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Original Research Article

Indications and Surgical Outcome of Cranial Defects Reconstruction

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ABSTRACT

Today, craniectomy is a common neurosurgical procedure that may be needed for traumatic skull fracture, tumour infiltration of the skull or for primary skull bone lesions. The goals of cranial reconstruction (cranioplasty) are to protect the underlying brain, restore aesthetics and psychological stability of the patients. The objective of this report was to review the indications and surgical outcome of reconstruction of cranial defects in our centre.

Subjects: Patients with cranial bone defects

Method: An audit of patients who had cranioplasty from July 2015 to June 2019 in our centre.

Results: Of the total twenty-five patients identified, 17 were males with an age range of 2 to 60 years. The indications for cranioplasty were post-traumatic skull defects-40% (10/25), post-craniectomy for intracranial and skull tumours-28% (7/25), fibrous dysplasia-24% (6/25), post-traumatic leptomeningeal cysts- 4%(1/25) and fronto-ethmoidal encephalocele-4% (1/25). Polymethylmethacrylate was used in 22 (88%) patients, titanium mesh in 2 cases (8%) and autogenous bone in 1 (4%) case. The overall postoperative outcome was good (acceptable to both Patients and the Surgeon) and the rates of complication was 12%, which all required re-operation; two patients for implant infection and exposure and one case of implant displacement secondary to recurrence of post-traumatic leptomeningeal cyst.

Conclusion: Numerous cranioplasties have been performed for repair of cranial defects as a result of trauma, tumour or other pathologies. The outcome was generally good with 12% morbidity all requiring re-operation recorded.

Keywords: cranial defects reconstruction, cranioplasty, craniectomy.

INTRODUCTION

Cranioplasty is a common neurosurgical procedure that involves reconstruction or recontouring of skull defects using autogenous bone or artificial materials. [1] It's a relatively safe procedure but a significant morbidity ranging from 10-40% has been reported. [2,3] The first report of successful cranioplasty was credited to J. Van Meekren in 1668 who used dog's bone to perform the procedure. [4-6] Today, craniectomy has become a common neurosurgical procedure that may be needed for traumatic skull fracture, skull osteomyelitis, intracranial or skull tumours. [3,4,7] The goals of cranial reconstruction (cranioplasty) may be simplified as cosmetic, protective and occasionally therapeutic, as in the case of syndrome of the trephined or sinking skin flap syndrome. [8-11] The proposed pathophysiology of sinking flap syndrome involves effect of atmospheric pressure on the site of skull defect with resultant increased external pressure on the vessels which would decrease blood flow in the area of large cranial defects. [4] In addition, the incidence of epilepsy is reported to be reduced after cranioplasty. [12,13] There are few clinical studies describing the indications and

clinical outcome of cranioplasty in West Africa. The objectives of this report were to describe the indications and surgical outcome of reconstruction of cranial defects in our centre.

METHOD

Medical records of patients who underwent cranioplasty at the Department of Neurosurgery, Usmanu Danfodiyo University Teaching Hospital Sokoto, Nigeria between July 2015 to June 2019 were identified. Relevant data including indications and outcome of surgery were noted and analysed.

RESULTS

Of the total twenty-five patients identified, 17 were males with an age range of 2 to 60 years. The indications for cranioplasty were post-traumatic skull defects-40% (10/25), post-craniectomy for intracranial and skull tumours-28% (7/25), fibrous dysplasia-24% (6/25), post-traumatic leptomeningeal cysts-4% (1/25) and fronto-ethmoidal encephalocele-4% (1/25). Cosmesis and brain protection from further injury were the main reasons for cranioplasty. Polymethylmethacrylate was used in 22 (88%) patients, titanium mesh in 2 cases (8%) and autogenous bone in 1 (4%) subject. The overall postoperative outcome was good (acceptable to both Patients and the Surgeon) and the rate of complication was 12%, which all required re-operation; two patients for implant infection and exposure and one case of implant displacement secondary to recurrence of post-traumatic leptomeningeal cyst.

