Case report

Article's Title

Subdural hematoma hidden by acute epidural hematoma; The first report of two cases.

Running title

Coexisting epidural hematoma and subdural hematoma on same location

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Background and importance

Epidural hematoma (EDH) and subdural hematoma (SDH) are intracranial emergencies and extremely lethal if not treated promptly. The coexistence of both of these entities in a patient of TBI lead to a catastrophe of events. Occurrence of both EDH and SDH, on the same side after single trauma ,isextremely rare. Sometimes, volume of EDH compresses underlying SDH, which in-turn leads to radiological obliteration of SDH; for which authors have suggested a terminology- ROSE(radiologically occult subdural hematoma in patients presenting with radiologically visible extradural hematoma) paradox of doom .

Case presentation

Authors present two cases of TBIs, where patients were initially operated for EDH, but later on , postoperative scans revealed SDH on the same side, which was not visible in preoperative scans. Identification of SDH in postoperative scans prompted second surgery.

Conclusion

EDHs and SDHs are fatal types of TBIs if left untreated. A large sized hematoma needs surgical evacuation as early as possible. Intraoperative dural pulsation and bulge determine the decision for durotomy. In both index cases, delay in presentation, extent of primary brain injury and radiological limitations in diagnosing both EDH and SDH leading to further delay in the complete evacuation of hematoma, were the chief reasons for the poor prognosis . Through this article, the authors want to emphasise the fact that surgeons should keep in mind this type of radiological phenomenon, which in turn is useful in maximising the limited resources of hospitals and minimising the surgical burden of the patients.

Highlights

- Epidural hematoma and subdural hematoma are intracranial emergency and extremely lethal if not treated promptly
- Although they are diagnosed radiologically when occur at separate locations but radiological obliteration of subdural hematoma due to overlying epidural hematoma make it difficult to diagnose radiologically , leading to unnecessary extra surgical stress and hazardous impact on recovery of the patient.

Plain Language Summary

Traumatic brain injuries are leading cause of mortalities . The prognosis of the patient depends on timely arrival in hospital and appropriate neurosurgical intervention. Most of the traumatic brain injuries are diagnosed radiologically on computed tomography scans. Epidural hematoma and subdural hematoma are common types of traumatic brain injuries which are can be diagnosed easily on computed tomography scans when occur on separate locations but sometimes become difficult when both ipsilateral and on same location. This can further complicate the treatment process leading to delay in complete evacuation of hematoma. In both index cases , ipsilateral occurrence of giant epidural hematoma caused radiological obliteration of subdural hematoma . Intraoperative judgement is very critical for complete surgical process as intraoperative dural bulge can be a sign of subdural hematoma. Since, very few cases have been reported, authors providing detailed analysis regarding such these types of radiological fallacies.

Introduction

Epidural hematoma(EDH) is an intracranial emergency and extremely lethal if not treated promptly. Judicious surgical evacuation of EDH is one of the most rewarding neurosurgical procedure[1,2]. Acute subdural hematoma (SDH) is another lethal form of traumatic brain injury (TBI) which has grave prognosis with high mortality [3,4]. The coexistence of both of these entities in a patient of TBI lead to a catastrophe of events. In most of the patients, EDH and SDH occur in different positions. Occurrence of both EDH and SDH, on the same side after single trauma ,is extremely rare [5,6]. Sometimes, volume of EDH compresses underlying SDH, which in-turn lead of radiological obliteration of SDH which in turn can lead to misjudgement in appropriate surgical procedure. Here, authors present two cases of TBIs, where patients were initially operated for EDH , but later on , postoperative scans revealed SDH on same side, which was not visible in preoperative scans. Identification of SDH in postoperative scans prompted second surgery.

Case illustration

Case 1

A male patient of 21 years old was brought to the emergency room in an unconscious state following a high velocity road traffic accident. The time interval between accident and arrival in the emergency room was 8 hours , as he was primarily managed in district hospital . At the time of arrival, the patient was in decerebrate posture .The Glasgow Coma Scale (GCS) score was 4 , blood pressure was 152/94 mm hg, pulse rate was 56, respiratory rate was 26 per minute and pupils were sluggish reactive to light. Immediate orotracheal intubation was done .Routine blood investigations including coagulation profile, were normal. Computed tomography (CT) scans revealed a left sided frontal bone fracture with an underlying giant EDH measuring around 70 ml in volume[Figure 1a]. The patient was operated immediately. A left frontal trephine craniectomy with complete evacuation of EDH was done. The underlying dura was pulsatile and slightly bulging. The patient was kept on ventilator support during postoperative period. A postoperative CT scan after 2 hours showed mixed density lesion at the same location [Figure 1b]. The patient was again taken for surgical evacuation of the hematoma . On re-exploration dura incised and around 50 ml of subdural blood was evacuated [Figure 1c,1d,1e] Postoperative scans showed complete evacuation of hematoma [Figure 1f] . The patient remained on the ventilator, failed to recover , and died after 3 days .

