



ORIGINAL RESEARCH PAPER

Plastic Surgery

FLAP COVER FOR EXPOSED TITANIUM IMPLANT POST CRANIOPLASTY WITHOUT REMOVING: TWO CASE REPORTS

KEY WORDS: Scalp Defect, Exposed Implant, Cranioplasty, Transposition Flap

Dr. Harish Kumar Sharma

Consultant & Professor, Department Of Burns, Plastic & Maxillofacial Surgery New Delhi, India.

Dr. Nupur Aggarwal*

M.Ch. Senior Resident, Department Of Burns, Plastic & Maxillofacial Surgery VMMC & Safdarjung Hospital, New Delhi, India. *Corresponding Author

Dr. Kshiteej Dhull

M.Ch. Senior Resident, Department Of Burns, Plastic & Maxillofacial Surgery New Delhi, India.

ABSTRACT

Scalp skin flap complications after decompressive craniectomy and cranioplasty exposing the underlying skull implant is a common case scenario being referred to plastic surgery for management. Titanium implants being strong, rigid and lightweight are most commonly used. Removal of the implant, skin closure and later a second cranioplasty has been the usual course of action for managing exposed infected implants. Here, we report two case scenarios with exposed titanium implant after cranioplasty due to scalp skin flap necrosis managed by covering the implant and exposed scalp bone with local scalp transposition flap without removing the implant. We experienced good clinical outcome with good wound healing and no further complications.

INTRODUCTION

Decompressive craniectomy is a commonly performed neurosurgical procedure to reduce intracranial pressure following head trauma or due to any space occupying lesion of the brain. It is further followed by cranioplasty to cover the skull defect and protect the underlying brain parenchyma with good cosmesis. Brain calvarial autografts can be used to cover the defect or implants made of Polymethylmethacrylate (PMMA), titanium meshes, three-dimensional modeled titanium, and polyetheretherketone (PEEK) can be used in case of non-availability of autografts due to comminuted fracture or infected calvarial bone.⁽¹⁾

Titanium being hard, rigid, strong, light, resistant to infection and biologically inert is increasingly being preferred for cranioplasty, with every surgeon not being comfortable with harvesting of autograft. But the surgery is not without complications with upto 30% incidence of headache, infection, poor cosmesis and seizures has been reported. An infection rate of 3-15% has been reported.⁽²⁾ Compromised scalp vascularity due to previous insults and inflammatory foreign body reaction further lead to scalp flap necrosis and dehiscence. Re-operation, debridement, plate removal and primary closure/ flap cover under antibiotic cover is the usual line of management.

Here we bring two case scenarios with exposed titanium mesh implant post cranioplasty managed without removal of titanium implant but by covering it with local scalp transposition flap under antibiotic cover.

Case 1

A 24-year-old male met with a road traffic accident and sustained head injury in May 2018. He was treated in a private hospital and was diagnosed with Skull base fracture and frontal bone fracture. Patient underwent right frontal craniotomy and was doing fine in immediate post-operative period and first few months of follow up. However, patient developed complaint of wound over site of craniotomy with pus discharge after 7 months post-surgery. Patient was referred to Neurosurgery department of our institution for further management. He underwent wound debridement and lavage followed by right frontal cranioplasty using titanium mesh in January, 2019 under neurosurgery. However, patient developed wound gape with exposure of implant one month after surgery and was referred to our

department of plastic surgery for further management of wound with exposed implant to provide cover. Patient was started on antibiotics for 6 weeks. On examination patient had exposed titanium mesh implant on right side frontal region with wound of about 4x4 cm (fig 1). Patient was planned for local transposition flap cover after wound debridement and lavage. In April 2019, after debridement of raw area, thorough lavage was given followed by marking of local transposition flap by planning in reverse. The flap was raised in sub-galeal plane and was transposed to cover the exposed implant and sutured to wound margins over a drain (fig 2). Donor site was covered with split-thickness graft. The post-operative period was uneventful with drain being removed on post-operative day three. The wound healed well on follow up with no further complaint of discharge wound dehiscence or flap necrosis (fig3).



Figure 1



Figure 2

Figure 3

Case 2

Another similar case of 34-year-old male presented to emergency of our institution after meeting with a road traffic accident. Patient underwent decompressive craniectomy in view of fronto-parietal fracture with underlying haemorrhage in September 2019. Patient underwent cranioplasty with titanium implant for skull defect one month after surgery. However, patient developed blackening and necrosis of skin flap exposing underlying bone in fronto-parietal region with infection and slight exposure of implant (fig 4). Patient was referred to plastic surgery for wound management. Patient was started on antibiotic cover for 6 weeks and was again planned for wound debridement, lavage and local transposition flap cover. In February 2019, wound was debrided followed by thorough lavage with skin margins over implant being freshened and closed primarily. The rest exposed bone was covered using large local transposition flap (fig 5) with donor site being grafted. Post-operative period was uneventful for this patient with good wound healing and no further complications.



Figure 4



Figure 5

Discussion

Infection and scalp skin flap necrosis is now a well-known complication following decompressive craniectomy and cranioplasty. However, management options and methods of preventing such complications have limited discussion in the literature. The most common line of management followed being administration of antibiotics, removal of the implant followed by repeat cranioplasty later to avoid complications of exposed brain parenchyma. Here we have reported two cases with exposed titanium implant post cranioplasty managed successfully with antibiotics, wound debridement and local scalp transposition flap cover for exposed implant with good wound healing.

