IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 25, Issue 6 Ser. 4 (June. 2026), PP 13-18
www.iosrjournals.org

Transantral Open Reduction of Orbital Floor Blowout Fracture Using Foley Catheter Balloon: A Case Report

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Abstract
Orbital floor blowout fractures are a common sequela of mid-facial trauma, often resulting from high-velocity impacts such as road traffic accidents. The management of such fractures poses a significant surgical challenge, particularly in resource-limited settings where costly implants and sophisticated instrumentation may not be readily available. We report a case of a 19-year-old male who sustained an orbital floor blowout fracture following a road traffic accident (RTA) involving a motorcycle and an autorickshaw near Mangalore. The patient was managed surgically under general anesthesia via a trans antral approach using an intraoral Caldwell-Luc window, with endoscopic visualization of the orbital floor and reduction achieved using a Foley catheter balloon as an improvised support scaffold. The catheter balloon was left in situ for three weeks to maintain the reduced orbital floor until bony consolidation occurred. Preoperative computed tomography (CT) and postoperative cone beam computed tomography (CBCT) confirmed satisfactory fracture reduction. This case highlights the Foley catheter as a cost-effective, readily available, and reliable alternative to conventional orbital floor implants in appropriate clinical scenarios.

Keywords: *Orbital floor fracture, blowout fracture, Foley catheter, trans antral approach, Caldwell-Luc, open reduction, maxillofacial trauma, road traffic accident*

Date of Submission: 06-06-2026 Date of Acceptance: 17-06-2026

I. INTRODUCTION

Orbital floor blowout fractures are among the most frequently encountered injuries in maxillofacial trauma, commonly resulting from road traffic accidents, assault, or sports-related injuries. The mechanism of injury typically involves a sudden increase in intraorbital pressure transmitted to the thin orbital floor (lamina papyracea of the maxilla), causing it to fracture inferiorly into the maxillary sinus. Clinical manifestations include periorbital ecchymosis, enophthalmos, diplopia, infraorbital hypoesthesia, and restriction of extraocular movements, particularly vertical gaze.

Management of orbital floor fractures ranges from conservative observation in minimal, non-displaced fractures to surgical reconstruction using various alloplastic or autogenous materials. Conventional surgical options include titanium mesh, Medpor implants, resorbable plates, and cartilage or bone grafts. However, these materials are expensive, require specialized implants, and may not be available in resource-constrained settings.

The trans antral (Caldwell-Luc) approach offers direct access to the orbital floor through the maxillary sinus, allowing visualization and reduction under endoscopic guidance. The use of a Foley catheter balloon as a temporary support scaffold following reduction represents an innovative, low-cost technique that eliminates the need for implant materials while providing adequate support during the healing phase. This report describes the successful application of this technique in a young trauma patient.

II. CASE REPORT

Patient Presentation and History

A 19-year-old male patient was brought to the emergency department with a history of road traffic accident (RTA) involving a collision between a motorcycle and an autorickshaw near Mangalore. The patient sustained injuries to the head, face, and lower limb. There was a history of loss of consciousness (LOC) of unknown duration at the scene of the accident. He denied any history of vomiting or seizures. A positive history of oral bleeding was noted. There was no history of nasal bleed or ear bleed.

General and Clinical Examination

On general examination, the patient was conscious and well-oriented to time, place, and person. The Glasgow Coma Scale (GCS) score was 15/15, indicating full neurological recovery at the time of presentation. Pupils were bilaterally equal and reactive to light (PBERL), with no signs of raised intracranial pressure. Extraocular movements (EOMs) were normal on initial examination, with no gross restriction of gaze noted at the time of initial assessment.

Local examination of the face revealed periorbital swelling and ecchymosis in the orbital region. Significant diplopia was documented at initial presentation, though infraorbital hypoesthesia was clinically suspected given the nature and mechanism of injury. Oral examination confirmed the source of oral bleeding, consistent with intraoral soft tissue laceration. Nasal and otoscopic examination were unremarkable.

