JKKI: Jurnal Kedokteran dan Kesehatan Indonesia
Indonesian Journal of Medicine and Health
Journal homepage: https://journal.uii.ac.id/JKKI
P-ISSN 2085-4145 | E-ISSN 2527-2950 || JKKI 2026;17(1): 121-130

Delayed management of blowout fractures: A case report on challenges and clinical recommendations

Al Hafiz,[1] Dwi Tika Septiany*[1]

[1]Department of Otorhinolaryngology-Head & Neck Surgery, Faculty of Medicine Universitas Andalas – M. Djamil General Hospital, Padang, West Sumatra, Indonesia

Article Info:	Article History:
Keywords: blowout fracture; endoscopic septorhinoplasty; orbital floor reconstruction; maxillofacial trauma; delayed management	Received: August 16, 2025 Accepted: March 13, 2026 Online: April 29, 2026
***Corresponding author:** dwitika200937@gmail.com	DOI: 10.20885/JKKI.Vol17.Iss1.art13

Case Report

ABSTRACT

Maxillofacial trauma is frequently encountered in emergency departments. Approximately 40% of orbital fractures are associated with concomitant maxillofacial fractures. Blowout fractures often result in both aesthetic and functional impairments. Clinical manifestations may include enophthalmos, hypoglobus, diplopia, ocular motility disorders, and visual disturbances. Optimal reconstruction is recommended within 14 days after trauma to prevent long-term sequelae. We reported a 24-year-old male patient diagnosed with a closed nasal bone fracture, deviated nasal septum, and orbital blowout fracture, with a month delayed since injury. The patient underwent endoscopic septorhinoplasty and orbital floor reconstruction utilizing a titanium plate and screw fixation. Proper and timely management of blowout fractures leads to satisfactory functional and aesthetic outcomes while significantly reducing the risk of permanent deformities. Delayed management of blowout fractures presents several challenges, including identifying orbital soft-tissue involvement, determining the optimal timing for intervention, and selecting appropriate implant materials. Clinical recommendations emphasize the importance of CT imaging and an integrated multidisciplinary approach involving ENT, ophthalmology, and radiology specialists to achieve the best possible functional and aesthetic outcomes for the patient.

INTRODUCTION

Traumatic injuries involving the orbit and periorbital region constitute a significant proportion of emergency department presentations, accounting for approximately 3% of all admissions.[1] Orbital fractures specifically represent 4% to 34% of all maxillofacial traumas. A notable clinical observation is the concomitant occurrence of orbital fractures with other facial skeletal disruptions in approximately 40% of cases, including naso-orbito-ethmoid (NOE) fractures, zygomaticomaxillary complex (ZMC) fractures, and Le Fort II and III fractures.[2] The predominant mechanisms of injury leading to these traumas encompass motor vehicle collisions, interpersonal violence, sports-related incidents, and falls.[1] Fractures of the orbital walls can precipitate both aesthetic and functional deficits, including enophthalmos, hypoglobus, diplopia, oculomotor dysfunction, and vision loss in severe cases.[3]

The various types of orbital fractures, the blowout fracture is particularly prevalent. This injury characteristically involves the medial wall or orbital floor and results from an acute, sudden increase in intraorbital pressure.[4] The mechanism involves a forceful external compression of the globe, which rapidly elevates intraorbital pressure, subsequently causing the attenuation and fracture of the orbital walls.[5] Surgical intervention for blowout fractures is primarily directed towards the liberation of entrapped orbital tissues, reconstruction of bony defects, and restoration of orbital volume.[6]

The optimal timing for surgical repair of orbital fractures is generally considered to be within two weeks after trauma, as this timeframe is associated with a reduced incidence of residual sequelae. Reconstructive surgery of the orbital floor is specifically indicated in cases presenting with diplopia or enophthalmos that compromise visual function and ocular motility.[7] Delayed surgical management can result in a spectrum of complications, including but not limited to eyelid deformities, persistent diplopia, paraesthesia within the distribution of the infraorbital nerve, progressive enophthalmos, and irreversible amaurosis in severe cases.[8] This case report discusses the challenges and clinical recommendations in the delayed management of blowout fractures, aiming to achieve optimal patient outcomes while considering the appropriate timing for surgical intervention.

