Emergent Burr Hole Drainage of Traumatic Acute Subdural Hematoma with Drain Placement in Preexisting Coagulopathy Showing Rapid Neurological Deterioration: A Novel Technique

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Abstract

Aim The aim of this article is to investigate the efficacy of emergency burr hole drainage of significantly thicker acute subdural hematoma (ASDH) with coagulopathy.

Patient and Methods A 23-year-old man presented with ASDH of left fronto-temporo-parietal region due to trauma following trivial injury. Patient was chronic alcoholic having coagulopathy and thrombocytopenia. He had rapid deterioration in neurological status. Though craniotomy and hematoma evacuation was planned initially, in view of persistent coagulopathy, emergent burr hole evacuation was performed. Neurological symptoms improved dramatically after the burr hole evacuation. He became alert and could walk unassisted 3 days after surgery, although psychic disturbance resulting from cerebral contusion persisted.

Result Burr hole evacuation is an useful treatment for significant thicker ASDH with coagulopathy, as procedure can be performed easily and rapidly, aids in achieving reduction of intracranial pressure while purchasing time for correction of coagulopathy.

Conclusion Emergency burr hole drainage should be considered in rapidly deteriorating patients with significant thicker ASDH with persistent thrombocytopenia and coagulopathy showing rapid neurological deterioration.

Keywords
- acute subdural hematoma
- burr hole drainage
- coagulopathy
- thrombocytopenia

Introduction

Coagulopathy can develop in one-quarter cases of traumatic head injury, who are undergoing surgery for evacuation of intracranial hematoma.[1] It may be minor and self-limiting, however, in few case may cause sufficient severe consequences, rarely even deaths. Authors' advocated mandatory evaluation of coagulation status in every patient, who is candidate for surgical intervention related to evacuation of intracranial hematoma. Minimal investigation includes prothrombin time, activated partial thromboplastin time, platelet count, bleeding time. However, coagulopathy detected during preoperative screening needs full correction before planning of surgery. Few cases may possess a challenge, which show rapid deterioration in neurological status while awaiting correction of coagulopathy.[1,2] There are no clear guidelines available in the current literature. Further prognosis is more unfavourable for patients with head injury who present with coagulopathy and subdural hematoma.[3] Authors report an

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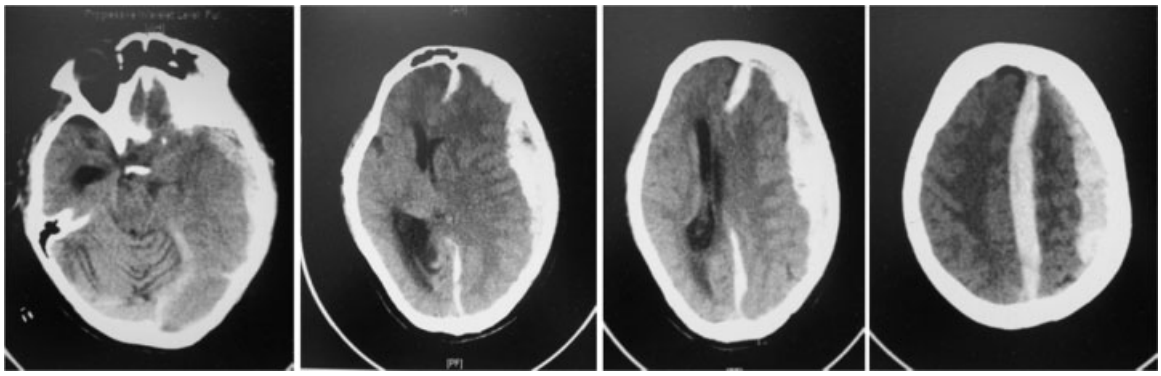

Fig. 1 Preoperative noncontrast CT scan showing extent of acute subdural hematoma of thickness 2.5 cm over left frontoparietal region causing severe subfalcine herniation leading to compression of ipsilateral lateral ventricle and transtentorial herniation producing severe mass effect and midline shift and associated inter-hemispheric fissure acute subdural hematoma.

emergent burr hole with placement of drainage tube placement technique for evacuation of acute subdural hematoma (ASDH), as a desperate attempt to save life.

