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Evaluating the Bicoronal Incision Approach in Frontal Bone Fracture Management Using Titanium Mesh and Miniplates: An Original Research Study

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Abstract

Background: Frontal bone fractures, often resulting from high-impact trauma, pose significant challenges in craniofacial reconstruction. The bicoronal incision approach, combined with titanium mesh and miniplates, has been utilized for effective management of such fractures.

Objective: To assess the efficacy, aesthetic outcomes, and complication rates associated with the bicoronal incision approach in the surgical management of frontal bone fractures using titanium mesh and miniplates.

Methods: A prospective study was conducted involving patients presenting with frontal bone fractures requiring surgical intervention. All patients underwent open reduction and internal fixation (ORIF) via a bicoronal incision, utilizing titanium mesh and miniplates for reconstruction. Postoperative outcomes were evaluated based on aesthetic results, functional recovery, and incidence of complications over a 6-month follow-up period.

Results: The study included 10 patients (9 males, 1 females) aged between 20 and 65 years. The majority of fractures resulted from road traffic accidents. All patients demonstrated satisfactory aesthetic outcomes with minimal scarring. Functional recovery, including mastication and occlusion, was rated as excellent in 83% of cases. No major complications, such as infection, CSF leak or implant rejection, were observed.

Conclusion: The bicoronal incision approach, when combined with titanium mesh and miniplates, offers a

reliable and effective method for the management of frontal bone fractures, ensuring favorable aesthetic and functional outcomes with a low complication rate.

Keywords: Frontal bone fracture, Bicoronal Incision, Titanium mesh, ORIF.

Introduction

Frontal bone fractures constitute a significant portion of craniofacial injuries, often resulting from high-energy impacts such as motor vehicle accidents and assaults, and require meticulous anatomical reconstruction to restore both form and function. The bicoronal approach remains the gold standard for optimal exposure. This study evaluates the use of bicoronal incision with titanium mesh and miniplates for rigid fixation and contour restoration. The bicoronal incision provides extensive exposure of the frontal bone, facilitating precise reduction and fixation. Titanium mesh and miniplates have emerged as preferred materials for reconstruction due to their biocompatibility and structural integrity.

Materials and Methods

Study Design: Prospective observational study.

Inclusion Criteria

- Patients aged 20–65 years with isolated or comminuted frontal bone fractures requiring surgical intervention.

Exclusion Criteria

- Patients with concomitant severe cranial injuries contraindicating surgery.

Surgical Technique

Under general anesthesia, a zig-zag bicoronal incision was made (Figure A). The scalp and pericranial flap were elevated to expose the fracture site. Comminuted bone fragments were identified and realigned. Miniplates were used to fix smaller bone fragments (Figure B). A titanium mesh was contoured and placed over the defect to provide additional stability and restore contour (Figure C). The flap was repositioned, and the wound closed in layers.

Figure 1: Preoperative marking showing zig-zag bicoronal incision line.

Figure 2: Intraoperative image showing miniplate fixation of comminuted frontal bone

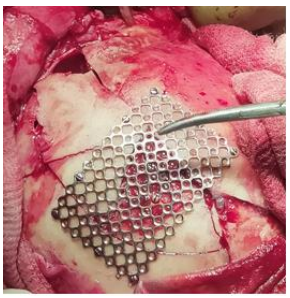

Figure 3: Placement of titanium mesh over defect after realignment.

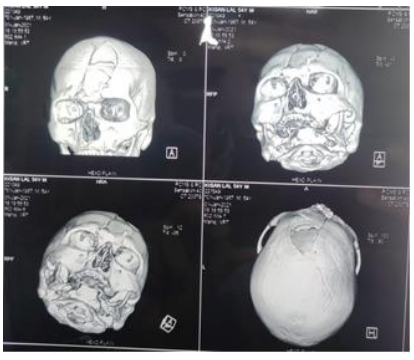

Figure 4: Preoperative CT scan showing extent of fracture and depression.

Postoperative Evaluation

Patients were assessed at 1 week, 1 month, 3 months, and 6 months post-surgery for:

- Aesthetic outcome (scar visibility, forehead contour).
- Functional recovery (mastication, occlusion).
- Complications (infection, implant exposure).

Results

Demographics

- Total patients: 10
- Gender: 9 males, 1 female
- Age range: 20–65 years
- Etiology: Road traffic accidents (82%), assaults (18%)

Outcomes

- Aesthetic: All patients reported satisfaction with minimal scarring.
- Functional: 83% rated mastication and occlusion as excellent; 17% as good.

Complications: No major complications observed.

Discussion

The bicoronal incision offers extensive exposure while preserving neurovascular structures allowing for precise reduction and fixation of fractures. Titanium mesh is advantageous due to its biocompatibility, ease of contouring, structural support and long-term stability.

Our study corroborates existing literature, demonstrating favorable outcomes with this approach.

Conclusion

Employing a bicoronal incision in the surgical management of frontal bone fractures, combined with titanium mesh and miniplates, results in satisfactory aesthetic and functional outcomes with minimal complications. This technique should be considered a standard approach in appropriate clinical scenarios.

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