Radiological Investigations

Preoperative computed tomography (CT) of the paranasal sinuses with axial, coronal, and sagittal reconstructions confirmed an orbital floor blowout fracture with inferior displacement of the bony fragments into the maxillary sinus (Figures 1 and 2). There was herniation of orbital fat and soft tissue contents into the maxillary antrum. No significant intraorbital haematoma or optic nerve compromise was identified. The maxillary sinus showed partial opacification consistent with haemosinus. CT findings of the head were within normal limits, with no evidence of intracranial haemorrhage or cerebral contusion.

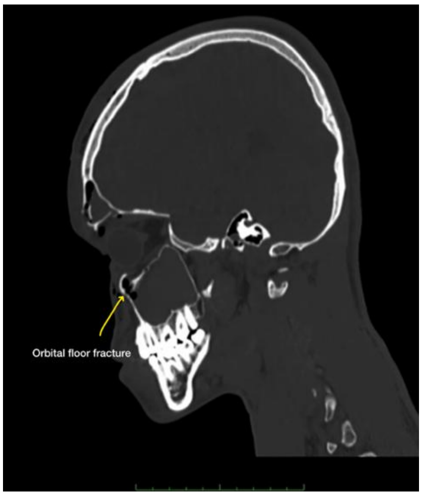

Figure 1: Preoperative computed tomography (CT) of the paranasal sinuses showing orbital floor blowout fracture with inferior displacement of bony fragments into the maxillary sinus (sagittal view)

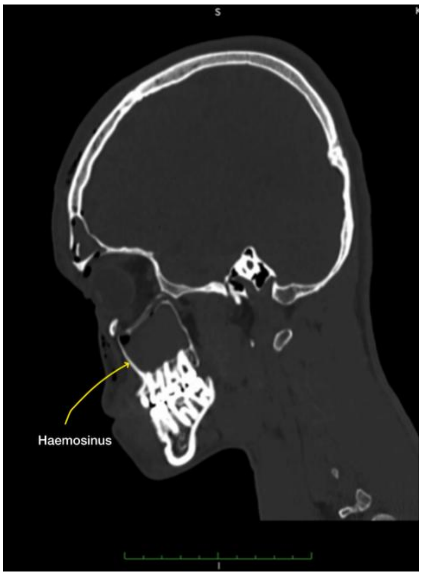

Figure 2: Preoperative CT scan (sagittal view) demonstrating orbital floor fracture with haemosinus

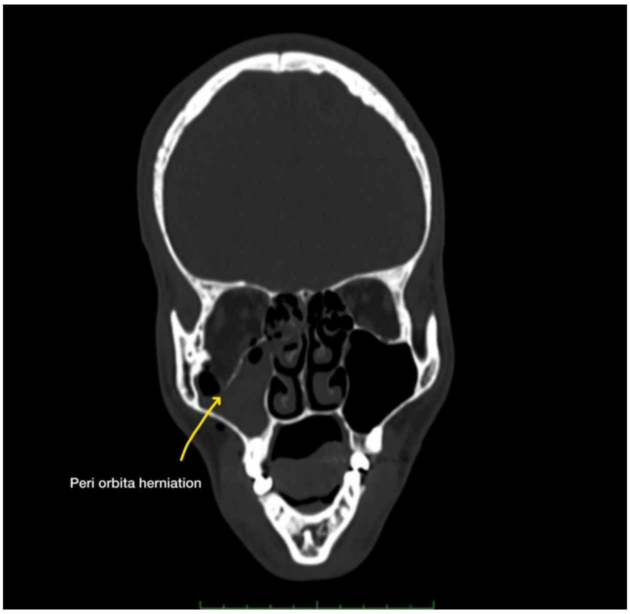

Figure 3: Preoperative CT scan (axial view) demonstrating orbital floor fracture with herniation of orbital fat and soft tissue contents into the maxillary antrum

Surgical Management

After adequate medical stabilization and multidisciplinary assessment — including neurosurgical clearance in view of the history of LOC — the patient was planned for surgical intervention. The procedure was performed under general anaesthesia (GA) with nasotracheal intubation.

A transantral (Caldwell-Luc) approach was employed. An intraoral sulcular incision was placed in the upper buccal vestibule above the maxillary premolar and molar region. The mucoperiosteal flap was elevated to expose the anterior wall of the maxillary sinus. An anterior antrostomy (bone window) was created using a piezoelectric device, providing access to the maxillary sinus. The sinus cavity was irrigated and debrided of clot and debris.