Case Report

A 23-year-old patient, chronic alcoholic patient with grade 2 fatty liver presented with altered sensorium following fall at ground level, evaluation on admission revealed a GCS score was 7, which further deteriorated rapidly to score 5 in the casualty. He had anisocoria with left pupil size 4 mm and right pupil size 2 mm and associate right hemiparesis. Hematological evaluation revealed gross thrombocytopenia with platelet count of 60,000 and deranged INR value—1.8. Noncontrast computed tomographic scan of head revealed ASDH of maximum thickness 2.5 cm over left fronto-temporo-parietal region with gross mass effect, midline shift of 17 mm to right and effacement of basal cistern and ipsilateral ventricle and interhemispheric subdural hematoma (►**Fig. 1**). Though correction of thrombocytopenia and coagulopathy was started promptly, rapidly deteriorating neurological status warranted urgent decompressive craniectomy. However, earlier plan of decompressive craniectomy was abandoned and burr hole evacuation of ASDH was performed as an emergent measure. Two larger burr holes of size 2.5 cm, in the frontal and parietal region of liberal size were made. Collected hematoma with organized hematoma came out under very high pressure. A small bore catheter was introduced and slow irrigation with normal saline into the subdural cavity was carried out. Part of hematoma under vision was extracted using cusp forceps at the end, returning fluid was clear and brain pulsating, soft drainage catheter was placed and wound closed (►**Fig. 2**).

After an emergency operation, pupil anomaly and hemiparesis improved. He was electively ventilated for 24 hours and decongestant therapy, antibiotics and antiepileptic medication continued. He gradually became alert on third day, although psychic disturbance resulting from cerebral contusion persisted. Subdural drain was kept for 5 days with daily output of about 30 to 50 mL of cerebrospinal fluid mixed blood. Meanwhile, coagulopathy was corrected, decompressive craniectomy performed on hospital day seven for removal of residual. He was finally discharged on twelfth postoperative day. At the last follow-up 1 year following surgery, he was conscious and alert, with GCS 15, with no focal neurological deficit.

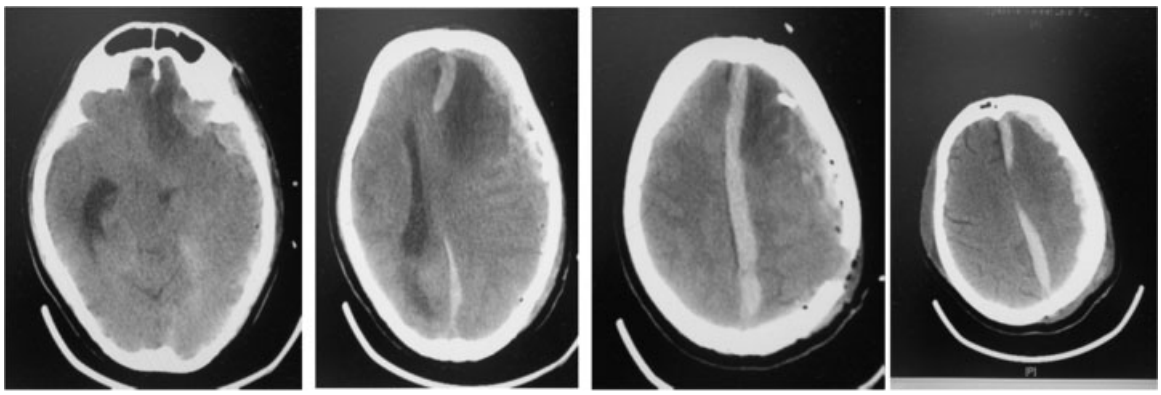

Fig. 2 Post burr hole NCCT head scan showing extent of markedly reduction of thickness and volume of acute subdural hematoma with partial resolution of mass effect with evidence of previous burr-hole.

