CASE REPORT

Severe traumatic brain injury managed with decompressive craniectomy

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Abstract

Patients with severe taumatic brain injury may develop intractable raised ICP resulting in high mortality and morbidity. This may be anticipated from the patient's clinical status and imaging findings even where intracranial monitoring is unavailable. Outcome may be improved by early and aggressive control of ICP and surgical decompressive craniectomy is increasingly advocated as necessary.

Key words: Bone storage, cranial decompression, craniectomy, cranioplasty

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Introduction

Severe traumatic brain injury (TBI) is a common cause of mortality and severe chronic morbidity especially in the young. In spite of the remarkable progress in the last three decades, the morbidity remains considerable.[1] Many of these patients present with markedly raised intracranial pressure and decompressive craniectomy has been advocated as an effective form of management.[2,3] Controversy however remains as to the outcome in terms of quality of life and two randomized trials are currently underway to evaluate the effectiveness of the procedure.[4,5] We present a case of severe traumatic brain injury with clinical and radiological evidence of raised ICP managed with decompressive craniectomy with good outcome. We advocate that in the more poorly equipped centers where sustained ICP monitoring is not easily available, early decompressive craniectomy based on CT findings with storage of bone in the abdominal wall is an effective therapeutic measure. To our knowledge no similar case has been reported in Nigeria at the time of this article.

Case Report

A 17-year-old right-handed male presented 8 hours after accidental metal injury to the head. He lost consciousness immediately. On arrival at a nearby health facility, he was noted to be bleeding from a right temporal laceration but not from any of the craniofacial orifices. He had three episodes of generalized tonic clonic seizures and had vomited once. It is uncertain what medical treatment was given before referral to the Neurosurgery center. He had no other significant past medical history.

On examination he was haemodynamically stable. His Glasgow coma score was 8/15 (E1V3M4) and he had left facial and left abducent palsy. He had left sided-hemiparesis of grade1/5. Other systems were normal. CT of the brain showed compound communuted depressed fracture of the right temporal bone with severe contusion of the underlying right cerebral hemisphere and a 10 mm midline shift [Figure 1].

An emergency right fronto-temporo-parietal decompressive craniectomy was performed. The dura was opened widely in a cruciate fashion by extending the margins of the lacerated dura The wound was debrided and the communuted

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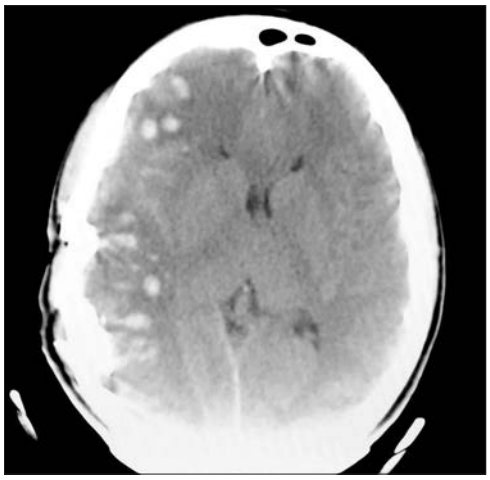

Figure 1: CT findings on admission

fragments were elevated and discarded. Dura was loosely closed using a large pericranial patch. The Craniectomy bone flap was thoroughly washed with hydrogen peroxide and warm normal saline and stored in a right paraumbilical subcutaneous pocket. Care was taken to ensure adequate skin and subcutaneous cover without any tension. The patient tolerated the procedure well.

Postoperatively he was transferred to the intensive care unit in a stable condition. His recovery was uneventful and he was discharged on the 21st postoperative day with significantly improved left hemiparesis from 1/5 on admission to 3/5. His GCS at discharge was 15 and the Glasgow outcome score was 4. The site of the decompression was still full but no longer tense. He was mobilising with support. Repeat CT of the brain showed no haematoma but a moderate dilatation of the right lateral ventricle. Cranioplasty was planned for 6-8 weeks postdecompression.