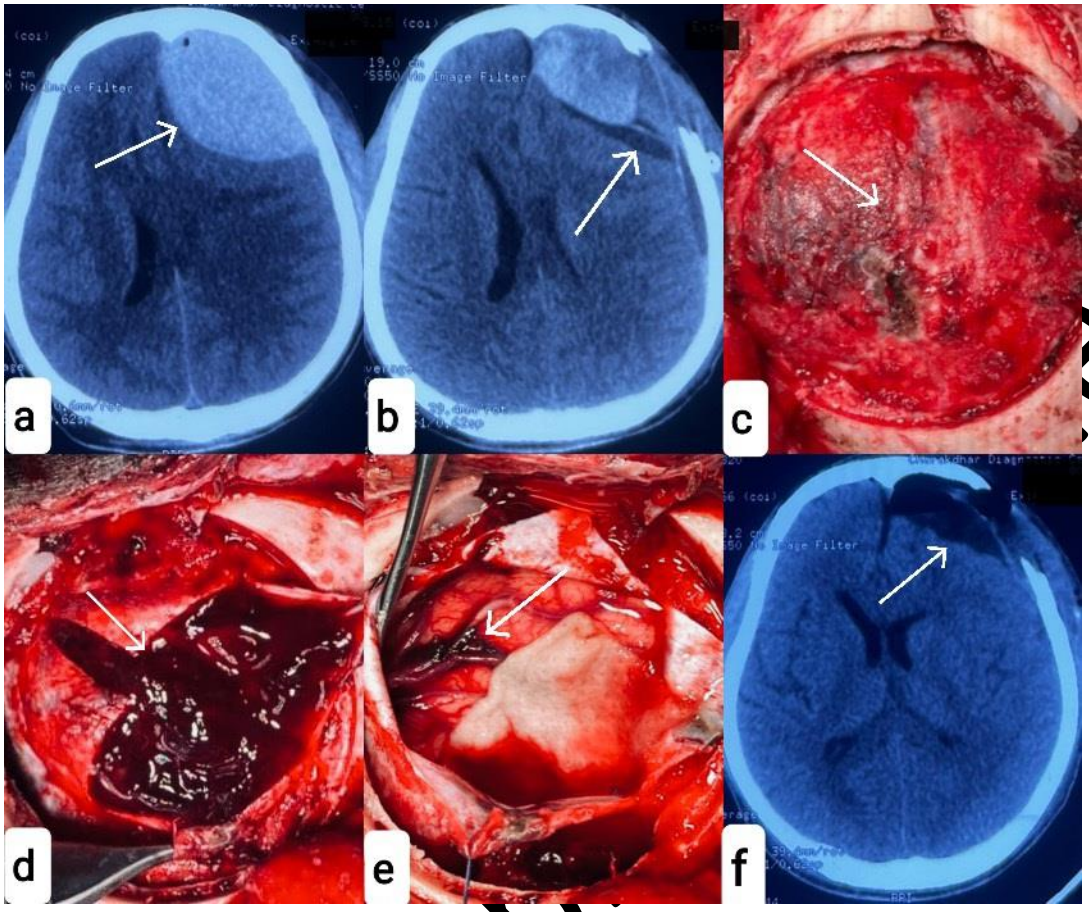

Figure 1; (a)- Axial section of computed tomography scan of the head showing giant epidural hematoma in the left frontal convexity region (arrow); (b)- Axial section of postoperative CT scan of the head showing mixed density lesion at the same location(arrow) with post craniectomy status (c)- Massive dural bulge intraoperatively during second surgery (arrow); (d)- Durotomy reveals subdural hematoma (arrow); (e)- Post hematoma evacuation status with coagulated cortical vein(arrow); (f)- Axial section of postoperative CT scan of the head after second surgery showing complete evacuation of hematoma (arrow).

