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Epidural hematoma and depressed skull fracture resulted from pin headrest – a rare complication: case report

Epidurální hematom a impresivní fraktura lebky v důsledku bodového uchycení hlavy: zpráva o neobvyklé komplikaci: kazuistika

Abstract

The standard three or four-point pin fixation systems immobilizing the head are common procedure for intracranial surgery. Intraoperative epidural hematoma complicated with depressed skull fracture resulting from pin headrest is a rare but devastating complication. Early diagnosis via computed tomographic scan and decompressive surgery with evacuation of hematoma influence the neurological outcome. We, herein, reported a 15-year-old boy who underwent a suboccipital craniotomy with removal of cerebellar tumor sustained with intraoperative supratentorial epidural hematoma and depressed skull fracture in the site of pin insertion. After emergent decompressive surgery, his neurological deficits recovered well. The relevant literature is also reviewed.

Souhrn

Standardní systémy tří- nebo čtyřbodového uchycení k imobilizaci hlavy představují v intrakraniální chirurgii běžný postup. Intraoperační epidurální hematom komplikovaný impresivní frakturou lebky v důsledku bodového uchycení hlavy je vzácnou, avšak devastující komplikací. Neurologický výsledek závisí na časné diagnóze pomocí scanu počítačového tomografu a dekompresivní operaci s evakuací hematomu. Článek popisuje případ 15letého chlapce, který podstoupil subokcipitální kraniotomii s odstraněním nádoru mozečku při intraoperačním supratentoriálním epidurálním hematomu a impresivní fraktuře lebky na místě založení kolíku. Po bezodkladné dekompresivní operaci došlo k rychlé úpravě neurologických deficitů. Je také podán přehled příslušné literatury.

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Key words

depressed fracture – epidural hematoma – complication – headrest – pin

Klíčová slova

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Introduction

The standard three-pin fixation systems immobilizing the head are meant to intracranial procedure, such as the tumor surgery, stereotactic surgery, and vascular surgery. However, the pin headrest was rarely reported to cause skull penetration or fracture with delayed post–operative epidural hematoma in the literature [1]. Here, we reported our experience of dealing with a 15-year-old boy who had acute epidural hematoma and depressed skull fracture in the inserted site of pin headrest after the tumor surgery. In the situation of deteriorating patient after intracranial procedure, one should keep highly clinical suspicion including this potential problem, especially in children and young adults with long lasting intracranial hypertension.

Case report

A previously healthy 15-year-old boy complained of vomiting and severe headache for one day. On admission, his physical