CASE DESCRIPTION

A 24-year-old male presented to the Otorhinolaryngology-Head and Neck Surgery (ORL-HNS) Outpatient Clinic, Facial Plastic and Reconstructive Surgery Subdivision, Dr. M. Djamil General Hospital, Padang, on February 18, 2025. The patient was referred from the Department of Ophthalmology with a diagnosis of right orbital diplopia secondary to a right orbital floor fracture, with differential diagnoses including entrapment of the right inferior rectus muscle and suspected nasal bone fracture.

He reported a chief complaint of progressively worsening nasal obstruction for the past month. This commenced following a motorcycle accident one month before, when the patient, riding at high speed, was struck by another motor vehicle from the right side, with impact to the nose and eye. He remained conscious at the time of the incident and denied any projectile vomiting after the trauma. Subsequently, he was transported to a regional hospital in Bukittinggi, where he was hospitalized for five days. Referral to the THT-KL Department at Dr. M. Djamil General Hospital, Padang, was recommended; however, due to financial constraints, he initially declined the referral.

For the past month, the patient had experienced binocular diplopia in the right eye. He also noted nasal deviation following the accident. Epistaxis occurred at the time of injury but resolved spontaneously. There was no sensation of post-nasal drip or bloody rhinorrhoea. He denied nasal pain or headache. He reported no history of sneezing episodes exceeding five times when exposed to dust or cold. A history of smoking was present, but cessation occurred one month prior to presentation. There was no history of hypertension or diabetes mellitus.

Nasal examination revealed a deviated alignment, absence of crepitation, and no swelling or tenderness (Figure 1). Naso endoscopy of the bilateral nasal cavity revealed a narrowed lumen, oedematous inferior turbinate without hyperaemia, difficult-to-assess middle turbinate, mucoid discharge, and a deviated nasal septum. Peak Nasal Inspiratory Flow (PNIF) measurements were 40/40/5. The working diagnosis was suspected closed nasal bone fracture of a month onset, suspected right orbital floor fracture and nasal septal deviation. Ophthalmological examination of the right orbit demonstrated a visual acuity of 20/40, absence of palpebral oedema, non-hyperaemic conjunctiva, clear cornea, adequately deep anterior chamber, brown iris, round and reactive pupil with a diameter of 3 mm, clear lens, orthophoria position, and restricted ocular motility, particularly in upward vertical gaze. The left orbit showed a visual acuity of 20/20, absence of palpebral oedema, clear cornea, adequately deep anterior chamber, brown iris, round and reactive pupil with a diameter of 3 mm, clear lens, orthophoria position, and full range of motion. Hertel exophthalmometry measurements were 13-17/109, and diplopia was noted in superior and supertemporal gazes.

Computed Tomography (CT) scans of the patient's orbits revealed fractures of the anterior and medial aspects of the right maxillary sinus wall, involving the orbital floor, bilateral nasal bone fractures, and bilateral maxillary sinusitis (Figures 2). Based on these findings, the patient was diagnosed with a closed nasal bone fracture, nasal septal deviation, and a blowout fracture. A joint surgical procedure was planned with the Department of Ophthalmology, encompassing septorhinoplasty and orbital floor reconstruction with plate and screw fixation.

