following four viewpoints: 1) the change in the clinical symptoms, 2) the amount of hematoma and the degree of midline shift at the diagnosis, 3) the time interval from symptom onset to diagnosis, and 4) the treatment method and prognosis.

Materials and Methods

Retrospective research was conducted on 18 recurrent cases among 138 patients who were operated due to chronic subdural hematoma in our hospital (recurrence rate: 13%). In the 18 cases of recurrence, the ratio of males to female was 5:1 and all of the patients were in their sixties or older except for one who was a teenager and had undergone a V-P shunt. The hemorrhage site was almost unilateral (left: 9, right: 8) in the 18 recurrent cases, except for one case in which burr hole drainage was conducted bilaterally for bilateral hemorrhage, and the young patient also had recurrence on one side. The amount of hematoma and the degree of midline shift in the 18 patients were compared between the first diagnosis and recurrence. Also, the clinical symptoms and the time period from the onset of symptoms to the diagnosis were evaluated by examining the patient’s records.

The Bender grade was utilized to evaluate the degree of consciousness of the patients, the thickness of the severest part of the hematoma on radiologic images was used to indicate the amount of hematoma and the most severe parts of the hematoma were compared in order to assess the degree of midline shift. Those patients with a history of anticoagulant medication, chronic renal failure, alcoholism, or coagulopathy were excluded from this study. In the first operation, Burr hole drainage was performed on the thickest part of hematoma and two burr hole drainage was conducted in those cases where there was a septum in the hematoma. Burr hole drainage was conducted in all symptomatic recurrent cases except one. In all cases, irrigation was performed through a drainage catheter during surgery, with the drainage catheter being inserted and maintained for only 2–3 days, regardless of the amount of drainage, because extended maintenance of a drainage catheter after surgery increases the possibility of infection and tension pneumocephalus. The head of the patient was placed at the same height as his or her heart, and enough fluid was supplied to accomplish the temporary swelling of the brain, which resulted in the rapid closure of the subdural space. The patients were discharged from hospital about 2 weeks after surgery, provided no complications occurred.

Non-periodical CT scans were conducted according to the patient’s symptoms, with the primary goal being a change in the level of consciousness of the patient, rather than a periodical change in the amount of hematoma on the CT scans which were performed two days, one week, and two weeks after surgery. The prognosis of these reoperated patients by using GOS was assessed following their trace observation for a period ranging from 6 months to one year after surgery.

Results

The comparison of symptoms between first diagnosis and recurrence

In this study, we compared only one major symptom of patients and in the case of consciousness change or hemiparesis, that symptom was more focused. In most patients, the symptoms at the first diagnosis and recurrence were similar, but 2 patients who possessed clear consciousness at the first diagnosis showed declined consciousness of Bender grade 2 upon recurrence. Three patients, who were admitted to hospital due to declined consciousness at the time of the first diagnosis, showed declined consciousness again at recurrence, and these patients constituted an exception to the general rule, wherein most patients complained of headache at recurrence, however this difference might have resulted from our comparing only the main symptom (Table 1). Older patients (more than 65) tended to have symptoms of incre-
ased intracranial pressure such as headache less often, but in the case of recurrence, they tended to suffer from headache frequently \(^2,14,15,17\), but in our study patients were complained headache less frequently.

**The amount of hematoma and midline shift at the first diagnosis**

When the amount of hematoma and midline shift were analyzed at recurrence, as follows (Table 2). Two cases had a smaller amount as compared to the first diagnosis (Fig. 1). One case in which hematoma broke out on the opposite side was excluded. In some cases, the patients complained of similar symptoms even if they had less hematoma than at the first diagnosis. This happened because the hematoma tended to have a relatively high density on the CT scan at recurrence, which led to bleeding into the subdural area that had not been dilated faster than the first attack, because patients' insight of the disease had increased, and because they were diagnosed sooner, since they were already in hospital.

**The period from symptom onset to diagnosis**

This study showed that in the 18 cases of recurrence, the reappearance of the symptoms occurred within 1 to 44 days (14.6 days on average). Many patients were recurred within two weeks (Table 3). The appearance of chronic subdural hematoma caused by traumatic injury was reported to take 3–4 months on average \(^7\), from the initial attack to its diagnosis, and all of the recurrent patients reportedly experienced reappearance within 1 month \(^10\). Our results showed the same results. The standard for the diagnosis of recurrence included not only reaccumulation of hematoma on the radiologic imaging, but also symptomatic recurrence as experienced by the patients. In many cases, the patients underwent reoperation because of symptomatic reappearance during hospitalization, but three of them were readmitted to hospital after being discharged.

**The proper surgical treatment method and prognosis**

In this study, the repeat burr hole drainage was practiced at the first operation site, except in one case in which the hematoma recurred on the opposite side. This case was included in the recurrence category, because air was spread on the opposite side of the cranium in relation to the newly operated area (Fig. 2), where a small amount of the initial hematoma remained after the first burr hole site, and the patient experienced no special trauma during hospitalization and had no history of special disease or medication in the past. The reoperation of burr hole drainage gave rise to good results (more than GOS 4), in the sense that the patients were able to resume their normal lives, as before the onset of the hematoma, except in 2 cases in which the patients died of pneumonia and infection related to the wounds inflicted during the operation. It is generally considered that craniotomy is desirable only if burr hole drainage fails \(^8\). Our study was also showed burr hole drainage using the previous burr hole was preferred at recurred patients.

