

Avascular necrosis of skin flap post titanium mesh cranioplasty



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Submission: 17-12-2023

Revision: 28-02-2024

Publication: 01-04-2024

ABSTRACT

Cranioplasty, the surgical restoration of cranial defects, has been a crucial procedure in neurosurgery for decades. Titanium mesh has emerged as a popular choice for cranial reconstruction due to biocompatibility and ability to conform the patient's unique cranial contours. While generally considered safe, titanium mesh cranioplasty is not without complications. This case report presents a challenging and atypical scenario of a patient who developed flap necrosis following titanium mesh cranioplasty. We aim to highlight the complexity of managing such cases and the importance of timely diagnosis and intervention.

Key words: Avascular necrosis; Titanium mesh cranioplasty; Skin Grafting

Access this article online

Website:

<http://nepjol.info/index.php/AJMS>

DOI: 10.3126/ajms.v15i4.60766

E-ISSN: 2091-0576

P-ISSN: 2467-9100

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INTRODUCTION

Full-thickness cranial bone defects commonly occur after head trauma or infection; repair by solid cranioplasty using autogenous or alloplastic materials is usually warranted for protection and aesthetics.¹ Although cranioplasty with alloplastic bio-materials is less invasive and simpler than autografting, allografting shows a higher rate of complications, especially for patients who have experienced complex trauma or those who undergo repeated surgery or radiation therapy.² Of all the complications, implant exposure is the most common complication of cranioplasty, affecting up to 9.6% of patients.³ This report presents the case of a patient-operated case of corpus callosal grade 3 glioma with infiltration to the left frontal bone, avascular necrosis of the skin, and exposed titanium mesh. To treat the skin defect with mesh exposure, a rotational skin flap and full-thickness skin grafting were done.

The study was approved by the ethics committee of Gajra Raja Medical College, Gwalior, India, number (13437–61), dated 18/05/23 and the patient provided written informed consent for the publication and use of his images.

CASE PRESENTATION

A 24-year-old male was brought to our neurosurgery department with a history of headaches in the forehead region for 6 months. The patient also had 4–5 episodes of abnormal body movements for 7 days. Patient complained of multiple episodes of vomiting for 2 days with a history of altered sensorium since 1 day. He doesn't have any known comorbidities and was on and off painkillers for headaches. On presentation, he was in a postictal state. His pulse was 104/min, BP 100/70 mmHg, respiratory rate of 26/min, and oxygen saturation of 98% in room air. On

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Figure 1: Pre-operative image

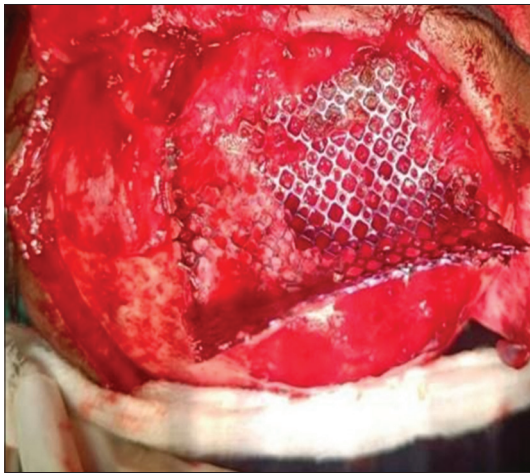


Figure 2: Intraoperative image



Figure 3: Post-operative images of primary flap repair and skin grafting

systemic examination, bilateral lung field air entry is equal to per abdomen softness. On neurological examination, the patient's Glasgow coma scale was conscious, confused, and obeying commands. The pupil was bilateral, normal size,

and normal reactive with an extensor plantar exaggerated reflex in view of the postictal state. The patient was managed on antiepileptics (injections of phenytoin and levetiracetam) and injections of mannitol and dexamethasone. After stabilization, magnetic resonance imaging of the brain was done, suggesting a corpus callosal grade 3 glioma with infiltration into the left frontal bone on treatment patient initially underwent a left frontal trephine craniotomy with an excision of space-occupying lesion and a left pericranium deroofing done on January 07, 2020. After that, the patient underwent a re-exploration of the wound with a titanium mesh cranioplasty over the left frontal bone defect done on November 02, 2022. He was closely monitored in the intensive care unit for several weeks following the craniotomy. He showed slow but steady improvements in his neurological status. He underwent rehabilitation to regain his motor and cognitive functions. Titanium Mesh Cranioplasty: On November 02, 2022, the patient underwent a re-exploration of the wound and a titanium mesh cranioplasty over the left frontal bone defect. A titanium mesh implant was used to cover the missing part of the skull. In the months following the cranioplasty, he began experiencing headaches and localized pain over the site of the titanium mesh, implant. Unfortunately, his condition worsened as he developed a deep-seated infection around the titanium mesh implant due to a secondary complication of avascular necrosis followed by bacterial contamination (Figure 1). To address the infection and avascular necrosis, sonu required surgical intervention. On July 22, 2023, he underwent a revision cranioplasty procedure. During this surgery, the infected titanium mesh implant was removed (Figure 2), and the infected bone tissue was debrided (surgically cleaned). To treat the avascular necrosis, a rotational occipital scalp flap was taken to cover the area, and the remaining area was covered with a split-thickness skin graft over pericranial tissue (Figure 3). Following the revision cranioplasty, he was placed on a course of intravenous antibiotics to clear the infection. He was also monitored closely for any signs of complications. Showing black patches of necrosed overlying skin with pus discharge.

DISCUSSION

Several factors contributed to the avascular flap necrosis⁴ observed in this case: Vascular Damage: Thermal cauterization, while commonly used for hemostasis, carries the risk of damaging blood vessels supplying the skin flap.⁵ Careful identification and preservation of these vessels are essential to preventing ischemic complications.⁶ In this particular case, there is a possibility of damage to the supratrochlear, supraorbital, and zygomaticotemporal arteries of the scalp. Thinning of Skin Flap: The use of a thin skin flap can compromise its vascularity, making it more susceptible to ischemic necrosis.⁷ In such cases,

alternative flap options with a better blood supply should be considered. The surgical approach plays a crucial role in minimizing the risk of vascular injury. Surgeons should be vigilant and consider alternative hemostatic techniques to avoid vascular damage during cranioplasty procedures. Patients with a history of vascular disease, smoking, or diabetes have compromised vascular supply with an increased risk of flap necrosis.

Preventive strategies to minimize the occurrence of avascular flap necrosis after meshplasty following preventive strategies should be considered. Preoperative evaluation of patients' vascular status to identify potential risk factors for compromised blood supply, and during surgical procedures, care should be taken to preserve the critical blood supply to the skin flap. Minimize the use of thermal cautery for hemostasis in areas close to critical blood vessels.

CONCLUSION

Avascular flap necrosis is a severe complication following titanium mesh cranioplasty. This case report highlights the importance of careful surgical technique, vascular preservation, and patient-specific risk assessment to prevent such complications. Surgeons should be aware of the potential risk factors and employ appropriate preventive strategies to ensure better outcomes for patients undergoing cranioplasty procedures. Further research and studies are warranted to validate these preventive measures and improve patient outcomes in the future.

ACKNOWLEDGMENT

None.

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Author's Contributions:

HDP- Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation and submission of article; **AS**- Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision, design of study, statistical analysis and interpretation, review manuscript; **VK**- Review manuscript; **SS**- Literature survey and preparation of figures; **AS**- Coordination and manuscript revision.

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Source of Support: Nil, **Conflicts of Interest:** None declared.