Figure 1. Preoperative photographs of the patient in 6 cardinal positions of gaze, demonstrating a deviated nasal alignment**.** Right ocular motility, showing impaired movement (red arrow)

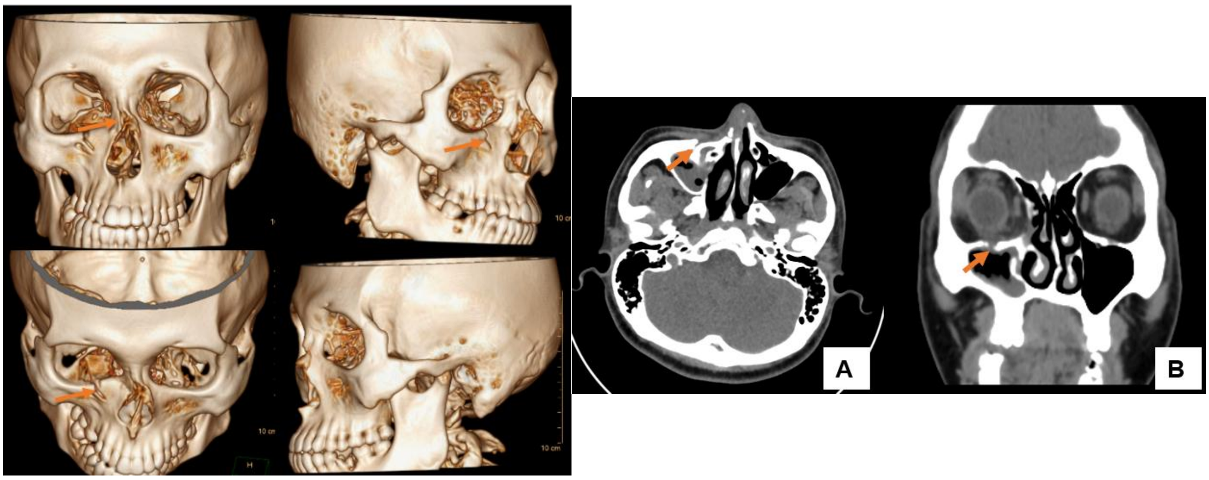

Figure 2. Orbital CT scan 3D orbital showing fracture of the floor of the right orbit (red arrow)

On March 5, 2025, the patient underwent endoscopic septorhinoplasty and orbital floor fracture reconstruction with plate and screw fixation. He was positioned supine on the operating table under general anaesthesia. Aseptic and antiseptic techniques were meticulously performed. The Department of Ophthalmology initiated the procedure by irrigating the superior and inferior conjunctival sacs with povidone-iodine. Sterile drapes were applied, and a 2 mm marker was placed along the inferior palpebral margin for a length of 50 mm. A subciliary incision was made horizontally following this marker. A 4.0 silk suture was used to provide traction on the inferior palpebra, aiding in the dissection through tissues until bone was visualized. Blunt dissection was then performed to separate the periosteum from the maxillary bone. A forced duction test was conducted to assess unrestricted ocular motility.

An orbital plate was then positioned onto the orbital floor. Two screws were used to secure the plate to the anterior maxillary bone. The periosteal tissue was subsequently reapproximated and closed with 4.0 Vicryl sutures. The incision was closed in layers up to the skin, followed by the application of antibiotic ointment and a sterile dressing (Figure 3).