Traumatic Brain Injury associated with contusions, haematomas and cerebral edema is the most common indication for decompressive craniectomy.⁽³⁾ To avoid wound complications of cranioplasty, it is recommended to have minimum time gap of 3 months after decompressive craniectomy before performing cranioplasty.⁽³⁾ This decreases the chances of nosocomial infections allowing commensals to replace the resident flora. Prior surgical insults to scalp skin and inflammation further compromise the vascularity of the scalp skin. Also, micro-organisms can adhere to alloegenous bone implants and form a biofilm, further hindering penetration of antibiotics and phagocytes to combat infection which makes implant removal necessary sometimes.^(3,4) So a detailed analysis of case scenario is needed before choosing a suitable management option. In our case scenarios, patients with exposed scalp implant after cranioplasty with mild discharge were managed successfully by giving antibiotic cover for 6 weeks and daily dressings to control infection. This was followed by local transposition flap from surrounding scalp tissue to cover the exposed titanium implant without any need to remove the implant. On follow up, patient showed satisfactory wound healing with no further wound complications or implant exposure. Hence, our case report highlights that cases of mild infection with exposed

scalp implant and adequate surrounding tissue for cover can be managed conservatively by our technique without any need to remove the implant. It saves the need for revision surgery and second implant cost.

Carefully planning the scalp incisions for craniectomy and cranioplasty by neurosurgeon in conjunction with plastic surgeon, taking care of preventing trauma to major scalp vessels, maintains viability of scalp skin.⁽¹⁾ Use of autogenous bone graft is preferable to prevent foreign body complications of implants. Most of studies so far, are unable to find a strong correlation of factors like size of skull defect, operative time interval from craniectomy, age, gender etc. with complications of decompressive craniectomy and cranioplasty.^(1,2,3,5) It is mostly the surgeon technique taking care of vascularity of skin flaps, anatomy of incisions with respect to blood supply and avoidance of closure under tension which results in good clinical outcomes.

In this era of antibiotics, cases with implant exposure due to skin dehiscence, flap necrosis or retraction, minimal infection should be managed early for wound cover with help of plastic surgeon without the need for implant removal. This prevents need for repeat cranioplasty later for parenchymal cover in case implant is removed. Cases with adequate vascular scalp tissue in vicinity of exposed implant can be successfully managed with subgaleal transposition flaps without any tension. Local vascularized calvarial flaps have also been successfully used to cover exposed scalp implant after cranioplasty.⁽⁶⁾ For larger defects free Lattissimus dorsi flap, anterolateral thigh flap or parascapular flaps can be used. One stage Reconstruction of infected cranial defects using titanium mesh plate enclosed in omental flap has been successfully done.⁽⁷⁾ Omentum not only obliterates the dead space but also its rich vascular and lymphatic supply helps combat infection. However, grossly infected cases need removal of the implant, wound debridement, skin flap cover and later revision cranioplasty.

CONCLUSION

The surgeons must understand the need for meticulous planning and execution of surgical technique of cranioplasty to avoid wound complications and exposure of implant. Titanium scalp implant if exposed can be managed successfully with local scalp flaps where adequate local healthy tissue is present in early phases of exposure before frank infection sets in. Such procedures are simpler and more cost-effective over free flaps. Further need for removal of costly implant and later repeat surgery is avoided. Larger case series on this subject is needed to further affirm our findings.

REFERENCES

1. Di Rienzo A, Pangrazi PP, Riccio M, Colasanti R, Ghetti I, Iacoangeli M. Skin flap complications after decompressive craniectomy and cranioplasty: Proposal of classification and treatment options. *Surg Neurol Int.* 2016;7: S737-45.
2. Hill C, Luoma A, Wilson S, Kitchen N. Titanium cranioplasty and the prediction of complications. *British Journal of Neurosurgery.* December 2012; 26(6): 832-837.
3. Chaturvedi J, Botta R, Prabhuraj A et al. Complications of cranioplasty after decompressive craniectomy for traumatic brain injury. *British Journal of Neurosurgery.* 2015; Early Online: 1-5.
4. Mikami T, Miyata K, Komatsu K et al. Exposure of titanium implants after cranioplasty: a matter of long-term consequences. *Interdisciplinary Neurosurgery: Advanced Techniques and Case Management.* 2017.
5. Reddy S, Khalifian S, Flores J et al. Clinical Outcomes in Cranioplasty: Risk Factors and Choice of Reconstructive Material. *Plast. Reconstr. Surg.* 2014; 133:864.
6. Takumi I, Akimoto M. One-stage reconstruction using a vascularized calvarial flap for intractable scalp ulcers in relation with cranial implants without removing the whole prosthesis. *Neurosurg Rev.* 2009; 32:363-368.
7. Asai S, Kamei Y, Torii S. One-Stage Reconstruction of Infected Cranial Defects Using a Titanium Mesh Plate Enclosed in an Omental Flap. *Ann Plast Surg.* 2004; 52: 144-147.