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Transcalvarial Herniation through a Decompressive Craniectomy Calvarial defect secondary to a Contralateral Subdural Hygroma

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Abstract

Decompressive craniectomies are lifesaving surgeries frequently done to reduce intractable raised intracranial pressure (ICP) of varied etiologies. The procedure while effective in reducing raised ICP is fraught with complications both in the short and in the long term. One such complication is an ipsilateral subdural hygroma which develops over the edematous brain under the scalp flap and adds to the morbidity of the procedure by adding pressure to the damaged brain and retarding recovery. We present an unusual case where, the subdural hygroma developed on the contralateral side and was pushing the brain out of the Calvarial bony defect. This location and action are both not documented in literature thereby making this report novel and interesting.

Keywords: Decompressive Craniectomy, Subdural Hygroma, Brain Herniation, Severe Head Injury, Syndrome of the Trephined

Introduction

Subdural hygromas are common in postoperative patients who have undergone decompressive craniectomy, as a fallout of changes in CSF flow dynamics after removal of the bone flap [1]. They usually occur over the affected hemisphere under the scalp flap or in the interhemispheric region [1,2]. Seeing the hygroma over the opposite side worsening the herniation is a first in documented history. We present our experience with this bizarre event below.

Case Report

A 35-year-old male presented to our emergency with a history of being hit by a heavy vehicle. He was drowsy yet arousable with left upper and lower limb weakness. CT scan of his brain showed him to be having an acute subdural hematoma with a burst temporal lobe, complete with mass effect and midline shift (Figure 1).

A small amount of contused brain was also visible on the opposite frontal lobe as a probable Contre-coup injury. He was also found to be COVID-19 positive. The patient was assessed and taken up for a decompressive craniectomy after obtaining the required consents from the relatives and taking the required precautions for the coronavirus pandemic.

The procedure was uneventful, and the patient gradually improved to a GCS of E4M6Vt. His post-operative scan was unremarkable and showed good decompression (Figure 2).

He was gradually weaning off the mechanical ventilator on POD3 after ensuring that no stigmata of COVID-19 existed and that the lungs were clear. The patient subsequently tested negative for the infection on POD4.

On POD 7, he dropped in sensorium to a GCS of E2M4Vt along with left sided pupillary dilatation. The decompressed site was tense and swollen. CT scan of the brain showed a large tense subdural hygroma on the contra lateral side of the brain pushing the cranial contents out through the decompressive craniectomy Calvarial defect. (Figure 3).

Such extreme Trans-Calvarial herniation, in such a short time was remarkable. The scan also showed dilated CSF spaces in the interhemispheric and fissures and along the base of the skull. Ventricles were also dilated and malformed due to the intensity of the herniation.

Explaining the risks involved, he was taken up for a burr hole and evacuation of the hygroma with placement of an external drain catheter in the subdural space to ensure no recurrence of the pressure.

The procedure was uneventful, and clear CSF was evacuated from the left side of the brain under significant pressure. Following the drainage, the swelling at decompressive site reduced. His sensorium improved to a GCS of E3M6Vt.

Tracheostomy was done in anticipation of prolonged need for mechanical ventilatory support and tracheal toileting. He was gradually weaned off the mechanical ventilator. The patient was shifted out of ICU and is currently undergoing physiotherapy and rehabilitation.