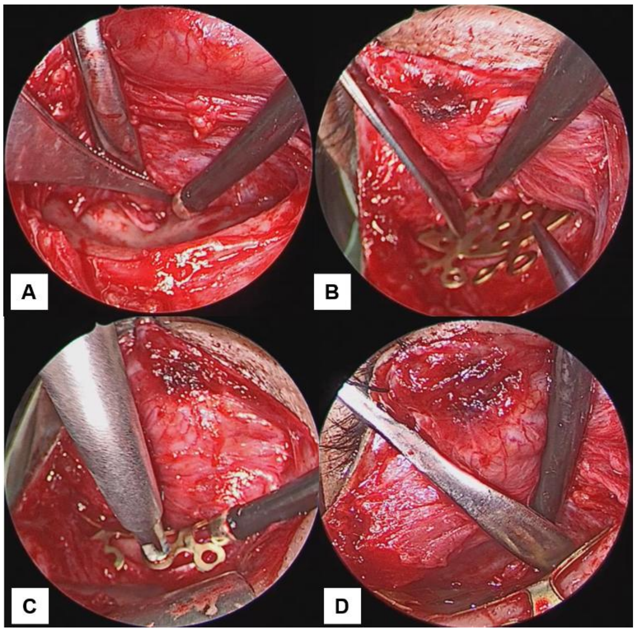

Figure 3. A. Orbital floor fracture with entrapment of the inferior rectus muscle, followed by release of the muscle from the fracture site. B. Placement of a metallic orbital plate with confirmation that no soft tissue structures are entrapped. C. Fixation with screw placement. D. Post-fixation evaluation after plate and screw insertion.

The procedure continued with septorhinoplasty. Epinephrine and lidocaine (1:4 solution) soaked packing was placed in both the right and left nasal cavities. A 0-degree endoscope was used for evaluation. Infiltration with Epinephrine 1:200,000 was performed in the columella and septum. An inverted V-shaped incision was made in the columella, extended with vestibular incisions using a no. 15 blade. Medial osteotomy was performed; the skin of the nasal dorsum was undermined through the intercartilaginous incision. A magic saw was introduced into the interseptal space until its tip reached 1-2 mm cranial to the transverse skin line. Lateral osteotomy was then carried out by inserting the magic saw straight along the caudal edge of the pyramid, 1-2 mm ventral to the nasal base line, with the saw tip oriented superiorly. Columellar dissection revealed the lower lateral cartilages, which were then retracted to expose the nasal septum.

Endoscopic septoplasty commenced with mucoperichondrial dissection to liberate the septal cartilage and septal mucosa. Evaluation of the left nasal cavity with a 0-degree endoscope revealed an inferomedial fold of the septum towards the nasal floor and a fracture on the left side of the septum. An inferior chondrotomy of the right nasal septum was performed, and endoscopic evaluation with a 0-degree scope showed the inferior portion of the septum folded towards the nasal floor. Osteotomy of the maxillary crest was performed using a chisel. Repositioning was achieved with Asch forceps, and the septum was moulded to its anatomical position.

Rhinoplasty involved dissection up to the apex of the nasal dorsum. Nasal tip reconstruction was performed by placing a septal cartilage graft between the lower lateral cartilages. This cartilage graft was then sutured to the lower lateral cartilages, and the nasal tip was shaped to conform to the patient's anatomical contours. Conchoplasty of the bilateral inferior turbinates was performed by outfracturing the inferior turbinate bone medially and then infracturing it laterally. The incision wounds were closed with 5.0 Prolene sutures. Anterior nasal packing (1:1 ratio) and an external nasal splint were applied. The wound was covered with a dressing and secured with tape, concluding the operation. Intraoperative blood loss was estimated at 25 ml. Postoperative therapy included intravenous Ringer's Lactate solution with a continuous infusion of Ketorolac 30 mg/flask, Ampicillin-Sulbactam 1500 mg IV every 4 hours, Dexamethasone 5 mg IV every 8 hours, and Ranitidine 25 mg IV every 12 hours. The patient was advised to avoid forceful nose blowing for two weeks after surgery.

On the third day after surgery, surgical site pain had diminished, and no epistaxis was observed. Physical examination revealed a well-applied dressing on the right eye and a quiescent post-suturing wound without signs of infection. The nasal splint remained well-positioned, and the anterior packing (1:1 ratio) was intact with no blood seepage. The anterior nasal packing was removed, while the external splint was maintained, and no active bleeding was noted. Pharyngeal examination demonstrated symmetrical arches, a midline uvula, quiescent T1-T1 tonsils, and no bleeding or clotting. The patient was discharged with oral medications including Clindamycin 150 mg tablet 4 times daily, Paracetamol 500 mg tablet 3 times daily, Acetylcysteine 200 mg tablet 3 times daily, and 0.9% NaCl nasal drops.

