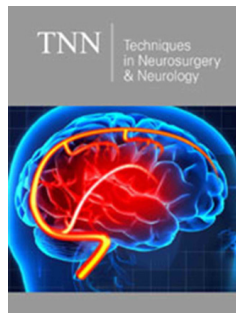


# Remote Site Intracerebral Bleed Following a Neurosurgical Procedure at another Site-A Case Report

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**Keywords:** Remote site intracranial hemorrhage; Post operative intracranial hemorrhage; Cerebellar hemorrhage; Post operative hemorrhage

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## Introduction

Remote site bleed is defined as intracranial haemorrhage at a site away from the operated site. Intracranial haemorrhage occurring at “remote site” from the site of surgery is a rare neurosurgical complication and can create significant morbidity and mortality. The location of remote site bleed can be epidural, subdural, or intracerebral [1,2] and can be supratentorial or infratentorial following a supratentorial or infratentorial surgery.

## Case

A 67-year-old male, known hypertensive, non-diabetic presented with severe headache and vomiting and right sided weakness, without any history of trauma. He was drowsy and aphasic. GCS was E2M5V2. He was hemodynamically stable and having normal respiratory parameters. Pupils were reacting in both sides. He underwent a CT scan of brain and that showed a left sided acute subdural hematoma with midline shift. His DSA of cerebral vessels was normal and coagulation parameters were also normal. He was not on any antiplatelets or any anti-coagulants. He underwent left sided craniotomy and evacuation of subdural hematoma. He was extubated after surgery and was in a same clinical status as before. His blood pressure was controlled all through with Labetalol infusion. After 12 hours of surgery, his GCS deteriorated (E1V1M2) and his respiration became irregular. Pupils were still reacting and other brain stem reflexes were present Urgent CT scan was done and it showed large cerebellar hemorrhage with hydrocephalus. Prognosis had been explained to family members and urgent EVD (External Ventricular Drainage) was done. Posterior fossae decompression and evacuation of hematoma was suggested but refused by relatives. Elective ventilation was continued. His condition did not improve, rather further deteriorated. Pupil became fixed and dilated with absence of other brain stem reflexes and finally he died. CT brain was repeated, and it showed multiple scattered intracerebral haemorrhage with brain stem infarct with EVD in situ. Literature was reviewed and, in this case, probable cause was CSF release as the other factors were all satisfactory (Figures 1-3).

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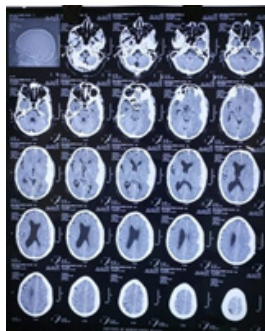
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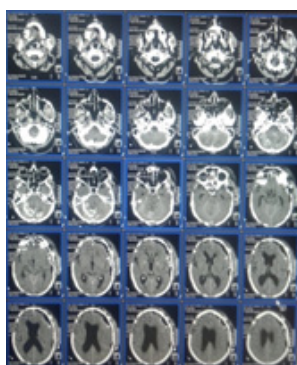
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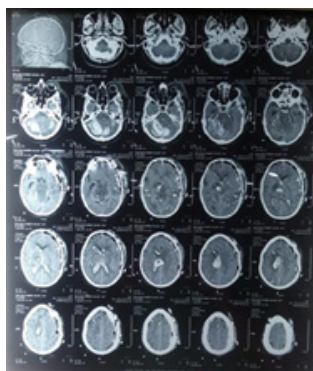
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**Figure 1:** Showing left sided acute fronto-temporo-parietal subdural hematoma with mass effect.



