Original Article

Indian Journal of Neurotrauma (IJNT)
2005, Vol. 2, No. 2, pp. 127-130

Treatment of chronic subdural Hematoma with burr hole craniostomy and irrigation

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Abstract: Several surgical procedures have been reported for the treatment of chronic subdural hematoma. Whether drain is required is not clear. Usefulness of burr hole craniostomy, irrigation and refilling the hematoma cavity with saline are analyzed. Between 1994 and 2004, 103 adult patients with chronic subdural hematoma were studied in respect to post operative recurrence and clinical improvement after burr hole irrigation without subdural drainage. Fifty six patients (54%) had definite history of head injury, and the hematoma was bilateral in 12 patients (11%). Ninety seven (94%) patients improved. Two patients required craniotomy and membranectomy after repeat irrigation. Recurrent bleeding from the outer membrane is the proven and widely accepted theory. Eosinophilic infiltration in the outer membrane may contribute the local hyperfibrinolysis and recurrent bleeding. Hematoma evacuation brings about hemostasis and fibrosis by stopping self-perpetuating cycles in the subdural neocapillaries. When neomembrane is matured, the neocapillary is no longer fragile. If absorption exceeds rebleeding the hematoma will disappear.

Keywords : Chronic subdural hematoma, hematoma recurrence, subdural air collection, subdural drainage

INTRODUCTION

Chronic Subdural Hematoma (CSDH) can be evacuated through a twist drill, burr holes or craniotomy, with or without the placement of a subdural drain. Most surgeons agree that twist drill and burr hole craniostomies are usually adequate for drainage. Although drain is used in all cases treated with a twist drill craniostomy, there is some controversy regarding the insertion of drain after burr hole craniostomy[1,2,3,4]. Concomitant diseases are frequently associated with CSDH and can impair both its prognosis and surgical outcome. In fact, death and recurrence are sometimes influenced more by the patients poor pre-operative clinical status or complication caused by concomitant diseases than by complications or failure of surgical treatment. The rate of recurrence of CSDH after surgery ranges between 3% to 27%[3-16].

The risk factors for recurrence are variable, and have been discussed in several papers. These risk factors appear to be related to the thickness and to neuroimaging features of the hematoma on CT or MR images, as well as the different modalities of surgical treatment that are performed(with/without drain, with/without irrigation) and to factors that affect brain re-expansion(post-operative subdural air collection). In this article usefulness of single burr hole craniostomy and saline irrigation without subdural drain is analyzed.

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MATERIAL AND METHODS

From December 1994 to November 2004, 103 patients were treated for chronic subdural hematoma at our hospital. All of them were surgically treated and were analyzed retrospectively. There were 86 males and 17 females (M:F ratio 5:1) in the study group. Mean age was 68 years (range between 31-93 years). In 56 (54%) patients definite history of head trauma was the cause of CSDH, while 47 (45%) patients did not have definite history of head injury. The clinical presentations were headache in 31 patients (30%), focal neurological deficit in 58 (44.6%) and altered mental state in six patients (5.8%). Interestingly, one patient presented with status epilepticus. Associated systemic disease like hypertension, diabetes, ischemic heart disease etc was diagnosed in 43 patients (41%).

In all cases Computed Tomography (CT) was used for diagnosis and post-operative assessment. Hematoma was bilateral in 12 patients (11%).

To evacuate the hematoma, a skin incision of approximately 4 to 5 cm was made over the maximum thickness of the hematoma. Burr hole was made, dura was cauterized and opened by cross shaped incision. Its outer membrane was coagulated and incised fluid material was let out and cut edges of the membrane were coagulated.

Infant feeding tube was passed into the heamtoma cavity, irrigation with normal saline was performed until a clear reflux was obtained. Irrigation was repeated by taking the catheter out and changing the direction of the catheter. After thorough and liberal saline irrigation the cavity was filled with saline. No drain was placed in the subdural space. Patients were discharged 7-12 days after surgery.

We assessed the residual or recurrent collection by taking CT scan before discharge and one month after surgery.

RESULTS

One patient died in post-operative period, who was 83 year old, admitted with poor neurological status. Five patients (4%) had recollection. Two patients after initial improvement deteriorated on the third day after surgery. Both the patients did not improve after repeat irrigation through the same burr hole, after which craniotomy and membranectomy was done. Three patients were readmitted, two patients 20 days after surgery and one on 24th day. All three had recurrence on the same side and site. They improved after repeat irrigation through the same burr hole. One patient presented with status epilepticus was managed with intravenous anticonvulsant drugs. Ninety seven patients (95%) were discharged with in seven days and five patients (4.8%) were discharged 12 days after surgery.

Twelve patients (11%) had subdural air collection at the time of discharge. Three patients required re-operation.