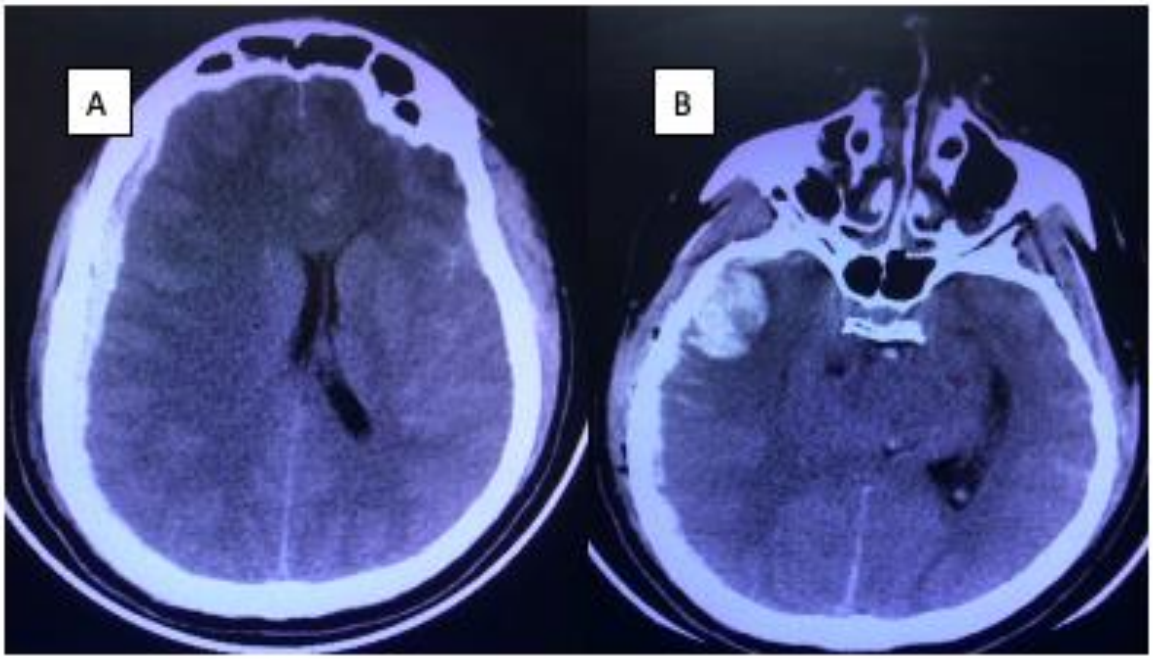

Fig 1: Axial CT scans of the brain showing a right subdural hematoma with significant mass effect and midline shift (A) caused by a burst temporal lobe seen in figure (B) Basal cisterns are absent and uncal herniation can be seen occurring.

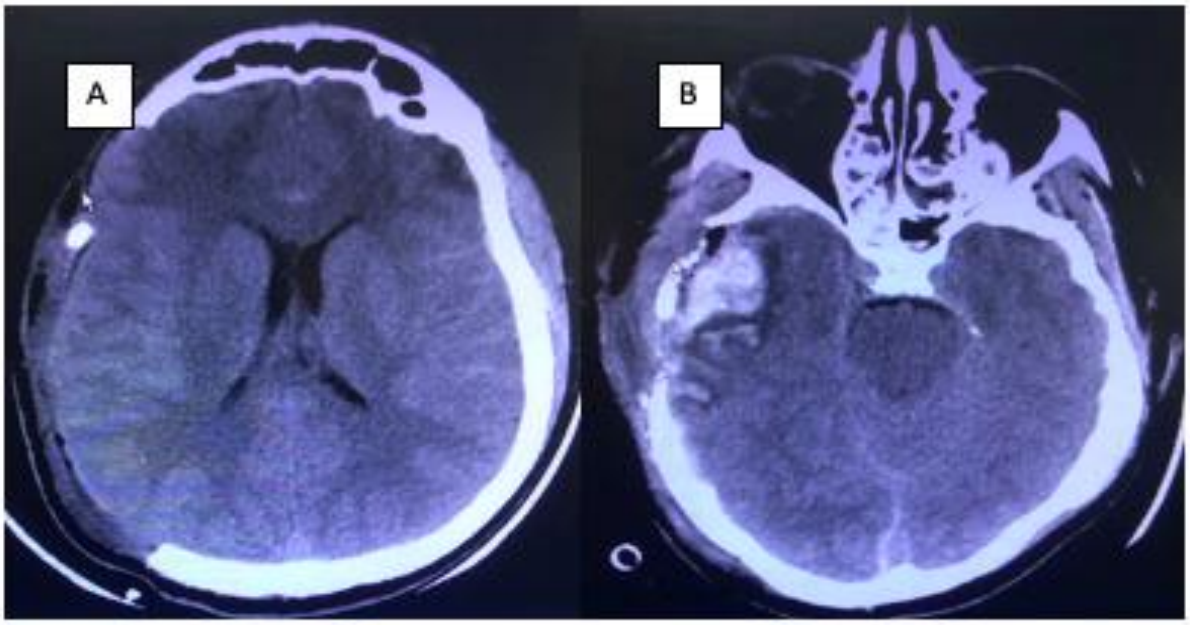

Fig 2: Axial CT scans of the brain post decompressive craniectomy POD1, which shows good expansion of the brain and resolution of the herniation (A) and the midline shift and mass effect. (B).