On the seventh day after surgery, he reported no complaints. He had discontinued nasal drops three days prior. Nasal examination of the right nasal cavity revealed a narrowed lumen, oedematous inferior turbinate, eutrophic middle turbinate, no active bleeding, no septal deviation, and the presence of crusting. The left nasal cavity showed a narrowed lumen, an oedematous inferior turbinate, apparent synechiae between the inferior turbinate and septum, the presence of crusting, and no active bleeding. He underwent release of synechiae, removal of the nasal splint, and removal of sutures from the columella. The wound appeared quiescent with no signs of infection, and antibiotic ointment was applied to the wound. Then he was advised to routinely use 0.9% NaCl nasal drops.

On the fourteenth day after surgery, he reported no new complaints. Nasal examination of the left nasal cavity showed no evidence of synechiae between the inferior turbinate and septum. The inferior turbinate remained oedematous, but there was no active bleeding (Figure 4). A Peak Nasal Inspiratory Flow (PNIF) test was performed, yielding results of 110/110/100, indicating significant improvement from previous measurements. Following this, he was referred for an ophthalmology consultation.

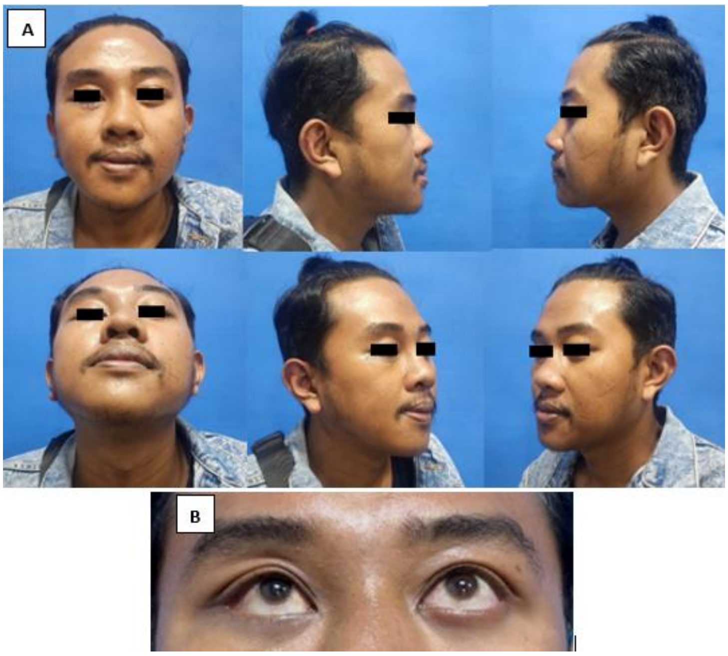

Figure 4. **A.** Patient photograph at 14-day postoperative follow-up. **B.** Ocular motility showing full range of movement in all directions.

During the ophthalmology follow-up, the patient reported no pain at the surgical site. He noted diplopia only when looking upwards, and denied any blurred vision. Ocular examination of the right orbit revealed a visual acuity of 20/25. The inferior palpebral incision site was well-healed with no bleeding. Examination of the left orbit revealed a visual acuity of 20/20, no palpebral oedema, non-hyperaemic conjunctiva, clear cornea, adequately deep anterior chamber, brown iris, round and reactive pupil with a diameter of 3mm, and clear lens. Full range of ocular motion was observed. Diplopia was still present in the superior and superotemporal gaze positions.

DISCUSSION

A case of a 24-year-old male was reported with a diagnosis of closed nasal bone fracture, nasal septal deviation, and blowout fracture. The patient underwent endoscopic septorhinoplasty, medial and lateral osteotomy, and orbital floor fracture reconstruction with plate and screw fixation under general anaesthesia, performed by the Division of Facial Plastic and Reconstructive Surgery, Department of Otorhinolaryngology–Head and Neck Surgery, in collaboration with the Department of Ophthalmology, Dr. M. Djamil Central General Hospital, Padang.