Discussion

During neurosurgical procedure for intracranial hematoma removal can lead to of coagulopathy, which can be observed during any phase of surgery and presented with various manifestations, ranging from self-limiting course to disaster.[1] However, during surgery either diffuse bleeding from brain surface and meningeal surface is harbinger of such catastrophic event. However, diffuse hemorrhage can also be contributed and compounded by massive brain swelling and causing further brain herniation through craniotomy defect and even further lobectomy may be needed to control swelling and thus starting a vicious cycle.[2]

However, preoperative screening for coagulation disorder can pick up coagulopathy. However, brief enquiry is quite important regarding previous intake of aspirin, warfarin, heparin, chronic alcoholism, and preexistent coagulopathy state such as von Willebrand disease, idiopathic thrombocytopenia, and purpura. Chronic alcoholism causes reduction in production of coagulation factors, alteration of platelets function, and nutritional factors deficiency. Disseminated intravascular coagulation can occur following massive transfusion of blood to replace blood loss occurring from associate abdominal or limb injury. These can predispose to development of large intracranial hematoma even following minor trauma as our case also has a history of fall.[1–3]

During craniotomy, cases with preexisting coagulopathy usually show exaggerated hyperemic response leading to profuse oozing of blood and difficult hemostasis and it is evident at the stage of raising of scalp flap, during dural opening, contusion removal, or at the final hemostasis stage. However, minor coagulopathy may be acceptable for abdominal or limb surgery, but it can make neurosurgical procedure extremely hazardous. So complete normalization of coagulation abnormality should be carried out by appropriate transfusion and replacing appropriate factors and transfusion department should also be alerted to make sure the availability of essential blood components and products.[4]

As our patient had rapid deterioration, a choice was sought including percutaneous needle aspiration, subdural drains, placement of burr holes alone or burr hole with placement of subdural drain. The authors made two burr holes and drain was put, which was draining about 200 mL daily. It was kept for 5 days and this led to clinical improvement, meanwhile corrective measure to rectify coagulation abnormality was undertaken. Double burr hole drainage is less invasive than craniotomy. In addition, this procedure being, providing almost immediate release of the high intracranial pressure can be achieved with lesser risk of bleeding and burr hole should be placed especially over thickest part of subdural clot. Moreover, this procedure can be performed in an examination room or even at the bedside. Decompressive craniectomy or other major procedure can be done later after correction of underlying coagulopathy. One limitation of burr hole drainage is the inability to evacuate hematoma containing a hard clot. However, in cases of cerebral herniation in the acute phase of injury, the hematoma is relatively soft and contains a larger liquid component than in the subacute phase, so it aids in expulsion of hematoma, as it is easily extruded from the burr hole, further assisted by preexisting raised intracranial pressure. Another limitation is the inability to perform hemostasis through a burr hole. If hemorrhage is recognized after hematoma drainage or clots are firm or failure to removal through burr hole leaving large residual hematoma, additional craniotomy may be required later on.[4]

Prognosis of head injury with coagulopathy is typically unfavorable. Various prognostic factors affecting favorable outcome however, younger patients carry better potential for recovery than older, a short duration from injury to operation can minimize the damage resulting from hypoxia because of traumatic cerebral perfusion, even if the patient shows signs of cerebral herniation.[3,5]

However, good recovery in our case may have been associated with relatively younger age, short interval from injury to surgical procedure making hematoma relatively softer, thicker subdural hematoma, selection of a simple burr hole procedure, associated minor cerebral contusion with maximal mass effect caused by ASDH and fortunate spontaneous hemostasis. Authors support the view that patient having ASDH with coagulopathy may show favorable outcomes if rapid decompression with burr hole drainage is performed rather than waiting for correction of coagulation profile and thrombocytopenia for major procedure in form of decompressive craniectomy.

Conclusion

The prognosis for rapidly deteriorating neurological status in patients with ASDH associated with coagulopathy is poor. However, emergency burr hole drainage may still be a suitable option considered especially in cases showing rapidly deteriorating neurological status harboring coagulopathy and thrombocytopenia, where there is dire lack of time for correction of coagulopathy. Current technique can be particularly suitable for relatively thicker ASDH collection with absent or minimal intracerebral contusion in setting of rapidly deteriorating neurological status. Measures for prompt and punctual correction of coagulopathy including transfusion of fresh frozen plasma and platelet-rich concentrate, vitamin K, administration, avoidance of antiplatelets medication, and other suitable measures in consultation with clinical hematologist should be carried out.

Conflicts of Interest
The authors have nothing to declare.

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