Case report of Traumatic Extradural Hematoma and Kernohan's Phenomena in Pediatric Patient

Abstract :
Introduction: Traumatic extradural hemorrhage is one of the types of brain injury in children. The mortality of this type of brain injury can be as high 11.9% where the fall is the most common mechanism. Immediate surgical intervention such as decompressive craniectomy is a gold standard treatment in extradural hemorrhage.
Case report: This is a case report of pediatric patient in trauma that sustained extradural hemorrhage that require surgical intervention due to low initial glowscow coma scale (GCS)upon presentation. Post trauma patient sustained ipsilateral weakness which was late recognization due to rare complication.
Conclusion: Managing extradural hemorrhage in pediatric patient is quite challenging as it has diversity of presentations where immediate surgical intervention is needed to prevent further complications.
Keywords: Kernohan's Phenomena, Extradural hematomaneeds few more

1. INTRODUCTION

Traumatic Head Injury in pediatric population in Malaysia is about 32 per 100,000 children. A study done in Tay et al in 2016 showed pediatric head injury rate in Emergency Department admission accounted for 12.7%.(1) From this data, 11.9% was reported as mortality rate. Among children aged 9 and under, falls were the predominant cause of traumatic brain injuries.(1) Delay in surgical intervention in pediatric age group can lead to mortality and serious morbidity such as ischemia of brain and ipsilateral hemiparesis.(2) This case report focused on Traumatic Extradural Hemorrhage (EDH) in pediatric group with sequelae.

2. CASE PRESENTATION

A four-year-old child with a history of an alleged fall while being carried by her brother on his shoulder accidentally fell onto the floor from a height of approximately one meter. Following the trauma, the child experienced vomiting but did not seek medical attention. Five hours after the incident, she was found to be less responsive and in a tonic position over her right upper and lower limbs. Upon initial presentation to the emergency department, her Glasgow Coma Scale (GCS) was poor (3), and she had unequal pupils, resulting in intubation for airway protection. The primary and secondary surveys revealed no significant injuries other than a large temporoparietal epidural hematoma measuring 3cm thickness with midline shift; therefore, she underwent left decompressive craniectomy and clot evacuation.

Intraoperative findings showed left temporoparietal EDH thickness 3cm evacuated.Repeated CT scans of the brain post operatively revealed acute infarcts in bothleft occipital lobe and left anteromedial temporal lobe. Furthermore, post-operative imaging indicated focal hypodensity involving the right crus cerebri due to mass effect from pre-operative CT scan results. On day six following surgery,child manage to wean off sedation and it was discovered that the child had developed left hemiparesis with upper limb hypotonia and hypertonia in her left lower limb. She successfully extubated on day ten with full GCS recovery but still exhibited residual left hemiparesis at discharge which required management by rehabilitation specialists.

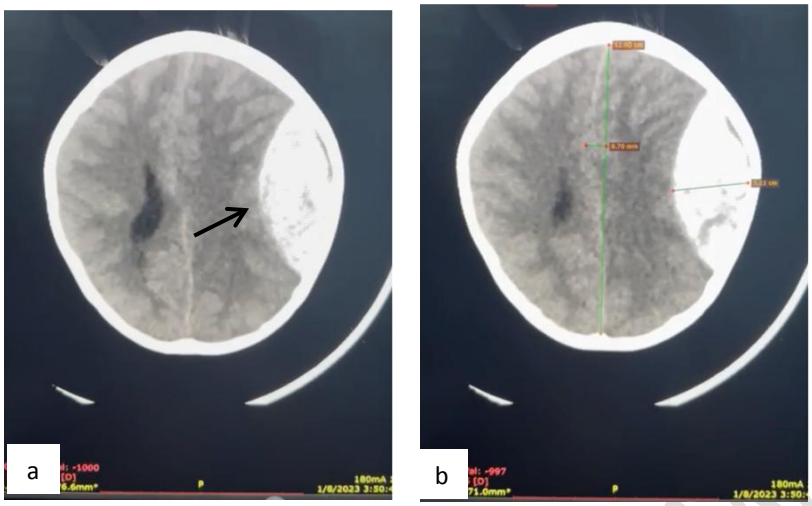

Figure 1. a.Initial CT scan showed large temporoparietal EDH. b.Size of EDH showed 3 cm with midline shift 0.8cm.

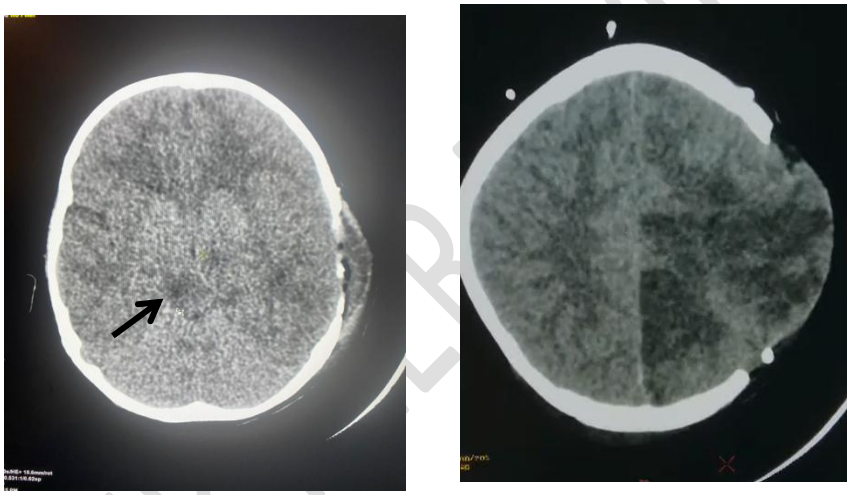

Figure 2 showed post operative CT scan. On right side noted focal area of hypodensity in right crus cerebri in midbrain. On left sided showed hypodensities over left anteromedial temporal lobe and occipital lobe representing infarcts.