Under the guidance of a rigid functional endoscope (0° and 30° lens), the orbital floor was clearly visualized through the antrostomy window. The displaced orbital floor fracture fragments, along with herniated orbital contents, were identified and gently reduced upward to their anatomical position using blunt elevators.

A 14-French Foley catheter was then introduced through the antrostomy into the maxillary sinus. The catheter balloon was positioned beneath the reduced orbital floor to provide upward support and maintain the reduction. The balloon was inflated with approximately 15 mL of normal saline, achieving firm contact with the undersurface of the orbital floor without evidence of over-distension or vascular compromise. The bony window was repositioned and stabilized using 3-0 Vicryl sutures. Fixation was achieved by placing drill holes at the four corners of the bony window and corresponding surrounding bone, allowing secure reapproximation of the segment and restoration of the antral wall contour allowing a small aperture for exit of foley catheter.

A small stab incision was made in the floor of the ipsilateral nasal cavity to establish a transnasal exit pathway. The distal end of the Foley catheter was guided from the maxillary antrum through the nasal floor and delivered through the ipsilateral nostril and was secured at the nasal aperture and the intraoral incision was closed in layers with resorbable sutures. The catheter was left in situ and the patient was monitored postoperatively. Appropriate antibiotics, analgesics, and anti-inflammatory medications were administered. The patient was instructed to avoid nose blowing and Valsalva maneuvers during the postoperative period (Figure 4A–D).