Case 2

A male patient of 18 years old was brought to the emergency room in an unconscious state following high velocity trauma due to the physical assault . The time interval between assault

and arrival in the emergency room was 24 hours. At the time of arrival, GCS was 8, blood pressure was 140/90 mm hg, pulse rate was 62 , respiratory rate was 23 per minute, and pupils were bilaterally constricted. A CT scan of head revealed a left sided giant EDH measuring 60 ml in volume [Figure 2a]. Routine blood investigations, including the coagulation profile , were normal. The patient was operated immediately. A left frontal trephine craniotomy with complete evacuation of EDH was done. The underlying dura was pulsatile and lax. A postoperative CT scan after 2 hours showed mixed density lesion at the same location with ipsilateral posterior cerebral artery (PCA) territory infarction with midline shift [Figure 2b, 2c]. Patient was immediately operated again . Left frontotemporoparietal craniectomy with SDH evacuation was done along with lax duraplasty .Postoperative scans showed complete evacuation of the hematoma[Figure 2d] . The patient was tracheostomized and kept on the ventilator. Gradually, the patient deteriorated and died after 12 days.

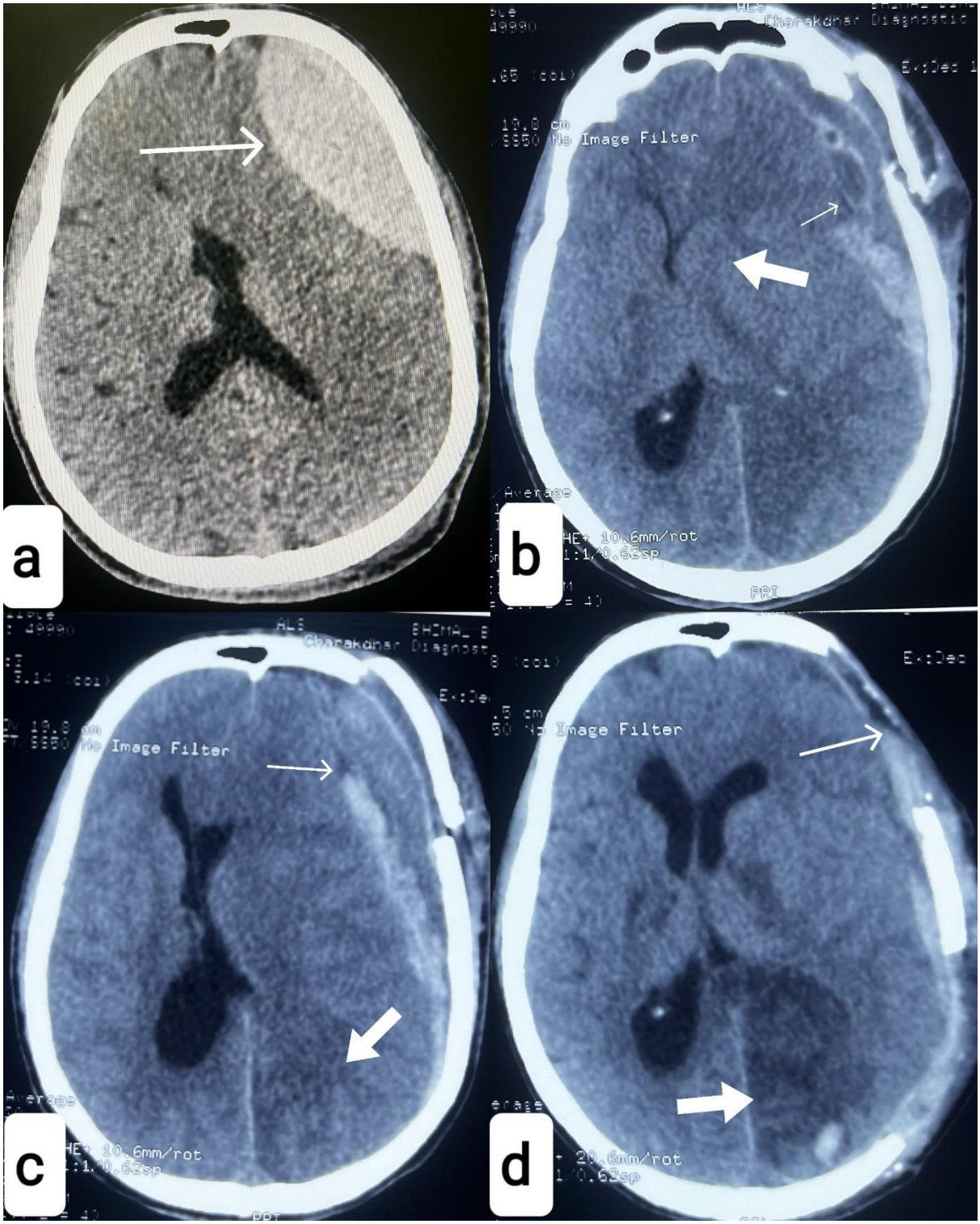

Figure 2; (a)- Axial section of computed tomography (CT) scan of the head showing giant epidural hematoma (EDH) on the left frontal convexity region (arrow) with midline shift ; (b)-