In this case, he presented with impaired movement of the right eyeball, particularly in upward vertical gaze. A blowout fracture is an orbital fracture involving the internal orbital wall, characterized by entrapment of soft tissue components.[9] Fractures of the orbital floor may lead to restricted ocular movement, caused by soft tissue oedema, haemorrhage, or injury to the extraocular muscles, such as the inferior rectus, inferior oblique, and medial rectus, or a combination thereof, due to bone fixation to the muscles and fascia.[10]

Clinical signs suggestive of orbital trauma, including periorbital ecchymosis, subconjunctival hematoma, and oedema, should be carefully evaluated, as they often indicate the presence of an orbital fracture. This evaluation should include visual acuity, extraocular muscle function, the extent and presence of subconjunctival haemorrhage, diplopia, strabismus, as well as the size, shape, and light reactivity of the pupils.[4] Enophthalmos is one of the three cardinal signs of orbital floor fracture, along with diplopia and sensory disturbances in the area innervated by the infraorbital nerve. Enophthalmos results from changes in the orbital volume ratio, potentially causing functional disturbances such as diplopia, eyelid dysfunction, and impaired tear film distribution over the ocular surface, with drainage into the nasal cavity.[11]

A CT scan is a crucial diagnostic tool to determine the location and extent of the fracture. The use of 3D imaging enhances preoperative planning and provides intraoperative guidance to ensure accurate plate positioning during orbital reconstruction, allowing for necessary modifications during surgery.[12] In addition to assessing the volume of herniated orbital contents, CT characteristics of blowout fractures are important predictors of subsequent deformity. Predictive algorithms have been reported with an accuracy of up to 83%. Diplopia in blowout fractures without limitation of ocular motility may be due to oedema, and observation is recommended until the oedema subsides before intervention is considered.[13]

Management guidelines recommend surgical intervention within 14 days in cases of blowout fracture with persistent diplopia and restricted ocular motility. Patients undergoing surgery within 48 hours of trauma have been reported to have no postoperative diplopia.[14] Early surgical intervention within 2 days of injury in cases with extraocular muscle entrapment reduces the risk of postoperative diplopia. Furthermore, nearly all large defects have better outcomes when repaired within 1 week of injury, minimizing the risk of postoperative enophthalmos.[13]

Various skin incisions provide surgical access to the orbital bone and periorbital structures through the eyelid and anterior orbit. Due to the superficial location of the underlying anatomy such as muscles, fat, tendons, and bone.[15] The subciliary incision is one of the most frequently used approaches for facial bone fractures, particularly complex orbital floor and zygomaticomaxillary fractures involving the inferior orbital rim. This approach provides a wide surgical field, facilitating accurate fracture reduction. However, it carries a risk of postoperative lower eyelid complications, including malposition, scleral show, eyelid oedema, entropion, and ectropion.[16]

After the intervention, the patient still had double vision. The aetiology of persistent diplopia after fracture reconstruction is multifactorial, including neuromuscular trauma to the orbital tissues, incomplete reduction of orbital tissue during repair, and implant-related fibrosis with adhesions to orbital structures. This may occur in cases when the inferior rectus muscle herniates through a small fracture and sustains ischemic injury due to delayed intervention.[17]

Complications from delayed surgery may include eyelid deformity, diplopia, paraesthesia in the infraorbital nerve distribution, enophthalmos, and blindness. Diplopia may improve within several weeks. Reported rates of persistent diplopia range from 8% to 42%. Residual enophthalmos due to fat atrophy, resulting from delayed repair has been observed in approximately 7% to 27% of cases.[8]

In blowout fracture cases with delayed surgery (an operative interval beyond 72 hours), affected muscles require a longer recovery time. The incidence of persistent diplopia is approximately 12.5% in patients operated within 24 hours, compared to 100% in those with delayed surgery (>96 hours).[18] Timely management of orbital fractures with tissue entrapment within 2 days after injury reduces the risk of postoperative diplopia, and large defects are better repaired within a week to minimize the risk of postoperative enophthalmos. In this case report, the mean interval from injury to intervention was a month.[13] The patient continued to experience right-eye diplopia; however, ocular motility had recovered fully in all directions.