3.DISCUSSION

Traumatic Brain Injury in pediatric population can result in death and morbidity.Annual mortality for children younger than 4 years old aproximately 5 per 100000 and is higher compare to those in 5-14 years of age.(3) .However the mortality rate between these pediatric age group can be as high 5.8% to 11.9% (1, 4) Most of the study showed that male is the predominence group in pediatric population compare to female. (3-5)

Extradural hematoma (EDH) is one of type of brain injury where there is an accumulation of blood between inner table of skull and the stripped off dural membrane consist of venous blood.(6) Majority of traumatic venous EDH manifest in pediatric patients are typically not correlated with any accompanying skull fractures.(7) In infants group, EDH is rare because the dura mater is adhered strongly to inner surface of skull particulary in proximity suture line.(3)

The study conducted by Browne and Lam found that 45.5% of patients had isolated EDH with no associated injury and fall as a major factor. A new study done by Mamoori et al in Pakistan showed almost similar results with 38.8% of cases being isolated EDH, with falls contributing

to half of these cases(7, 8).For the evaluation of EDH, plain skull x-ray is not helpful. CT scan is the gold standard with appearance of high density biconvex shape can be seen in 84% of the cases.Surgical management is indicated when the EDH is more than 30cc regardless of GCS. Non-surgical intervention may be preferred for cases that exhibit a volume less than 30cc, thickness under 15 millimeters, midline shift below 5 millimeters and GCS score more than eight in the absence of focal deficits and should be monitored in neurosurgical centre.(green)In the TBI pediatric population, individuals presenting to the ED with a reduced GCS accounted for approximately 56.6% of mortality rates within a year. Nonetheless, an additional 15% of patients experienced favorable outcomes over a period spanning at least ten years.(3)

In this case study, the child successfully preventedmortality.Nonetheless, she experienced morbidity characterized by left-sided hemiparesis consistent with the location of the bleeding side. This sign can be attributed to false localizing sign or Kernohan's notch Phenomena. Kernohan's phenomena was first decribed by James Kernohan in 1929 while writing the article known as incisura of the crus due to contralateral brain tumor.(9)This phenomena refers to an intracranial anomaly that results in a significant lateral mass effect, resulting in the compression of the contralateral cerebral peduncle against the free margin of the cerebellar tentorium. (10) It is also resulting from the compression of the contralateral cerebral peduncles against the tough dural reflections, which causes damage to pyramidal tract fibers located in the brainstem. (11) This ultimately leads to paralysis on the ipsilateral side of a lesion present in the brain similar to our patient in this case report.

The most credible pathophysiological theory for KWNP suggests a transient inadequacy in regional blood circulation due to mechanical compression at the tentorial notch. In the study done by Beuclear et al in 2022 showed that 53% patients suffered from post operative neurological status whereby 29% of them sustained ipsilateral hemiparesis and 18% had ipsilateral hemiplagia. (10) As for abnormality in pupil examination 8% suffered from ipsilateral mydriasis on arrival however were resolved later. It was reported that 92% were benefit from MRI study to diagnose Kernohan's phenomena.(10) Until recently, computed tomography (CT) scans were not utilized for diagnosing Kernohan's notch. However, when obtained to diagnose an intracranial space-occupying lesion, a CT scan can detect contralateral midbrain compression and, combined with clinical features indicating ipsilateral pyramidal tract involvement, provide support for the diagnosis of Kernohan's notch.(11) . A solitary case study conducted by Ragesh et al. demonstrates that the efficacy of CT scans is sufficient, rendering additional MRI procedures unnecessary.(11)This findings also showed that CT scan also can be one of the modality of imaging in which centers that do not provide MRI facility.According to Beucler et al, 45% of patients achieved positive outcomes while 39% experienced negative outcomes.(10) Within the latter group, it was reported that an unfortunate of 22% suffered from hemiparesis. As for long term functional outcome statistically not associated with any factors such as age, dilated pupil upon admission or trauma lesion. The sole variable that lacked significance, yet exhibited a propensity towards improved motor functionality was a GCS score more than 3 upon admission.(10)

4. CONCLUSION

Managing traumatic EDH in pediatric patients can be a complex task due to the diverse clinical presentations that are age-dependent. Early recognition of this neurosurgical emergency is crucial to prevent mortality and minimize morbidity. Therefore, meticulous clinical evaluation and radioimaging assessments play a pivotal role in detecting early signs of morbidity.

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