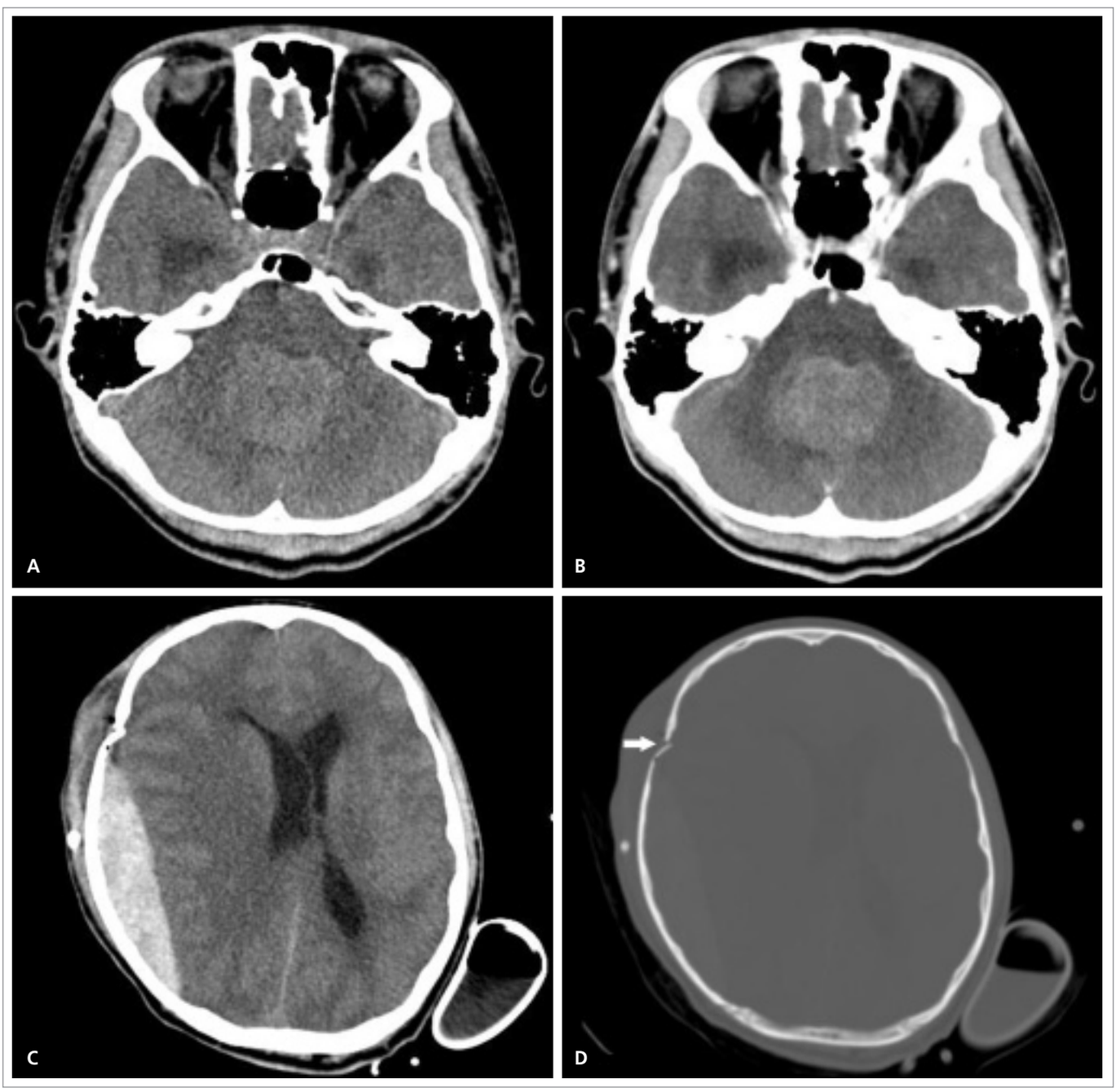


Fig. 1. (A) CT scan of brain revealed an iso to hyperdensity mass measuring 4.1 × 4.2 × 3.1 cm in the cerebellum. (B) The mass appeared with homogenously enhancement after injection of contrast. (C) Postoperatively, CT scan of brain revealed a large right parieto-occipital epidural hematoma. (D) Postoperatively, bone window of CT scan revealed a depressed skull fracture (white arrow) in the previous inserted site of pin.

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examination was unremarkable except for drowsy consciousness (Glasgow coma scale equal E3M5V3). Neurological examination revealed trunk ataxia, hyperreflexia of lower extremities, and present of Babinski's signs. The laboratory examination demonstrated no abnormal findings. The computed tomographic (CT) scan of brain revealed a hyperdense mass measuring 4.1 × × 4.2 × 3.1 cm in the cerebellar vermis (Fig. 1A). The mass appeared with homogenously enhancement after injection of contrast (Fig. 1B). In addition, obstructive hydrocephalus was also discovered. The lesion was approached through a suboccipital craniotomy crossing midline, after the head was secured applying a Mayfield headrest. The mass was totally removed and the dura was closed with fibrin sealant. Postoperatively, the patient was kept intubated and monitored in the intensive care unit. Approximately seven hours later, Glasgow coma scale declined from E2M5Vt to E2M1Vt and muscle strength in left limbs was significantly decreased compared to the right side. An emergent CT scan of the brain revealed a large right parieto-occipital epidural hematoma with a depressed skull fracture at the location of the previous insertion site of pin (Fig. 1C and 1D). Emergent craniotomy with evacuation of hematoma was performed. On operation, the underlying dura was intact and the bleeder from middle meningeal artery was coagulated. The profound neurological deficits recovered well postoperatively. The patient was extubated on the Day 5 and no neurological deficit was found at discharge. The histopathological examination confirmed the diagnosis of medulloblastoma.

Discussion

Acute epidural hematoma and depressed skull fracture resulting from pin headrest devices is a rare but devastating complication in the postoperative course. In a study of 6688 patients with postoperative hematomas, reported by Palmer et al., the incidence of epidural hematoma account for approximately 0.3% [2]. Another study of 1105 intracranial operations, postoperative extradural hematomas larger than 2cm comprised only 5 cases (0.5%) [3]. The postoperative epidural hematomas may develop distant from, adjacent to, or just under an operative locus and were associated with underlying coagulopathies, incomplete hemostasis of dura mater or bone, collapsed brain or abrupt change of intracranial pressure. However, none of the above cases were related to a depressed skull fracture resulting from pin headrest devices [2,3].

In the found literature, only two papers reported the same complication [1,4]. Missing pressure adjusting of pin headrest, lack of an intermediary piece, and calvarial thickness have been stated as the main cause of intraoperative skull fracture and EDH. The calvarial thickness in children and infant are thinner than that in adult, varying from 1 to 6mm [5]. In adults, most three-pin systems are tightened until 60 pounds of force are measured. However, the force applied on children and infants may result in skull penetration because of the relative thinness of the cranium, as in our case; In general, sudden lowering of intracranial volume or sudden release of ventricular cerebrospinal fluid contribute to separate the dura from the skull; if significant collecting blood accumulated in the space, further dura dissection and larger epidural clot is warranted. Our case had preceding blood clot in the epidural space due to the fracture and vessel injury, the downward extension by gravity promotes the mass effect. In a modification of the Mayfield horseshoe headrest in infants and young children, Gupta reported using the horseshoe to support the head could decrease the pin pressure to immobilize the head and no complication such as cranium perforation, cranium fracture or pin slippage, were observed [6]. The recommendation is that 5 pounds are used in children between 6 and 12 months of age; 10 pounds are used in children from 12 months to 2 years of age; 20 pounds are used in children from 2 to 5 years of age; and from 5 to 12 years of age, 30 pounds of force are used. With improvement of the conic shape of the pins, the pressure adjusting mechanism in Mayfield pin headrest, combination of horseshoe headrest, and the assessment of thickness of cranium via CT scan, the incidence of skull penetration could be reduced [1,6].

The clinical presentation of postoperative EDH and depressed skull fracture varied from altered consciousness, motor weakness or seizure. If underestimated, this complication can be devastating in the postoperative period. CT scan is considered as the best modalities for early and accurate diagnosis of EDH and depressed skull fracture. Decompressive surgery with evacuation of hematomas should be performed as soon as possible, as the treatment principle of traumatic epidural hematomas. Furthermore, the neurological outcome depends on the time interval between onset of symptoms and surgical intervention.

In conclusion, intraoperative EDH complicated by depressed skull fracture from the insertion of pin headrest is a rare but devastating complication. Pre-operative assessment of calvarial thickness via CT scan, the site of pin insertion, assistance of horseshoe headrest and adjusting force of pin fixation could reduce the risk of this incidence.

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