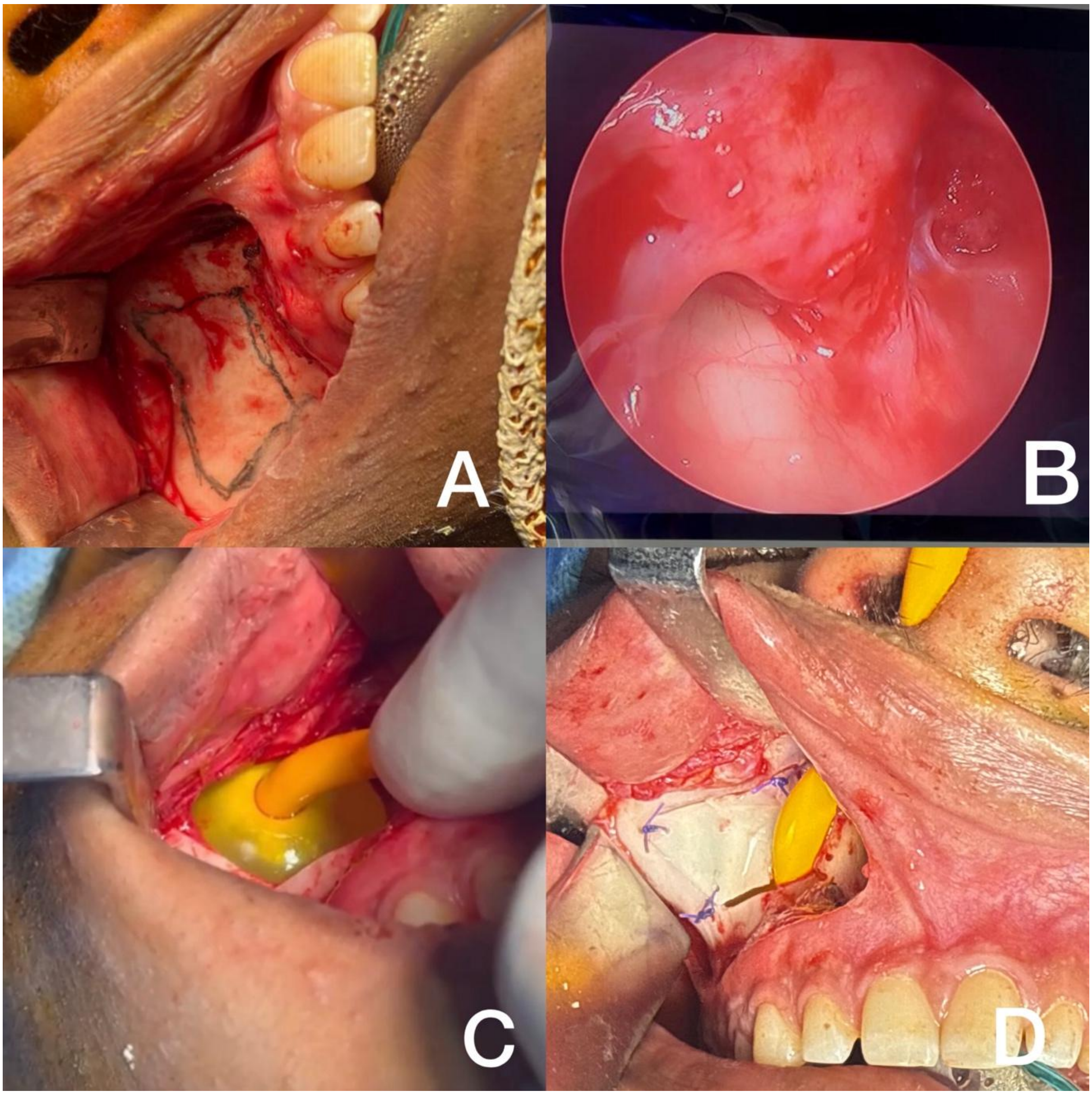

Figure 4: Intraoperative photographs showing the transantral approach. (A) Markings at anterior antrum; (B) Endoscopic visualization of orbital floor; (C) Inflation of Foley catheter balloon beneath reduced orbital floor; (D) Closed antral wall bony window with 3-0 Vicryl sutures with Foley catheter in situ

Postoperative Course and Outcome

The patient had an uneventful postoperative recovery. The Foley catheter was maintained in situ for a period of three weeks to allow adequate bony consolidation and fibrous union of the orbital floor. Regular follow-up was performed during this period to monitor for any complications, including infection, balloon deflation, or pressure-related effects on the orbital contents.

At the end of three weeks, the catheter balloon was gradually deflated and the catheter removed without complications. Postoperative cone beam computed tomography (CBCT) was performed to assess the adequacy of orbital floor reduction. CBCT images demonstrated satisfactory repositioning of the orbital floor fragments with restoration of the orbital volume and floor contour during 1 month follow up(Figures 5–7). There was no residual herniation of orbital contents into the maxillary sinus.

On subsequent 5th month follow-up, the patient reported no diplopia, no restriction of extraocular movements, and no significant enophthalmos (Figure 8). Infraorbital sensation showed gradual recovery. No anatomical discrepancies were notes in CBCT. The patient expressed satisfaction with the functional and aesthetic outcome.

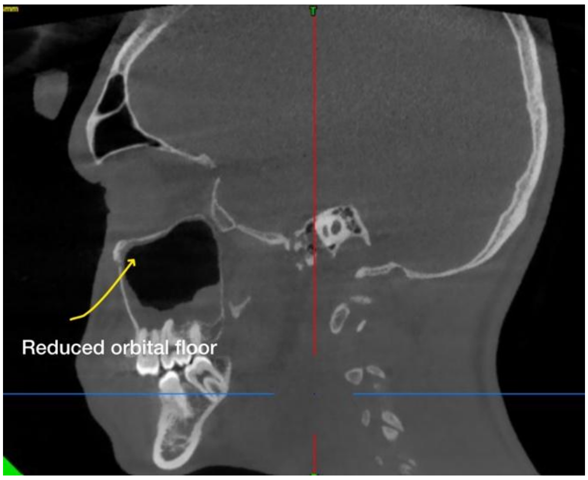

Figure 6: Postoperative clinical photograph showing the Foley catheter exiting through the ipsilateral nostril following transantral reduction

Figure 5: Postoperative cone beam computed tomography (CBCT) demonstrating satisfactory repositioning of orbital floor fragments with restoration of orbital volume (coronal view)