Titanium implants are the material of choice for orbital reconstruction due to their rigidity for structural support, flexibility for better adaptation, and excellent biocompatibility. Materials lacking these properties are more prone to migration, extrusion, and postoperative infection.[12] Titanium undergoes molecular-level osseointegration without the development of interfering fibrous tissue. Furthermore, titanium implants can be clearly evaluated and visualized on radiologic imaging.[19]

Postoperative care may include administration of systemic and topical antibiotics, as well as the application of cold compresses and head elevation to prevent and reduce oedema. Visual acuity should be monitored regularly, along with pupil size and extraocular motility, to anticipate signs of retrobulbar hematoma.[8] The patient was scheduled for postoperative follow-up at one week, two weeks, six weeks, three months, and six months. In this case report, systemic antibiotics and analgesics were prescribed upon discharge.[1] During the follow-up, the patient reported no nasal complaints and was referred back to the Department of Ophthalmology for further evaluation of diplopia and ocular motility.

In cases of nasal bone fracture, if deformity results from neglected trauma, corrective management after more than three weeks should involve septorhinoplasty and cosmetic craniofacial surgery.[20] Nasal bone repositioning is an important component in most nasal surgeries performed for external correction. Specifically, medial mobilization of the nasal bones via osteotomy enables reconstruction of the nasal pyramid into its normal position. Osteotomy aims to straighten a deviated dorsum, close or open the nasal dome, and narrow the dorsal nasal width.[21]

Closed reduction and external splinting rely on the integrity of the mucosa and soft tissue for appropriate bone healing. The external splint was applied for 10 days. All patients were educated on the importance of maintaining the external splint for a variable duration of 5–10 days.[22] Oedema and ecchymosis typically reach peak severity within 3 days postoperatively and may persist until postoperative day 9. Periosteal elevation is associated with the development of oedema and ecchymosis.[21]

Delayed surgical intervention beyond two weeks increases the risk of necrosis and fibrosis of the entrapped extraocular muscles, making recovery of normal ocular motility difficult and potentially resulting in persistent diplopia. In adults, blowout fracture repair is ideally performed within 1–2 weeks; surgery delayed for several months is considered neglected and is associated with a higher risk of permanent extraocular muscle dysfunction.[23] Muscle entrapment accompanied by the oculocardiac reflex, trapdoor fractures, or suspected traumatic optic neuropathy constitutes an indication for emergency surgical intervention. When these conditions are overlooked and surgery is delayed for months, the prognosis for visual function and ocular motility is significantly worsened.[24] This case of delayed repair of blowout fracture illustrates how the maxillofacial surgery and ophthalmology teams planned the surgical approach, orbital floor reconstruction, and globe protection following a delay of approximately one month. Therefore, a multidisciplinary approach involving otorhinolaryngology and ophthalmology is essential in such cases to reduce the risk of complications, including visual impairment and extraocular motility disorders. [25]

CONCLUSION

The challenges in managing blowout fractures include assessing the extent of orbital soft tissue involvement, determining the optimal timing of intervention, and selecting the appropriate implant material. Clinical recommendations for the fractures emphasize the role of CT imaging and comprehensive evaluation; proper management should ideally be performed within two weeks, combined with a multidisciplinary collaborative approach, to optimize both functional and aesthetic outcomes for the patient.