**Figure 2:** Showing cerebellar hemorrhage with hydrocephalus with left sided craniotomy for SDH.



**Figure 3:** Showing the multiple scattered intracerebral haemorrhage with brain stem infarct after EVD.

## Discussion

Medline and Pubmed search were done for remote site intracranial bleed following cranial neurosurgery using key words like postoperative hematoma, remote site hemorrhage. The search found 83 such reports. Postoperative surgical site hematomas can be a life-threatening complication in neurosurgery and are commonly due to inadequate intraoperative hemostasis [3]. Compared to them intracerebral haemorrhage occurring “remote” from the site of craniotomy is a rare neurosurgical complication and can lead to significant morbidity and mortality [4,5]. Different mechanisms have been proposed to explain such a rare occurrence.

The only common implicating factor among the 83 patients reviewed was sudden decompression in case of Chronically Elevated Intracranial Pressure (ICP). The other possible factors for postoperative remote site bleed are coagulation disorders and hypertension. However, only one patient in our series had hypertension. Transient hypertensive peaks during the recovery from anesthesia have in the past been considered as an important risk factor. More recently, this theory has been partly refuted as only some patients had documented high (200mmHg) blood pressure levels in the perioperative period [6]. Some authors consider that aggressive intraoperative volume loss and CSF removal together or acute obstruction of the venous outflow, can cause brain shift that contributes to intracerebral hemorrhage [7-9]. It is also hypothesized that the tissue thromboplastin released from the injured brain tissue in severe Traumatic Brain Injury (TBI) leads to a local consumptive coagulopathy [10]. The same can happen due to extensive blood loss during surgery and transfusion reactions. The loss of substantial CSF volume during surgery appears to play a central role in the pathophysiological development of remote site hematoma. Suction of the CSF may cause intracranial hypotension. Further reduction of intracranial pressure leads to an increased transmural venous pressure with subsequent rupture of veins [11,12]. Substantial loss of CSF leads to sagging of the cerebellum away from the tentorium and thus stretching of the cerebellar veins with an increase in the transmural pressure [13] or it may be due to jugular vein compression by the transverse process of atlas in extended neck position [14]. Cerebellar “sag” as a result of CSF hypovolemia, causing transient occlusion of superior bridging veins within the posterior fossa and consequent hemorrhagic venous infarction, has also been proposed to be the most likely pathophysiological cause of remote cerebellar hematoma [15]. Pin site Extradural Hematoma (EDH) is an also a known etiology for remote site bleed [16]. One retrospective study on cerebellar hemorrhages after supratentorial surgery had reported these to be a postoperative event rather than an intraoperative one [17,18].

We strongly advocate screening of all major neurosurgical cases for coagulation, bleeding diathesis and hypertension. While positioning undue neck compression should be avoided to prevent intracranial venous hypertension. Mayfield or three pin fixation needs to be carefully done to prevent breach of inner cortex of skull. During surgery, whenever possible, sudden decompression of brain should be avoided. Cases where massive blood loss is expected, use of preoperative embolization, intraprocedural use of cell saver and even staging of the procedure is warranted to prevent consumptive coagulopathy. In case of sudden rise of ICP or brain becoming tense during surgery in an otherwise relaxed brain, an immediate postoperative CT scan is warranted to rule out remote site bleed. We routinely perform CT scan of our post-operative patients after 4 hours of cranial surgery and after 12 hours. Clinicians need to keep a high index of suspicion to diagnose this fatal complication at

an early stage. In a patient with delayed reversal and deteriorating Glasgow Comma Scale (GCS) after surgery, CT is performed at the earliest to rule out this cause. Wide fluctuations in the blood pressure in the operative and postoperative periods should be avoided. In patients with remote site bleed, workup of complete coagulation profile before surgical intervention is highly warranted, Decision to evacuate remote site hematoma should be tailored based on clinical, radiological, and coagulation profile [18]. In patients with deranged coagulation profile, appropriate corrections should be done before any surgical intervention. External ventricular drain or twist drill may be the options in patients who are likely to deteriorate due to abnormal coagulation profile [18]. Though we found 83 reported cases, but it seems unreported and unpublished incidence of such complications are not very uncommon. So, neurosurgeons have to be very careful about this complication and take adequate pre-operative and post-operative precautions as mentioned to prevent these catastrophic complications.

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