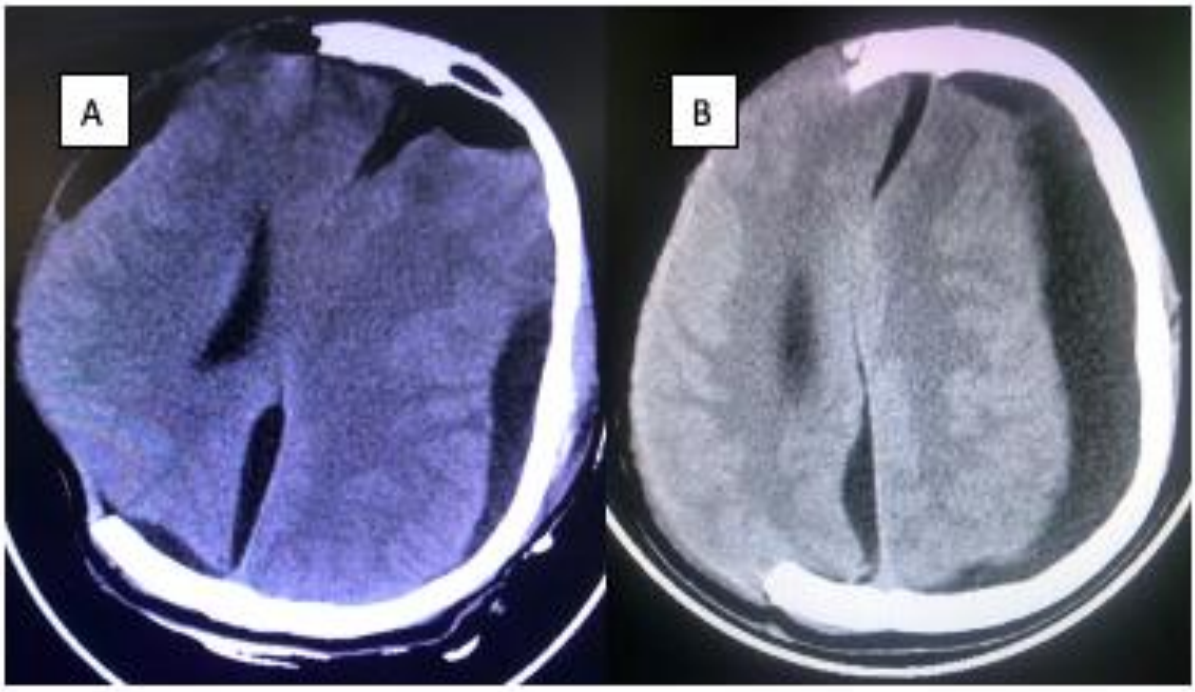

Fig 3: Axial CT scans of the brain taken on POD7, after detecting deterioration in GCS, which showed hygromas in the interhemispheric fissure and under the scalp flap, (A) but mainly on the opposite side of the cranium pushing the brain through the calvarial defect. (B)

Discussion

Subdural hygromas are known complications of decompressive craniectomies (1). The sudden loss of pressure coupled with atmospheric pressure interference causes CSF to exude out of the cells into the subarachnoid space. This CSF collection coupled with edema leads to transient worsening of the deficits of the patient. This has been referred to as the 'syndrome of the trephined'.

CSF collections are also known under the decompressive craniectomy flap and contribute to the overall morbidity of the disease [2]. It is often postulated that hygromas, especially in the interhemispheric regions are predictors for the development of post-traumatic hydrocephalus [3,4].

Our case is different as it is the first report where the hygroma is on the contralateral side, thereby not compressing the affected side of the brain, but paradoxically pushing the brain out through the calvarial bone defect. Hence this complication is worsening the mass effect and midline shift which the decompressive craniectomy was meant to solve.

Subdural hygromas are usually seen converting into chronic subdural hematomas in around 22-27% of the time [3-6], but here there was no inciting factor except for CSF pressure gradient disruptions. A small contusion was present over the opposite temporal lobe and could have theoretically contributed to the collection, but there was no acute bleed seen and the timeline was too short to declare it a Chronic Subdural Hematoma.

Conclusion

CSF flow dynamics in trauma are difficult to predict and are under constant study. The role of Subdural hygromas in predicting ventricular flow obstruction and adding to the disease burden of an already traumatized brain is still unclear [5,6]. It is hoped that clarity in the future can lead to management algorhythms that minimize secondary brain damage and improve survival.

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