Surgical management of traumatic acute subdural haematoma

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ABSTRACT

Traumatic acute subdural haematoma (ASDH) is a major clinical entity in traumatic brain injury (TBI). It acts as a space occupying lesion to increase intracranial pressure, and is often complicated by co-existing lesions, and is modified by cerebral blood flow (CBF) changes, coagulopathy, and delayed haematomas. Because of its complicated pathophysiology, the mortality of ASDH is still remaining high. In this review article, its pathophyiology, surgical treatment, and salvage ability are described.. Concerning pathophysiology, in addition to well-known initial intracranial hypertension and subsequent ischemia, or haematoma is being recognized. With regard to surgical procedure, decompressive craniectomy seem to be effective. Since Glasgow Coma Scale (GCS) scores, age, papillary reaction, and computed tomographic findings are strongly correlated to outcome.

Key words: acute subdural haematoma, traumatic brain injury, surgical management, indication, salvage ability.

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INTRODUCTION

Acute subdural haematomas (ASDH) are observed in one third of patients with severe traumatic brain injury.[1] ASDH forms between the dura and arachnoid membranes usually due to tearing of bridging veins or arterial rupture. Management of ASDH may vary from simple observation to different surgical evacuation technique. Two most frequent surgical modalities are craniotomy (CO) and decompressive craniectomy (DC). CO procedure removes bone of skull and subdural haematoma followed by replacement of original skull bone. DC also removes skull bone and haematoma, but keep the bone unclosed for possible expansion of oedematous brain tissue with or without an additional expansile duroplasty.[2]

Many studies have been reported showing effectiveness of DC for ASDH.[3,4,5,6,7,8] However, not all patients show severe postoperative brain swelling after evacuation of haematoma where theoretical benefit of DC is questionable. DC also carries disadvantage owing to lack of bone closure.[2,9,10,11] The optimal surgical modality for ASDH still remains to be clarified.

CASE PRESENTATION

A 21 years old male subjected to blast injury and he was referred to Mohammed Al-Majid Hospital in Samara about 2 hours after the injury. He has suffered a head injury with scalp wounds. On examination showed a Glasgow Coma Scale (GCS) scores of 8/15, unresponsive right pupil , left sided weakness 0/5 according to modified Rankin scale(MRs). Endotracheal tube was inserted and sent for a brain CT scan that showed a right acute subdural haematoma with a midline shift. (See figure 1A)

Resuscitation by maintaining the airways and the circulation were done. Essential laboratory investigations were done and intravenous 1 gram ceftriaxone was given. Surgical management by large right question mark shape scalp incision. A large decompressive craniectomy of the skull was made, then layers of the dura was identified and a c shape incision was made, and subdural haematoma with cortical vein bleeder was identified. Haemostasis was secured by using bipolar cattery and surgicell then haematoma was evacuated. A 7 cm vertical right paramedian incision was made in the

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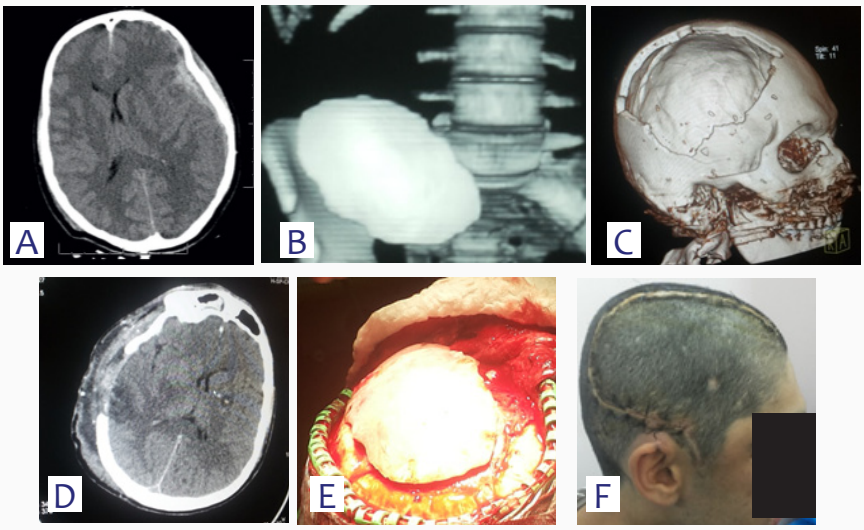

Figure 1: A: Brain CT scan shows right acute subdural haematoma with midline shift. B: skull bone flap elevated and replaced in the abdomen. C: 3D study and D: axial brain CT scan before the final surgery. E: replacement of skull bone after decortication and multiple penetration by high speed drill fixation by suturing with adjacent skull bone. F: Patient discharged home with complete recovery.

abdomen, then subcutaneous dissection has been made to place the skull bone flap. In the end, the wound was closed in layers. (Figure 1B). The patient was referred to Medical City Hospital in Baghdad where he kept for observation. A week later on, he was extubeted and discharged home conscious with a GCS of 15/15. He was kept on carbamazepine 400 mg a day and neuroAID [MLC 601] for 3 months. His muscle power was improving over the next month and he gained complete recovery after 3 months from the injury.

