Case Report

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Rehabilitation of an Acquired Skull Defect Using Custom Made Titanium Cranial Prosthesis: A Case Report

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Abstract

Cranial defects may occur from congenital malformations, trauma, or a disease. Such defects will influence both the physical and mental state of the patient. Management of the skull defect is necessary to reduce the patient anxiety and protect the brain tissue underneath. Obtaining good esthetic result during cranioplasty is often challenging. Several materials are being used for the cranioplasty procedure. Of the several materials used to perform cranioplasty, methyl methacrylate, and titanium have remained as the most viable alternatives. Cranioplasty can be performed using different materials and techniques. This article illustrates a case report of rehabilitation of a patient with a skull defect using a titanium cranial prosthesis.

Key words: Cranial implant, Cranioplasty, Skull defects, Titanium cranial implant

INTRODUCTION

Cranial defects can occur from congenital malformations, infection, trauma, and pathological tumors. The surgical management and prosthetic rehabilitation of an acquired skull defect are a challenge to the practitioner. Rehabilitation of cranial defect is essential to minimize patient apprehension, protect the underlying brain, provide pain relief at the site, and improve esthetics.[1,2] This article presents the rehabilitation of a patient with an acquired skull defect using a custom made titanium implant.

CASE REPORT

A 27-year-old male patient reported to the Department of Prosthodontics, Government Dental College, Trivandrum, with an acquired skull defect following a road traffic accident. The patient was referred from the Department of Neurosurgery, Government Medical College, Trivandrum following a decompressive craniectomy. On examination, a skull defect of 7 cm × 5 cm was present in the frontal area of the skull (Figure 1). It was decided to fabricate a titanium cranial prosthesis for rehabilitating the skull defect.

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Impression Procedure

The construction of cranial prosthesis includes various stages such as moulage impression and working cast fabrication, sculpture and making of the wax pattern, mold fabrication, and processing of the prosthesis.[2]

A marking was made 3-4 mm beyond the outermost borders of the cranial defect using an indelible pen. The wax was adapted to the defect area to act as a tray for the impression material. A lightly mixed alginate impression material was then poured onto the defect area carefully without trapping air. After placing cotton tufts onto the setting impression material, a second pour of lightly mixed Plaster of Paris was placed over it to provide a rigid support to the impression material (Figures 2 and 3). The impression obtained was evaluated for any voids or inaccuracies (Figure 4). Type-III dental stone was mixed and poured into the alginate impression to obtain the cast. The border lines marked were transferred to the cast.

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Figure 1: Cranial defect in the frontal part of skull

Figure 3: Thin mixture of Plaster of Paris placed over the impression

Figure 2: Cotton tufts placed over the hydrocolloid impression while it sets

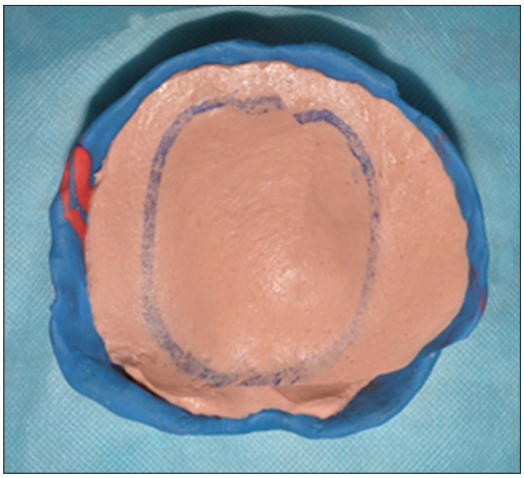

Figure 4: Impression of the cranial defect

Cranial Prosthesis Fabrication

The design of the prosthesis was discussed with the neurosurgeon, and the wax pattern was fabricated following the contours of the skull. The patient was recalled for a try-in procedure to evaluate the accurate fit of the wax pattern along the margins (Figure 5). A titanium cranial prosthesis was fabricated from the wax pattern (Jayon Implants Pvt Ltd. Lab, Palakkad, Kerala) (Figure 6). Holes of 2 mm dimensions were drilled onto the surface of the titanium prosthesis to prevent the development of epidural hematoma, and allow for ingrowth of fibrous connective tissue to assist in stabilization. Furthermore, the holes help to secure the prosthesis to the bony defect.[3]

Surgical Placement of Cranial Implant

Reflection of the surgical area was done to expose the margins of the defect. The cranial prosthesis was adjusted with a trimmer so as to correctly adapt over the edges of the defect (Figure 7). Titanium screws were used to secure the prosthesis into the exact position. The suction drain placed soon after the surgical procedure was removed on the 2nd day. Post-operative care instructions were given, and follow-up visits were scheduled. During the follow-up visit, the esthetic results were observed to be satisfactory (Figure 8).