Axial section of postoperative CT scan of the head showing mixed density lesion(subdural hematoma) on the same side (thin arrow) and midline shift (thick arrow); (c)- Axial section of postoperative CT scan of the head showing subdural hematoma on the same location (thin arrow) with the posterior cerebral artery (PCA) territory infarction(thick arrow); (d)-Axial section of postoperative CT scan of the head after second surgery showing residual subdural blood (thin arrow) with persisting PCA infarction(thick arrow).

Discussion

EDHs are fatal type of TBIs if left untreated. Important causes leading to the formation of EDH are middle meningeal vessels rupture, stripping of dural veins, fracture bleed or sinus bleed [7,8]. EDH on CT scans appears as a crescentic or biconvex hyperdense lesion in epidural space[9]. SDH is commonly caused by the rupture of veins which are deep to the duramater. Acute SDH presents as a hyperdense collection in the subdural space which may be concavo – convex or irregular [5,9]. In the first case , the cause of EDH was a fracture bleed with stripping of dural veins . In the second case , dural veins stripping with sinus bleed was the probable cause. Rupture of the venous system deep to the duramater was the cause of SDH in both cases. These entities are easily identifiable on conventional CT scans when occur on different locations in same patient. Sometimes, it is very difficult to differentiate both SDH from EDH when both occur in the same location, as evident in these two case reports . SDH may be obliterated radiologically, probably due the large volume of EDH or the redistribution and dispersal of hematoma in subdural spaces [5,10,11,12]. These situations can lead to failure of identification of hematoma in subdural spaces radiologically , which further leads to misjudgement of appropriate surgical procedure and delay in adequate decompression of the brain . During the redistribution of hematoma, the mixing of cerebrospinal fluid gives SDH a mixed density appearance [5]. In both reported cases , following the evacuation of EDH , the hematoma in subdural spaces appeared as mixed density lesions on CT scans [Figure 1b,2b,2c].

The reappearance of hematoma in subdural spaces in subsequent scans following the evacuation of EDH prompt further surgical procedures that can cause extra surgical stress. Treatment strategies for acute SDH and EDH are based on the GCS score and volume of hematoma along with midline shift [13,14]. EDH with a volume of 30 ml or more should be surgically evacuated [15] . The prognosis of EDH is extremely good if early surgical intervention is made. SDH with a thickness of greater than 10 mm or midline shift of 5 mm should be operated by craniectomy or craniotomy with hematoma evacuation [14]. The prognosis of acute SDH usually depends on preoperative status of the patient with extent primary brain injury. In our cases, delay in presentation, extent of primary brain injury and radiological limitations in diagnosing both EDH and SDH leading to further delay in complete evacuation of hematoma, were chief reasons for the poor prognosis of both patients. TBIs are extremely common cause of mortality and morbidity in developing countries . A large number of cases of TBIs are being operated in these countries with limited resources. Sometimes ,poor patients can't afford cost of multiple surgeries. So , precise decision-making becomes very important to tackle these precarious situations . Through this article, the authors want to emphasise the fact that surgeons should keep in mind this type of radiological phenomenon , which in turn is useful in maximising the limited resources of hospitals and minimising the surgical burden of the patients .

Previously , a few number of isolated case reports have been published regarding this specific condition. Through this article, authors are probably first to report multiple cases in a single article

Conclusions

Coexisting EDH and SDH at the same location following TBIs are extremely rare. It needs early identification and appropriate neurosurgical intervention , depending on the severity of

brain injuries. CT scans are the most common modalities to diagnose these lesions . Intraoperative dural pulsation and bulge determine the decision for durotomy. A large sized hematoma needs surgical evacuation as early as possible, followed by dedicated neurosurgical care.

Ethical Considerations

Compliance with ethical guidelines

Written consent was obtained from relatives of the patients to publish the history and corresponding radiological images.

Funding

This article did not receive any grant from funding agencies in the public , commercial or non profit sectors.

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Critically revising the article: Nityanand Pandey and Ravi Shankar Prasad

Reviewing submitted version of manuscript: Nityanand Pandey and Ravi Shankar Prasad

Approving the final version of the manuscript: All authors

Conflict of interest

None

Acknowledgements

Authors are grateful to Dr Debabrata Deb for his valuable opinion and support in drafting the manuscript.

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