**Discussion**

Chronic subdural hematoma is sometimes misdiagnosed, because it's symptoms are similar to those of other CNS diseases such as dementia and cerebral infarction. The symptoms include headache resulting from an increase in cerebral pressure, decreased muscle power resulting from a decline in local movement and sensory function, dysarthria, and a change in the level of consciousness and personality \(^15\). However, it should be noted that headache is not prevalent in the elderly population \(^17\). In the case where chronic subdural hematoma recurs, headache is the commonest sym-
ptom and the hematoma appears as a high density area on the
CT image due to the vulnerability of the capillary of the
neomembrane. It has been reported that recurrence is rare in
those cases in which the preoperative hematoma appears in
the form of a high signal on the T1-weighted MRI scan. The
recurrence rate of the cranial base type of chronic subdural
hemorrhage was high and that of the convexity type was low.
The location and usage of a drainage catheter after surgery is
related to recurrence, and in those cases where the drainage
catheter is located in the frontal area, recurrence is less likely,
because the drainage catheter can diminish the amount of air
inside the cerebrum. Recurrence is also less likely when a drainage
catheter is used than when one is not used, whereas recurrence
is more likely if the intracerebral air is not removed within
7 days or if the subdural space is larger than 10 mm. There is
less likelihood of recurrence when the drainage catheter is
used without irrigation than after irrigation and when a
larger amount of hematoma is removed. The thickness of the
hematoma and midline shift are not correlated with recurrence
and, in many surveys, the criterion for the diagnosis of
hematoma recurrence is said to be the reaccumulation of sub-
dural hematoma after operation and the reappearance of
neurological symptoms within 6 months.

Although it has been reported that there is less likelihood of recurrence in cases of chronic subdural hematoma resulting
from trauma, no significant difference was found in our
study, since recurrence occurred in 7 of the 56 patients whose
initial hematoma resulted from trauma (12.5%), 9 of the 63

Table 3. Interval from first operation to symptom recurrence (n=18)

<table>
<thead>
<tr>
<th>Interval</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day to 3 days</td>
<td>1</td>
</tr>
<tr>
<td>4 days to 2 weeks</td>
<td>12</td>
</tr>
<tr>
<td>2 weeks to 4 weeks</td>
<td>4</td>
</tr>
<tr>
<td>more than 4 weeks</td>
<td>1</td>
</tr>
</tbody>
</table>

patients whose etiology was non-traumatic (14.3%) and 2 of
the 19 patients in whom the origin of the initial hematoma was
unclear (10.5%). However, the classification of the patients
into the trauma and non-trauma groups is likely to be inexact,
because many of the patients were not able to remember their
trauma history precisely and, consequently, they gave a negative
response, whether or not they had in fact experienced trauma.

In the re-operation, 4 of the 18 patients had septum and these patients had a higher recurrence rate than those without
septum. Since MRI was not usually used, it was difficult to make a clear distinction between monolayer and multilayer.
According to Tanikawa, the recurrence rate is higher if the structure of the hematoma is multilayer, and the existence of a
septum is considered to be associated with a high recurrence
rate. There have been some proposals in favor of performing
craniotomy in order to accomplish the complete removal of
the hematoma and the eradication of the inner membrane of
the hematoma, but this remains controversial. Therefore, at
present, it is generally considered that there is no significant
difference between burr hole trephination and craniotomy.

The reason the age of the patients is closely related to brain
dependent expansion is that, with age degenerative changes
occur in the brain and cerebral resilience factors, such as the
volume of the cerebral vasculature, cerebral meninges, and
subpial brain tissue, all decrease. It has been argued that at
least 6 weeks of trace-observation is needed if brain expansion
does not occur rapidly after the operation and recommended
stop anticoagulant which used before operation until the brain
was fully expanded.

Based on the results of this study, we suggest that a 6-week
period of careful trace-observation should be made in such
cases, because almost all cases of recurrence occurred within
6 weeks. In the 18 cases of recurrence, the period from
operation to re-operation was 1–44 days (14.6 days on average).

Fig. 2. A: Preoperative computed tomography (CT) showing isodense hematoma and small hematoma on contralateral side. B: Postoperative CT showing a large air collection. C: After 7 days, the air is completely absorbed on operative site but still remained on the contralateral side. D: After 10 days, CT showing high density hematoma on air-remaining side. The patient had no additional trauma and specific medication history.
and the result was similar to the findings of Alexander\cite{20} 1–7 days (2–3 days on average), Mellergard\cite{46} average 11 days, and Adhiyaman\cite{19} average 12 days. In this study, burr hole drainage was conducted in 17 of the 18 cases of recurrence, with the one exception being a case in which the patient had a substantial amount of hematoma, severe midline shift and experienced a sudden change in his level of consciousness. In contrast to the assertion made in previous studies, that the recurrence rate tends to be higher after re-operation and a different surgical method should be selected for the re-operation\cite{46}, our patients had no recurrence after re-operation and generally had a good prognosis, and there was a temporary improvement in their symptoms after the first operation. The potential complications arising from the surgical treatment of chronic subdural hematoma are mainly extracranial in nature, consisting of the recurrence of hematoma, epileptic seizure, intracerebral hemorrhage, epidural hemorrhage, tension pneumocephalus, infection and pulmonary embolism\cite{2,5}. Our two patients died because of infection and pneumonia.

**Conclusion**

The number of patients who experienced recurrence in this study was relatively low. But some patients can have recurrence of symptoms with a smaller amount of hematoma than that at the first diagnosis, and some patients’ mental status is lower than at the first diagnosis. Most of patients recur within one month, especially two weeks. Both careful observation of the patients during hospitalization and sufficient education when they are discharged are needed.

Burr hole drainage using previous burr hole is a proper surgical method and patients treated rapidly have good prognosis.

**References**