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Case Report

Subdural Hematoma Hidden by Acute Epidural Hematoma: The First Report of Two Cases

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ABSTRACT

Background and Importance: Epidural hematoma (EDH) and subdural hematoma (SDH) are intracranial emergencies and are extremely lethal if not treated promptly. The coexistence of both of these entities in a patient with traumatic brain injury (TBI) leads to a catastrophe of events. Occurrence of both EDH and SDH, on the same side after single trauma is extremely rare. Sometimes, the EDH volume compresses underlying SDH, which in turn leads to radiological obliteration of SDH, leading to misjudgment in surgical planning.

Case Presentation: The authors present two cases of TBIs, in which patients were initially operated on EDH, but later, postoperative scans revealed SDH on the same side, which was not visible in preoperative scans. Identification of SDH in postoperative scans prompted a 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 emphasize the fact that surgeons should consider this type of radiological phenomenon, which in turn is useful in maximizing the limited resources of hospitals and minimizing the surgical burden of the patients.

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Highlights

• Epidural hematoma (EDH) and subdural hematoma (SDH) are intracranial emergencies and very lethal if not treated on time.

• Although they are radiologically diagnosed when occur at separate locations, radiological obliteration of SDH due to overlying EDH makes radiological diagnosis difficult, leading to unnecessary extra surgical stress and a hazardous impact on the recovery of the patient.

Plain Language Summary

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

1. Background and Importance

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

2. Case Presentation

Case 1

A 21-year-old male patient was brought to the emergency room in an unconscious state following a high-velocity road traffic accident. The time interval between the accident and arrival in the emergency room was 8 hours because he was primarily managed in the 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 and reactive to light. Immediate orotracheal intubation was performed. Routine blood investigations, including the 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 immediately operated on. A left frontal trephine craniectomy was performed with complete evacuation of EDH. The underlying dura was pulsatile and slightly bulging. The patient was supported by a ventilator during the 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, the dura was incised and around 50 mL of subdural blood was evacuated (Figures 1c, 1d, and 1e). Postop-

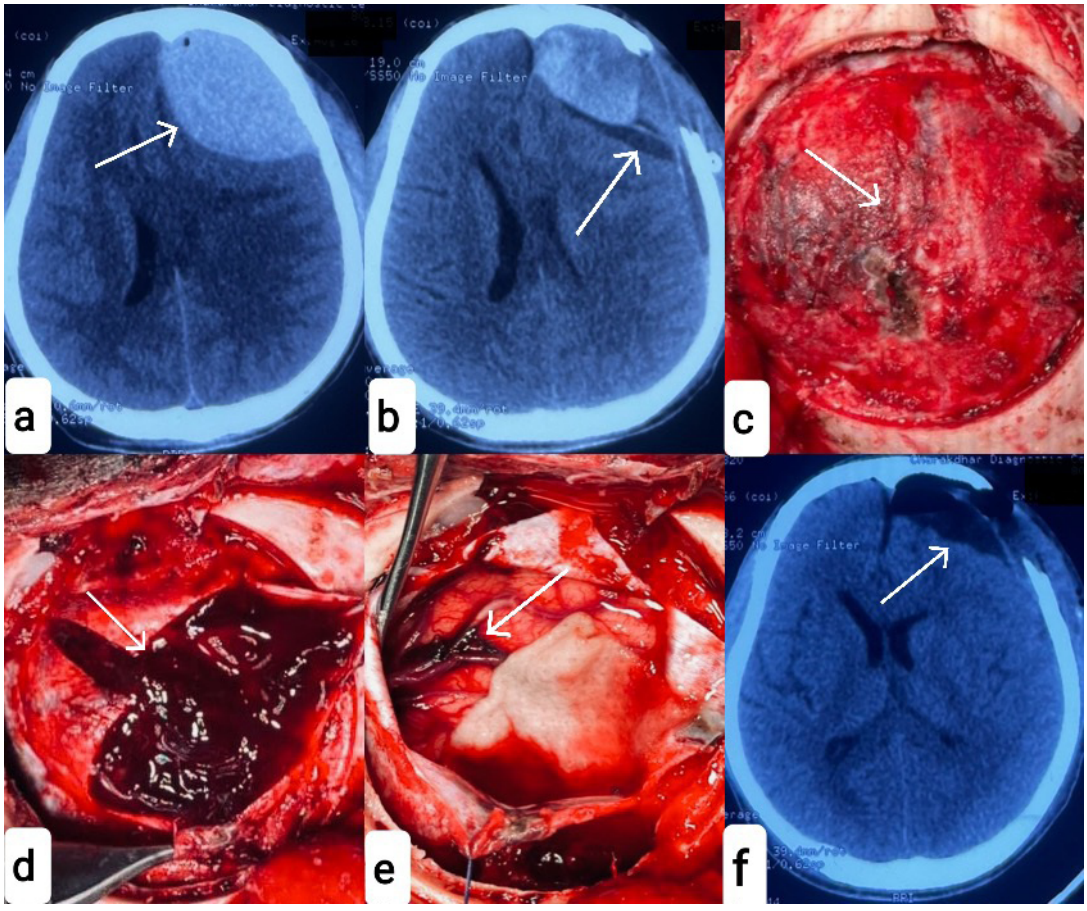

Figure 1. a) Axial section of CT scan of the head showing giant EDH in the left frontal convexity region (arrow), b) Axial section of postoperative CT scan of the head showing mixed density lesion at the same location (arrow) with post craniectomy status, c) Massive dural bulge intraoperatively during second surgery (arrow), d) Durotomy revealing SDH (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)

CT: Computed tomography; EDH: Epidural hematoma.

erative scans indicated complete hematoma evacuation (Figure 1f). The patient remained on the ventilator, failed to recover, and died after 3 days.

