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Review Article

Contralateral development of massive acute subdural hematoma occurrence during decompressive craniectomy and surgery for evacuation of ipsilateral acute subdural hematoma: Literature review



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ABSTRACT

Contralateral massive acute subdural hematoma (ASDH) developing acutely during decompressive craniectomy for severe head injury with ASDH evacuation is very rare occurrence. Till date about seven cases are published in the western literature with outcome varying from death, vegetative existence and severe disability. Interestingly all seven cases were operated at varying time-interval following first surgery varying from 0.5 to 3 h following initial surgery. Current case is the first case in the best of knowledge of authors in western literature, who was diagnosed even got operated in continuity with good neurological outcome. Awareness of intraoperative brain swelling is important. Author presents a case occurring in a 45-year old male, developed acute subdural hematoma on contralateral side during decompressive surgery, causing sudden brain bulge, refractory to medical management, however, wound was closed rapidly and urgent CT scan carried out, revealed massive acute subdural hematoma, requiring immediate decompressive surgical intervention. In the immediate postoperative period, he required ventilatory support and discharged after two weeks following surgery. High degree of suspicion, brain bulge during surgery not relieving with routine measure warrants immediate CT scan and a rapid return to the operating room for immediate surgical intervention for acute SDH evacuation can provide good outcome.

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1. Introduction

Development of extraxial hematoma during surgery for severe head injury is rare, but represents a potential life threatening complication if not recognized.¹ It can occur as extradural, subdural or intracerebral hematoma. Development of extradural or intracerebral hematoma on contralateral side following surgery is well documented in literature.² However, Acute subdural hematoma (ASDH) development over contralateral side during surgical evacuation of ASDH is very rare, although reported.¹⁻⁵ To the best of author's knowledge only seven such cases have been reported in western literature. A patient with post-traumatic ASDH undergoing decompressive craniectomy can develop brain bulge during surgery due to contralateral development of acute subdural, acute epidural, intracerebral hematoma or aggravation of hydrocephalus.^{1,6–8} Intraoperative brain swelling not responding to routine measure directed to relieve intracranial pressure eg. head elevation to encourage venous drainage, securing air way patency, correction over-rotation of head, intravenous osmotic agent administration, correction of air way obstruction like endotrachecal tube kinking, hyperventilation, stopping inhalation anesthetic agent, switching over to total intravenous anesthetic management regimen and possibility of hematoma development on contralateral side should be kept as potential cause, requires urgent attention, necessitating immediate CT scan for correct diagnosis with emergency planning of management.^{1,3,5,7} Authors report an interesting case of severe head injury with acute ASDH, who developed acute brain bulge intraoperatively, NCCT head showed contralateral massive ASDH, which needed emergency surgical evacuation. This case emphasizes getting immediate CT scan directly from operating room and return to carry out evacuation of contralateral ASDH.

2. Case report

A 45-year old man was brought to our emergency services following road traffic accident and in state of altered consciousness. On physical examination, pulse rate of 110 per minute and blood pressure of 136/80 mm Hg. His Glasgow Coma Scale (GCS) score, on admission, was 8. Left pupil was dilated sluggishly reacting in size; right was normal size and reacting to light. Patient was intubated immediately. X-rays of the chest and cervical spine were normal. Focused abdominal sonogram for trauma was also negative. NCCT head (Fig. 1) showed thick left sided acute subdural hematoma with midline shift with effacement of basal cisterns. The patient was immediately shifted to operating room for emergency decompressive craniectomy and evacuation of ASDH. He underwent left frontotemporoprarietal scalp flap and decompressive craniectomy was carried out. Brain was lax after hematoma evacuation, but at time of dura closure suddenly brain bulge was observed, which was refractory to routine medical management. In view of above possibility of development of intra-parenchymal contusions or fresh contralateral extraxial hematomas formation was considered as possible causes. After rapid wound closure following securing

hemostasis, patient was shifted for NCCT head (Fig. 2), which showed thick right sided acute subdural hematoma with gross midline shift. In view of large size of hematoma, significant mass effect with midline shift, plan was made for decompressive craniectomy over right side and immediately shifted back to operating room from CT room followed by decompressive craniectomy and evacuation of hematoma was carried out. He was electively ventilated, intracranial pressure (ICP) was monitored in the postoperative period for five days and was within normal limits and gradually weaned off the ventilatory support. He received cerebral decongestants, antiepileptics and antibiotics during the postoperative period. His postoperative course was uneventful and discharged on seventeenth postoperative day. At the time of discharge, the patient's neurological response was E3V2M5 (GCS = 10). The patient recovered over due course of time and recovered to GCS of 14 at six-month follow-up visit.