DISCUSSION

Obtaining good esthetic result during cranioplasty is often challenging. Several materials are being used for the cranioplasty procedure. Of the several materials used to perform cranioplasty, methyl methacrylate and titanium have remained as the most viable alternatives.[4] Compared to methyl methacrylate, titanium is expensive and difficult to pre-fabricate. However, methyl methacrylate can cause exothermic reactions, which may damage the surrounding tissues and lead to subgaleal exudative fluid and infection.[5,6] Titanium has low modulus of elasticity, low density, and a very low rate of corrosion. It is non-toxic, elicits no inflammatory reaction and has an infection rate of under 2%.[7-9] Although computer-aided design-computer-aided manufacturing generated titanium cranial prostheses have been introduced,[10,11] patients may not give consent due to economic reasons.

Figure 5: Try-in of the wax pattern

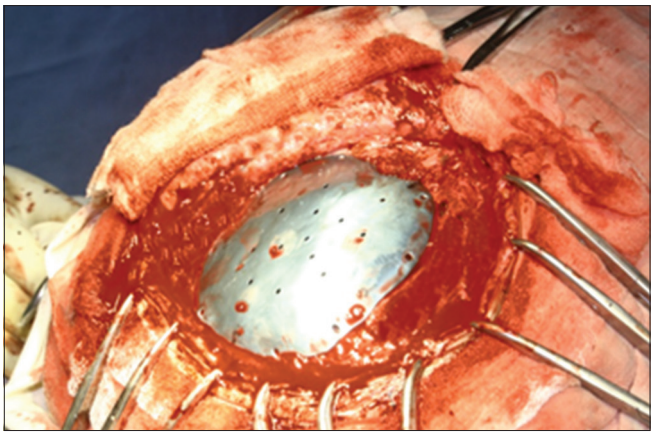

Figure 7: Surgical placement of cranial prosthesis

Figure 6: Titanium cranial prosthesis

Figure 8: Post-operative result after 3 weeks

CONCLUSION

Prefabricated cranial prostheses simplify the cranioplasty procedure by decreasing the time required for adjustment of the prosthesis during the surgery. Although prefabricated poly-methyl methacrylate prostheses are inexpensive, titanium is generally opted due to its non-corrosive nature, low density and decreased risk of infection. This case report describes the rehabilitation of a person with an acquired skull defect using a custom made titanium cranial prosthesis.

REFERENCES

1. Beumer J 3rd, Firtell DN, Curtis TA. Current concepts in cranioplasty. J Prosthet Dent 1979;42:67-77.
2. Martin JW, Ganz SD, King GE, Jacob RF, Kramer DC. Cranial implant modification. J Prosthet Dent 1984;52:414-6.
3. Beumer J IIIrd, Curtis TA, Marunick MT. Maxillofacial Rehabilitation Prosthodontic and Surgical Considerations. St. Louis: Ishiyaku EuroAmerica; 1996. p. 455-77.
4. Prolo DJ, Oklund SA. The use of bone grafts and alloplastic materials in cranioplasty. Clin Orthop Relat Res 1991:270-8.
5. Maniscalco JE, Garcia-Bengochea F. Cranioplasty: A method of prefabricating alloplastic plates. Surg Neurol 1974;2:339-41.
6. van Gool AV. Preformed polymethylmethacrylate cranioplasties: Report of 45 cases. J Maxillofac Surg 1985;13:2-8.
7. Blake GB, MacFarlane MR, Hinton JW. Titanium in reconstructive surgery of the skull and face. Br J Plast Surg 1990;43:528-35.
8. Eufinger H, Wehmöller M, Harders A, Heuser L. Prefabricated prostheses for the reconstruction of skull defects. Int J Oral Maxillofac Surg 1995;24:104-10.
9. Joffe JM, Aghabeigi B, Davies EH, Harris M. A retrospective study of 66 titanium cranioplasties. Br J Oral Maxillofac Surg 1993;31:144-8.
10. Eppley BL. Craniofacial reconstruction with computer-generated HTR patient-matched implants: Use in primary bony tumor excision. J Craniofac Surg 2002;13:650-7.
11. Kasprzak P, Tomaszewski G, Kotwica Z, Kwinta B, Zwolinski J. Reconstruction of cranial defects with individually formed cranial prostheses made of polypropylene polyester knitwear: An analysis of 48 consecutive patients. J Neurotrauma 2012;29:1084-9.

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