Case 2

An 18-year-old male patient was brought to the emergency room in an unconscious state following high-velocity trauma due to a physical assault. The time interval between assault and arrival in the emergency room was 24 hours. On 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 the 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 immediately operated on. A left frontal trephine craniotomy was performed with complete evacuation of EDH. 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 (Figures 2b, and 2c). The patient was immediately operated again. Left frontotemporoparietal craniectomy was performed with SDH evacuation along with lax duraplasty. Postoperative scans showed complete evacuation of the hematoma (Figure 2d). The patient was tracheostomized and kept on the ventilator. The patient's condition gradually deteriorated and died after 12 days.

3. Discussion

EDHs are fatal types of TBIs if left untreated. Crucial causes leading to the formation of EDH are middle meningeal vessel rupture, stripping of dural veins, frac-

Iranian Journal of NEUROSURGERY

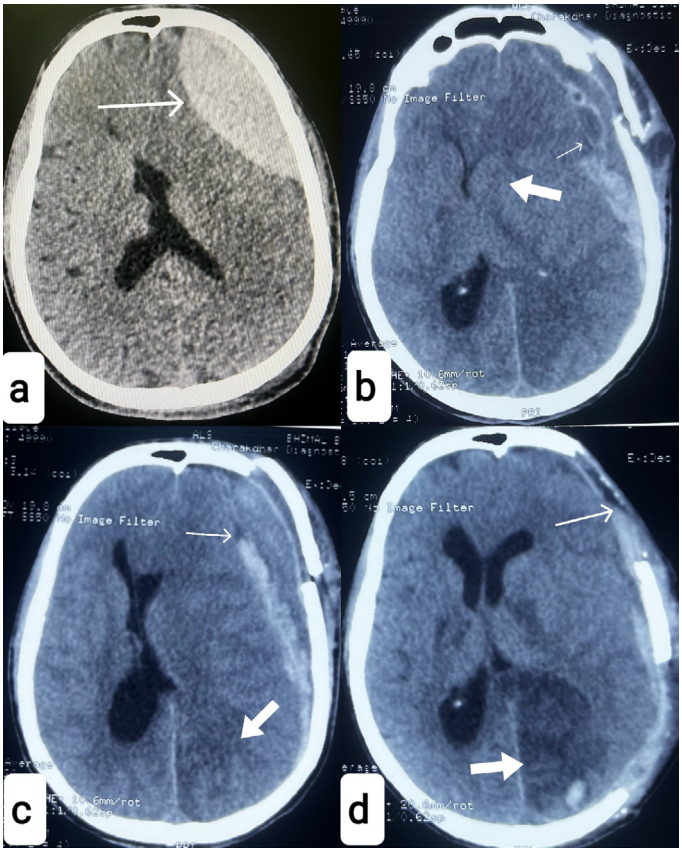

Figure 2. a) Axial section of CT scan of the head showing giant EDH on the left frontal convexity region (arrow) with midline shift, b) Axial section of postoperative CT scan of the head showing mixed density lesion (SDH) on the same side (thin arrow) and midline shift (thick arrow), c) Axial section of postoperative CT scan of the head showing SDH on the same location (thin arrow) with the 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)

Abbreviation: CT: Computed tomography; EDH: Epidural hematoma; PCA: Posterior cerebral artery.

ture bleed, or sinus bleeding [7, 8]. EDH on CT scans appears as a crescentic or biconvex hyperdense lesion in the epidural space [9]. SDH is commonly caused by the rupture of veins that are deep into the dura mater. Acute SDH presents as a hyperdense collection in the subdural space that 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. In both cases, rupture of the deep venous system to the dura mater was the cause of SDH. These entities are easily identifiable on conventional CT scans when occur in different locations in the 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 to the large volume of EDH or the redistribution and dispersal of hematoma in subdural spaces [5, 10-12]. These situations can lead to the non-identification of hematoma in subdural spaces radiologically, which further leads to misjudgment of the appropriate surgical procedures 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 (Figures 1b, 2b, and 2c). The reappearance of hematoma in subdural spaces in subsequent scans following the evacuation of EDH prompts 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 a midline shift of 5 mm should be operated by craniecto-

my or craniotomy with hematoma evacuation [14]. The prognosis of acute SDH usually depends on the preoperative status of the patient with the extent of 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 the main reasons for the poor prognosis of both patients. TBIs are an 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 cannot afford multiple surgeries. Therefore, precise decision-making becomes vital to tackle these precarious situations. Through this article, the authors want to emphasize the fact that surgeons should keep in mind this type of radiological phenomenon, which in turn is useful in maximizing the limited resources of hospitals and minimizing the surgical burden of the patients.

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

4. Conclusion

Coexisting EDH and SDH at the same location following TBI are extremely rare. Depending on the severity of brain injuries, early identification, and appropriate neurosurgical intervention are required. 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 the patient's relatives to publish the history and corresponding radiological images.

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Authors' contributions

Conceptualization and study design: Nityanand Pandey; Data collection: Vikrant Yadav; Data analysis and interpretation: Ravi Shankar Prasad; writing and final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

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