On subsequent review however, the decompression site was still full. There was no clinical evidence of infection. A repeat CT scan at this stage revealed a cystic space at the site of the previously contused brain in communication with the right lateral ventricle. Three months after the initial surgery, he had a cysto-peritoneal shunt and autologous bone cranioplasty at the same session. The procedure and recovery were uneventful and he was discharged in stable condition. At last follow-up he was fully conscious but still had a residual left hemiparesis of grade 4/5. He is awaiting formal neuropsychological assessment.

Discussion

Surgical decompression is an acceptable modality of treatment for traumatic malignant intracranial hypertension with or without associated haematoma. The benefit of this form of surgery in terms of survival is well established. [2] However, controversy persists about the quality of survival. [6] A randomized, double-blind, multicenter European trial (the rescue-ICP study) is underway and should help resolve the question.[5] It is generally agreed that surgery in these cases requires a large bony decompression and wide dural opening.[2] This practice unfortunately is not widely applied in Nigeria and other developing countries because of the difficulties associated with subsequent management of the defect. The alternative use of the more limited, wide craniotomy via a trauma flap with the bone flap allowed to float is more common. This however does not provide adequate decompression for patients with severe TBI. Studies of potential gains in cranial volume against size of craniectomy have shown that small craniectomies risk brain herniation with venous infarction at the bone margins.[2]

In our patient, a large fronto-temporo-parietal free bone flap was raised. The communuted fragments were debrided and discarded before storage of the flap in the abdominal subcutaneous pocket to reduce the risk of infection. The discarded bone meant a defect but we felt that a small defect protected under a well developed temporalis muscle was an acceptable risk compared to infection. Expansive duroplasty with pericranium is an accepted method of repairing wide dural defects and we used it in this case to create more space while providing additional protection from infection for the intracranial contents. We felt that the use of temporalis fascia was not justified, as a strong healthy temporalis was necessary to cover for the cranial defect. Many surgeons however advocate leaving the dura widely open with the brain covered with a sheath of surgicel.[2]

The storage of bone flap in abdominal pockets has been long in use.[7] Reports of serious complications including infection, skin erosion, and wound breakdown however have limited its use and alternative techniques such as titanium cranioplast and custom bone replacement have become more popular in developed countries. These techniques are expensive for developing countries. In a recent, two-center collaborative study we were able to demonstrate that careful selection of site for placement of the abdominal pocket resulted in a safe and low risk storage.[8] Other methods using autologous bone including use of fibula grafts and split cranial bones are less popular for obvious reasons and the use of polymethylmethacrylate is limited by the size of the defect. Khrisnan *et al*. reported storage of the bone flap in a subgaleal pocket on the other side of the scalp.[9] Bone flaps have also been stored in dedicated refrigerators either before autoclaving or after.[8] This was limited in our experience by difficulties with maintaining the desired temperature and by infection.

Decompressive craniectomy is still under evaluation for the management of patients with posttraumatic malignant intracranial hypertension. The results of the DECRA study suggest that clinical outcomes is worse in patients who had decompressive craniectomy but the ICP threshold was low.[10] The results of the RescueICP study is still awaited.[4] Where

facilities for monitoring intracranial pressure are not readily available, decompressive craniectomy may be considered early in the young patient with clinical and radiological evidence of raised ICP. We advocate storage of the bone flap in a subcutaneous anterior abdominal wall pocket as both biologically and economically viable alternatives to the more expensive custom bone cranioplasties.