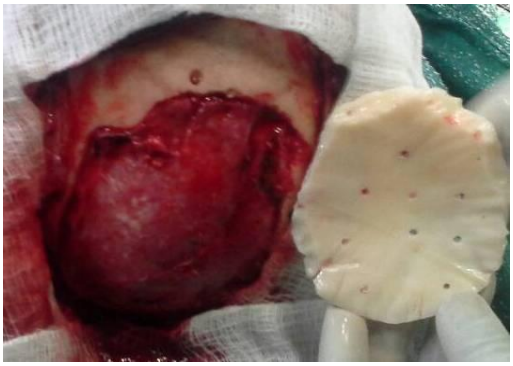

Figure 1: Polymethylmethacrylates about to be placed on Post-craniectomy defect.

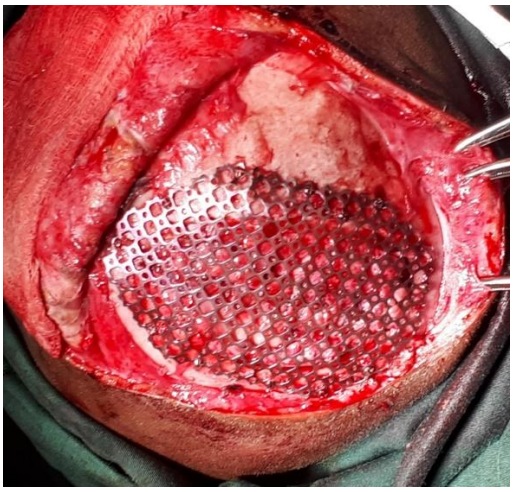

Figure 2: Intraoperative photograph shows a titanium mesh placed

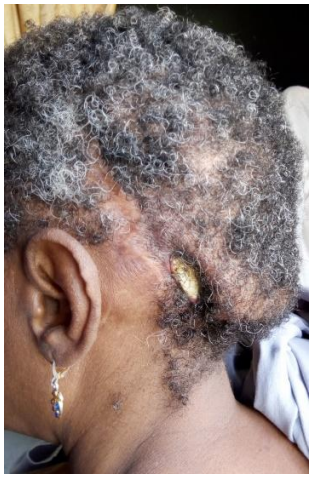

Figure 3: Exposed infected polymethylmethacrylates-acrylate implant

DISCUSSION

The goals of performing cranioplasty were to restore structure and functions of the missing skull and provide protection and supports to soft tissues. Various materials as shown in this paper can be used to achieve the goals of this fascinating neuro-reconstructive surgery.[1] The reasons for cranioplasty in the index series were to protect the underlying brain and other soft tissues as well as achieve an acceptable cosmesis. We did not experience any case of sinking flap syndrome. Trauma as in the present study remains the most common preceding pathology in patients who had cranioplasty. [3,7] In head trauma with comminuted skull fracture a significant debridement of broken pieces of bone would leave a defect that will require cranioplasty

when patients survive. Management of intracranial tumour such as meningioma or skull tumour may require extensive skull excision thereby creating a defect that would need reconstruction. Posttraumatic leptomeningeal cyst though rare, is one of the conditions that may warrant cranioplasty. We managed a case of fronto-ethmoidal encephalocele that left a wide defect which was closed using a piece of bone harvested from patient's parietal eminence.

Our series showed a relatively good outcome with complications rate of 12%. Our complication and re-operation rates were 12%, which was lower than reports of other studies. [14,15] Infections necessitating removal of implant was also reported by other Authors. [16,17] The difference in rates of complication and re-operation might be attributed to fewer sample size in our study compared to previous studies.

CONCLUSION

Numerous cranioplasties have been performed for repair of cranial defects as a result of trauma, tumour or other pathologies. The outcome was generally good with 12% morbidity all requiring re-operation recorded.

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