Six months after the injury, the patient arranged for another cranioplasty, full investigations including a brain CT scan with 3D study were done (Figure 1C & D). we incised the old abdominal scar. The skull bone flap was released while the scalp was incised with replacement of skull bone after decortication and multiple penetration by high speed drill. Fixation of the bone flap was done by suturing with adjacent skull bone and the would closed in layers (Figure 1E). Thee days later on, the patient was discharged with complete recovery (Figure 1F).

DISCUSSION

ASDH are present in approximately one third of patients with severe traumatic brain injury.[11] Despite advances in emergency medical services and surgical techniques, ASDH remains one of the most lethal of all intracranial injuries. Various surgical modality such as simple burr hole trephination, CO, and DC are used for evacuation of ASDH. On the Brain Trauma Foundation guidelines published in 2006, they recommended that ASDH with thickness greater than 10 mm, or midline shifting greater than 5 mm on CT scan should be treated surgically.[1] Mortality rates of ASDH ranges from 55% to 79% even with surgical intervention of any modality.[9]

Ransohoff[10] reported recovery rate of 40% for ASDH treated with hemicraniectomy followed by removal of haematoma. After the report, DC for ASDH has been recommended as a surgical modality of choice, and performing DC in ASDH patients seemed to be attractive.[1,4,7,8] Girotto[5] reported DC technique of adequate size, early surgery, and GCS of 6 to 8 group would contribute significantly to better outcome by reducing morbidity and mortality. Meier and Gräwe[12] reported that DC benefits on overall outcome of patients with traumatic brain injury. The rationale behind performing DC lies in control of postoperative brain swelling and overwhelming intracranial hypertension, but little is known on the degree of postoperative swelling after evacuation of haematoma. Empirical decision for DC or CO is made by the neurosurgeon based on patients' clinical status and CT findings which may be confounding unless brain swelling is noted intra-operatively after evacuation of haematoma.

The analysis of postoperative brain swelling is difficult since the postoperative CT findings or intracranial pressure measurements will vary depending on closure or opening bone flap. Different trauma setting among patients makes

randomized trial for CO and DC impossible and unethical. Nevertheless, there were several retrospective series that compared the outcome of CO and DC.[3,5,12] Woertgen[13] compared the surgical outcomes in ASDH which were not significantly different between CO and DC. They concluded that signs of herniation at presentation, and increasing age had most influence to patient outcome. So, preoperative clinical feature influenced most on outcome and DC does not seem to have a therapeutic advantage over CO in ASDH. Li[14] tried to diminish the effect of preoperative clinical status by using CRASH-CT prognostic model. Predicted outcome was calculated in 85 patients in a retrospective fashion. Favourable outcomes were observed in 45% of CO versus 42% of DC (p=0.83), but standardized morbidity ratio (observed/expected unfavourable outcome) was 0.90 for CO group and 0.75 for DC group. Hasan et al[15] has shown high proportion of functional recovery in muscle power 82% after 3 months in patients with ischemic stroke taking neuroAID [MLC601] 4tablets 3 times daily.

Our study showed good outcome in DC. Our results carry similar selection bias that neurosurgeons tend to perform DC when patients' preoperative clinical status is poor.

Subgaleal haemorrhage, herniation through the cranial defect, subdural effusion, syndrome of the trephined (sinking skin flap syndrome), and hydrocephalus are complications reported with DC.[7] In our case, the patient had severe sinking of skin flap causing difficulty in cranioplasty. DC also have disadvantage of requiring subsequent cranioplasty which harbour additional risk of complication.[2,7] Gooch et al[16] reported that immediate post-operative complication rate of cranioplasty after DC was as high as 34% which were infection, wound breakdown, intracranial haemorrhage, and bone resorption. No complications of cranioplasty in our study

CONCLUSION

Rapid transferring of patient with head injury to neurosurgical centre may improve the outcome and facilitate recovery. Although DC remains the standard of surgical modality for patients with poor clinical status, close follow up may reduce the possible complications. Updated knowledge and using of new drugs had a great role in improving patient outcome. Controlled prospective study with larger patient population is needed clarify these points

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