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References

1. Valadka AB, Robertson CS. Surgery of cerebral trauma and associated critical care. Neurosurgery 2007;61(1 Suppl):203-20; discussion 220-1.
2. Hutchinson P, Timofeev I, Kirkpatrick P. Surgery for brain edema: Decompressive craniectomy. Neurosurgery Focus 2007;22:E14.
3. Schirmer CM, Ackil AA Jr, Malek AM. Decompressive Craniectomy. Neurocrit Care 2008;8:456-70.
4. Hutchinson PJ, Corteen E, Czosnyka M, Mendelow AD, Menon DK, Mitchell P, *et al.* Decompressive craniectomy in traumatic brain injury: The randomized multicenter RESCUEicp study. Acta Neurochir Suppl 2006;96:17-20.
5. Rosenfeld JV, Cooper DJ, Murray L. A multicenter prospective randomized trial of early decompressive craniectomy in patients with severe traumatic brain injury. Neurosurgery 2006;59:467-8.
6. Kakar V, Nagaria J, Kirkpatrick JP. The current status of decompressive craniectomy. Br J Neurosurg 2009;23:147-57.
7. Baldo S, Tacconi L. Effectiveness and safety of subcutaneous abdominal preservation of autologous bone flap after decompressive craniectomy: A prospective pilotstudy. World Neurosurg 2010;73:552-6.
8. Mezue WC, O'Reilly G, Ohaegbulam SC. The utility of storage of bone flaps in anterior abdominal wall pockets following Decompressive Craniectomies for severe traumatic Brain Injuries. Port Harcourt Medical Journal 2012; 6: 204-210
9. Khrisnan P, Bhattacharyya AK, Sil K, De R. Bone flap preservation after decompressive craniectomy – Experience with 55 cases. Neurol India 2006;54:291-2.
10. Cooper DJ, Rosenfeld JV, Murray L, Arabi YM, Davies AR, D'Urso P, *et al.* Decompressive craniectomy in diffuse traumatic brain injury. N Engl J Medicine 2011;364:1493-502.

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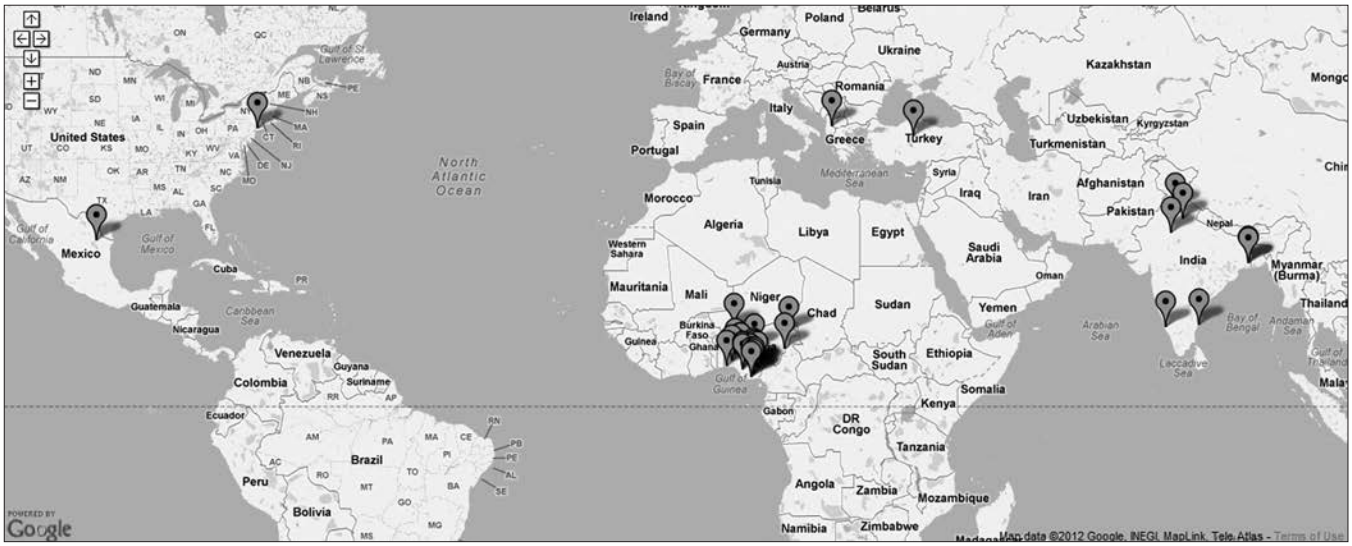

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