3. Discussion

Contralateral epidural hematoma formation during surgery for traumatic severe head injury is rare.^{7,8} However ASDH development is very rare and only seven cases are reported in the form of isolated cases report.^{1–6} (Table 1) Either it may occur immediately after ASDH removal^{1–5} or very rarely in delayed manner.⁶ Exact mechanism of contralateral ASDH development is unknown. Various postulates are put forward to explain the intraoperative development of contralateral ASDH. Tomycz et al postulated rapid brain shift caused by craniotomy, lead to shear stress on bridging veins of contralateral side, which might get torn and lead to ASDH formation,



Fig. 1 – Initial CT scan head showing thick acute subdural hematoma over left frontotemporoprarietal region causing subfalcine herniation and effacement of basal cistern with significant mass effect.

PICE M.457

Fig. 2 – Intraoperative NCCT scan head showing fresh developing acute SDH over right frontotemporoprarietal region.

further ongoing collection of blood may cause brain bulge during surgery, which is unresponsive to medication.³ Takeuchi et al suggested early initial CT scan is usually done within few hours following injury and these scan are likely to miss as contralateral ASDH formation, which may be natural course of evolution.⁴ Another important additional mechanism is underlying ASDH formation at the pin site dural penetration, as the patient may be fixed on pins while positioning of patient during surgery. A pre-existing small isodense ASDH in case of severe anemic patient may be missed on CT scan could be an additional mechanism.

Feuerman et al defined intraoperative ASDH hematoma is characterized by occurrence of hematoma, which are not observed during initial CT scan, but developing slowly following surgical evacuation either during surgery or in the immediate postoperative period.⁷

Time interval required to diagnosis and definitive second surgery needed varying time interval in the literature. It can range from 0.5 to 3 h in cases reported by Ban et al⁶ and took one, three and 5 h respectively cases operated and managed by Matsuno et al,² and it took about 3 h in a case managed by Shen et al.⁵ However no data of time-interval is available in either 81-year female underwent surgery in year 2010 reported by Tomycz et al³ or 85 year-old operated by Fridley et al¹

However, current case is the first case to the best of knowledge of authors in western literature, which was diagnosed during first surgery and even got operated in continuity.

Singh et al described about manifestation, which most dramatically present either during craniotomy or following craniotomy after opening of dura.8 Such hematoma development may present in postoperative period as neurological deterioration or delay or non reversal from anesthesia following surgery. Its occurrence may be precipitated by intraoperative use of osmotic dehydrating agent, hyperventilation, CSF rhinorrhea, otorhorea, and these factor may be act either in combination due to loss of temponade or alone.^{1,2,8} Detection of causes of brain bulge and remedial measure is very important and despite routine intraoperative maneuver including ventricular tapping, brain continue to bulge and not responding, possibility of such condition may be considered, diagnosis is very important as accordingly treatment option need to be selected to prevent progressive neurological insult.8 Indicator of remote bleeding following craniotomy is progressive brain swelling with persistent failure to achieve hemostasis in the surgical cavity due to recurrent oozing or venous bleeding is important indicator. It needs regular monitoring. It can be diagnosed with CT scan or intraoperative ultrasonography.⁵ In extradural hematoma, fracture of contralateral skull should be evident.⁹ In present case, compression from left sided ASDH with midline shift probably prevented contralateral subdural hematomas from developing but following evacuation of first hematoma led to decrease in intracranial tension and evolution of hematoma. Resultant reduction in intracranial pressure causing loss of temponade effect is factors led to the development of contralateral hematoma.

S. No.	Author/ reference	Year	Age,	Sex	Initial surgery	Surgery for contralateral acute SDH	Outcome
1	Matsuno et al, ²	2003	31	М	Decompressive craniectomty	Decompressive craniectomty	Survived but severely disabled
			40	М	Decompressive craniectomty	Decompressive craniectomy with acute subdural hematoma removal	Survived but severely disabled
			19	Μ	Decompressive craniectomty	Decompressive ctraniectomy	Survived but vegetative state
2	Tomycz et al ³	2010	81	F	Craniotomy surgery ^a	Craniotomy ^a	Survived with good recovery
3	Fridley et al ¹	2011	85	F	Craniotomy surgery ^a	Surgery ^a	Survived with good recovery
4	Takeuchi et al ⁴	2013	7	М	Decompressive craniectomty	Decompressive craniectomty	Death
5	Shen et al ⁵	2013	28	М	Decompressive craniectomty	Decompressive craniectomty	Death
6	Current study	2014	45	М	Decompressive craniectomty	Decompressive craniectomty	Survived
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Table 1 — Previously reported contralateral acute subdural hematoma development during intraoperative craniotomy for acute subdural hematoma evacuation not associate with extradural hematoma.

^a Details not available.

Management of such cases depends upon size, mass effect, rate of progression. A large acute SDH requires evacuation; perhaps have been managed by delayed evacuation using burr-holes/twist drill once it became chronic. However a moderate or small contralateral ASDH collection developing or detected in postoperative period can be observed and can be evacuated by twist drill or burr-hole, once it becomes chronic SDH or causes mass effect. However, our case needed urgent surgical intervention.

Conflicts of interest

All authors have none to declare.

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