Split Calvarial Graft to Repair the Large Frontal Bone Defect

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Abstract The ideal reconstructive material for cranioplasty is autogenous bone, however if it is not available the use of alloplastic materials is recommended. We present a case of 26-year-male patient who sustained compound depressed fracture of the frontal bone and associated anterior cranial fossa fracture following a road traffic accident. He was managed at hospital where the fractured bone fragments were removed but recently presented with watery discharge from nose (CSF rhinorrhoea) and cosmetic deformity of forehead. We describe the utilization of autogenous local frontal bone split calvarial graft for the reconstruction of the defect.

Keywords Frontal fracture · CSF rhinorrhea · Calvaria · Graft

Introduction

It is well accepted that the ideal reconstructive material for cranioplasty is autogenous bone, however if it is not available the use of alloplastic materials is recommended [1, 2]. The necessity and advisability of using free and vascularized bone grafts in the reconstruction of small to moderate size anterior cranial fossa defects is controversial [3]. We describe the utilization of autogenous local frontal bone split calvarial graft for the reconstruction of the large post-traumatic frontal defect.

Case Report

A 26-year-male patient with head injury following a road traffic accident that happened two months back. At that time he sustained compound depressed fracture of the frontal bone and associated anterior cranial fossa fracture (Fig. 1). He was managed at a peripheral hospital where the all loose bone fragments were removed (Fig. 2). Now he presented with watery discharge from nose (CSF rhinorrhoea) and cosmetic deformity of forehead (Fig. 3). There was no history of fever, headache, vomiting, seizures or focal weakness. His general and systemic examination was normal. He was conscious, alert and oriented to time, place and person. Cranial nerves were normal except loss of smell. Motor and sensory examination was normal. There were no meningeal signs. His repeat CT scan showed large defect in the frontal bone as well as in the region of cribriform plate (Fig. 4). The patient underwent bifrontal craniotomy through a bicoronal skin flap. There was large defect in the frontal bone (Fig. 5 inset). The dural was opened and gliotic brain tissue was removed from the

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Fig. 1 CT scan showing compound depressed fracture of the frontal bone

Fig. 2 CT scan showing large bone defect after initial surgery

Fig. 3 Clinical photograph showing the mid forehead depression

Fig. 4 Intra-operative photograph showing the bone defect

cribriform plate. As the pericranium was very thin, temporalis fascia was used to cover the cribriform plate. Frontal bone defect was covered with split calvarial graft and the graft was fixed with plate and screws (Fig. 6). The

screws were covered with fascia so it will touch the brain parenchyma. CSF rhinorrhoea subsided in the immediate postoperative period. Follow-up X-rays showed good position of the calvarial graft (Fig. 7).

Fig. 5 Photograph showing the reconstructed defect with split calvarial graft

Fig. 6 Photograph showing the replaced frontal bone

Fig. 7 Follow-up x-ray showing the graft in place

Discussion

As described in the literature, the purposes of the reconstruction in present case were to cover the bone, to achieve the separation of the cranial cavity from the nasopharynx, the paranasal sinuses, and the orbit, to achieve the watertight dural reconstruction and to provide an adequate support of the brain tissue [3–6]. The available options to reconstruct the frontal bone include autogenous bone graft (particularly split-thickness calvarial bone grafts) [7], alloplastic materials (e.g. titanium mesh, hydroxyapatite cement, and prefabricated custom acrylic implants) [8] and the bioactive glass-coated fiber-reinforced composite (long-term studies are needed for use in humans) [9]. Methylmethacrylate is cheap, readily available and easy to use alloplastic material and remains the material of choice for cranioplasty [1, 10]. On the other hand with hydroxyapatite cement the long term results are disappointing [1, 11, 12]. The options to reconstruct the dural include free autografts (e.g. fascia lata and temporalis fascia) and vascularized flaps (i.e., free muscular flaps, pericranial or galeal flaps), assuming that an overlying vascular tissue will provide the long-term viability of the fascial graft [6, 13].

Conclusion

The utilization of autogenous local bone for reconstruction provides autogenous tissue, obviates second surgical intervention, donor site morbidity and is rarely rejected. In our circumstances where the finances may be a limiting factor the autogenous bone is the most appropriate [14–17].

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