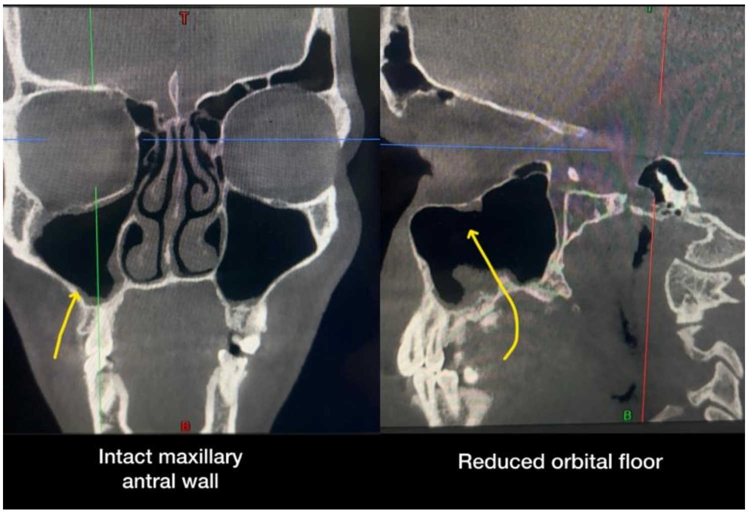

Figure 7: Postoperative CBCT (three-dimensional reconstruction) confirming adequate orbital floor reduction and restoration of orbital contour

Figure 8: Postoperative clinical photograph of the patient at follow-up showing foley catheter in situ

III. DISCUSSION

Orbital floor blowout fractures present a therapeutic challenge requiring careful timing of surgical intervention, appropriate surgical access, and reliable support of the reduced orbital floor during healing. While alloplastic implants such as titanium mesh and Medpor remain the gold standard in many centres, their high cost and limited availability in resource-limited settings necessitate the exploration of alternative techniques.

The use of a Foley catheter balloon for orbital floor support was first described several decades ago and has been periodically revisited in the literature. The balloon functions as a temporary scaffold, providing upward mechanical support to the reduced orbital floor until adequate fibrosis and bony consolidation prevent re-displacement of the fragments. The transantral (Caldwell-Luc) approach provides excellent access to the orbital floor via the maxillary antrum, allowing direct visualization and manipulation of fracture fragments without the need for a transcutaneous infraorbital incision, thereby minimising external scarring.

The integration of functional endoscopy during the transantral approach significantly enhanced intraoperative visualization in this case. Endoscopic assistance allowed precise identification of the fracture edges, assessment of herniated orbital fat, and real-time monitoring of balloon inflation, reducing the risk of over-distension and orbital compartment syndrome.

Maintenance of the catheter for three weeks is consistent with established protocols in the literature, with most authors recommending a period of two to four weeks to allow adequate healing. Regular monitoring and patient compliance are essential during this period. The risk of balloon deflation, migration, or infection remains a concern; however, careful surgical technique and postoperative surveillance can mitigate these risks effectively.

The use of CBCT for postoperative assessment is particularly valuable in this context, offering three-dimensional evaluation of fracture reduction with lower radiation dose compared to conventional CT. This facilitated objective documentation of the surgical outcome and provided a useful comparison with preoperative CT imaging.

This case underscores the continued clinical relevance of the Foley catheter technique in selected patients with orbital floor fractures, particularly in settings where implants are unavailable or prohibitively expensive. It is a simple, reproducible, and cost-effective technique that yields satisfactory functional and radiological outcomes when performed with appropriate patient selection and careful technique.

IV. CONCLUSION

Trans antral open reduction of orbital floor blowout fractures using a Foley catheter balloon is a safe, effective, and economical technique that deserves renewed attention in contemporary maxillofacial surgical practice. In this case, endoscopic-assisted transantral approach combined with Foley catheter balloon tamponade achieved satisfactory orbital floor reduction with minimal morbidity. The catheter was well tolerated over a three-week period, with postoperative CBCT confirming excellent fracture reduction and restoration of orbital anatomy. This approach should be considered as a viable primary treatment option, especially in resource-constrained environments.

PATIENT CONSENT

Written informed consent was obtained from the patient for publication of this case report and accompanying radiological images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

DECLARATIONS

Conflicts of Interest: None declared.
Funding: No funding was received for this study.
Ethical Approval: Institutional ethical committee approval was obtained prior to publication.

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