DISCUSSION

The recurrence rate is highly variable irrespective of whether the subdural cavity is drained or not drained. The rate of recurrence in our series is 4%, equals those of the other authors[3-16]. Drains are used whether as the primary means of decompressing the hematoma through a twist drill or burr hole or as an adjuvant to allow continued drainage of the subdural space after the surgical decompression has been completed through either a twist drill, burr hole or craniotomy. There is no consensus in the literature regarding the superiority of drains. Laumer et al[14] randomized 49 patients to closed system drainage and 47 to no drainage after burr hole craniostomy. There was no significant difference between the groups, with a repeated operation rate of 27%. Wakai et al[16] reported that closed system drainage through burr hole was significantly better than simple burr hole. Markwalder and Seiler[2] described no additional benefit with subdural drain. Reoperation rate has been observed to be low in chronic subdural hematoma treated with post-burr hole drains but no difference was observed in sub acute subdural hematoma[3]. Erol et al[17] in his prospective study, reported no significant difference in recurrence rate between simple burr hole craniostomy, irrigation and burr hole craniostomy with closed system drainage. Hamilton et al[4] reported no significant difference regarding the incidence of post-operative complications or hematoma recurrence requiring subsequent surgery between the groups who underwent burr hole and craniotomy with or without drain.

Possible factors responsible for these discrepancies include, failure to recognize and treat properly multiloculated CSDH, too aggressive a surgical approach towards persistant CT demonstrated but asymptomatic subdural residual or recurrent collections[18].

Markwalder et al[19] demonstrated persisting subdural collection in 78% of cases on the tenth day after surgery after burr hole craniostomy evacuation and closed system drainage. He suggested the blood vessel dysfunction and impairment of cerebral blood flow may participate in delay of brain re expansion. He suggested that well developed subdural neo-membranes are the crucial factors of cerebral reexpansion, a phenomenon that takes at least 10 to 20 days and the additional surgical procedures like repeat tapping, craniostomy and membranectomy or even craniectomy should not be evaluated earlier than 20 days after the initial surgical procedure unless the patient has deteriorated markedly.

Nakaguchi[6] found that the reduction of residual air volume in the subdural space by keeping drain in frontal position as suitable means to avoid recurrence of CSDH. Mori[12] suggested complete replacement of subdural hematoma by normal saline to prevent influx of air into the subdural space reduce the recurrence.

The pathogenesis and recurrence of CSDH has been controversial for more than a century and still remains obscure. The most widely accepted theory is that is the result of repeated bleeding from the outer membranes of the hematoma. Many causes for the repeated bleeding are explained[20,21,22,23]. The histological and histochemical changes are also responsible for recurrence. Sarkar et al[22] observed infiltration of eosinophils in the vascularised and hynalised granulations tissue of the subdural membrane. Yamashima[20] postulated that the eosinophils in the outer membrane may contribute to the development of local hyperfibrinolysis and recurrent subdural bleedings; probably there is liberation of eosinophilic granules might provoke local hyper fibrinolysis, liquifaction and expansion of subdural clot.

Benzel et al[24] suggested recurrence rate depends on the removal of the residual semisolid subdural hematoma component and the removal, dilution and inactivation of endogenous fibrinolytic agents.

Mere removal of CSDH although leaving the entire outer membrane intact, are almost always effective in treating these lesions. However it has never been explained why these procedures stop the repeated hemorrhage from the outer membrane. Weir[25] proposed that the removal of CSDH brings about hemostasis and fibrosis by stopping the self-perpetuating cycles in the subdural neocapillaries by removal of hemorrhagic fluid that probably contains anti-clotting factors.

Yamashima[26] on ultra structural studies, showed gap junctions in the endothelial cells of the outer membranes, which indicate the high permeability of capillary walls. The distinctive feature of the thin or absent basement membrane among these macro capillaries indicates that these vascular structures are fragile and have characteristics of easy bleeding. Once the pressure within the inner cavity of the hematoma becomes reduced following hematoma drainage, a hydrostatic pressure gap from the capillary pressure will develop. Therefore, exudation can occur along the opened endothelial gap junctions of the vessels, with this gap as a driving force[27].

Yamashima[26] explained this phenomenon by the mechanism of formation of such a gap junction where neighboring endothelial cells were separated as the intra-luminal hydrostatic pressure became increased. As the intraluminal pressure drops following surgical hematoma drainage, the separations between endothelial cells become reduced. Thus a reduction of gap junctions in turn decreases membrane permeability gradually after the surgery. It is likely that there is a balance between the influx and efflux of blood (components) in the vessels within the outer membrane. When efflux exceeds influx because of local hyperfibtrinolysis the hematoma enlarges; conversely, when influx exceeds efflux because of decreased fibrinolysis the hematoma shrinks[23,26].

CONCLUSION

Adequate and complete evacuation of the CSDH to significantly reduce the intra cavitary pressure, thorough and liberal saline wash to remove the residual semi solid component and the removal, dilution and inactivation of endogenous fibrinolytic agents, refill the subdural cavity with saline to prevent the influx of air into the subdural space reduce the recurrence rate in the treatment of CSDH. Even with this information it is likely that the controversy will continue.

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