CONFLICT OF INTEREST

The authors declare that they have no competing interests. The patient has agreed to be included in scientific publications as a learning tool.

PATIENT CONSENT STATEMENT

Written informed consent was obtained from the patient for the publication of this case report, including all accompanying images and clinical information. The patient understood that personal identifiers would not be disclosed and that all efforts would be made to maintain confidentiality. Proof of consent has been provided to the editorial office

ACKNOWLEDGMENTS

The authors would like to thank the Department of Otorhinolaryngology, Faculty of Medicine, Andalas University, Padang, Indonesia, for their ongoing academic and clinical support and for providing the facilities that enabled the completion of this case report. No external funding was received for this work.

DATA AVAILABILITY STATEMENT

All data supporting the findings of this study are available within the article. Further details can be obtained from the corresponding author upon reasonable request.

SUPLEMENTARY MATERIAL

No supplementary materials were included in this manuscript.

AUTHOR CONTRIBUTIONS

DTS contributed to the study concept and design, data collection, analysis, and manuscript drafting. AH contributed to the clinical assessment, literature review, and manuscript revision. All authors have read and approved the final version of the manuscript.

DECLARATION OF USING AI IN THE WRITING PROCESS

Interpretation, critical analysis, and scriptwriting were performed entirely by the authors. No AI tools were used to generate or compose any part of the final text.

LIST OF ABBREVIATIONS

NOE: Naso-orbito-ethmoid; ZMC: Zygomaticomaxillary complex; ORL-HNS: Otorhinolaryngology-Head and Neck Surgery; PNIF: Peak Nasal Inspiratory Flow, CT: Computed Tomography.

REFERENCES

1. Zhou P, Chambers CB. Orbital fractures. InSeminars in plastic surgery 2021 Nov (Vol. 35, No. 04, pp. 269-273). Thieme Medical Publishers, Inc.. DOI: 10.1055/s-0041-1735815
2. Moenadjat Y. Fraktur Orbita. In: Moenadjat Y, ed. Prinsip tata laksana trauma muka . Jakarta: Departemen Ilmu Bedah Fakultas Kedokteran Universitas Indonesia; 2020:134-146.
3. Zong CL, Shi YL, Jia JQ, Ding MC, Chang SP, Lu JB, et al. A retrospective study to compare the

treatment outcomes with and without surgical navigation for fracture of the orbital wall. Chinese Journal of Traumatology. 2021;24(01):11-7. DOI: 10.1016/j.cjtee.2020.10.002
4. Hafiz A, Julianda W. Le Fort I and nasal fracture, primary reduction, and secondary revision saddle nose: A case report. JKKI: Jurnal Kedokteran dan Kesehatan Indonesia. 2023:217-23. DOI: 10.20885/JKKI.Vol14.Iss2.art14
5. Wei Y, Wang H, Song X, Bi X, Li Y, Zhou H, et al. Orbital soft tissue displacement after blow-out fracture repair using poly (L-lactide-co-glycolide) polymer plates based on image fusion technique. Journal of Craniofacial Surgery. 2023;34(2):e149-53. DOI: 10.1097/SCS.0000000000008891
6. Ozturker C, Sari Y, Ozbilen KT, Ceylan NA, Tuncer S. Surgical repair of orbital blow-out fractures: outcomes and complications. Beyoglu Eye J. 2022;7(03):199-206. DOI:10.14744/bej.2022.88156
7. Døving M, Lindal FP, Mjøen E, Galteland P. Orbital fractures. Tidsskrift for Den norske legeforening. 2022. DOI: 10.4045/tidsskr.21.0586
8. Pidro A, Jovanovic N, Kadribašic E, Barucija N, Leto N, Kahana A. Delayed management of an orbital floor blow-out fracture. Beyoglu eye journal. 2021;6(3):249. DOI: 10.14744/bej.2021.94834
9. Shetty SK, Saritha RS, Singh S. Isolated pure orbital blowout fracture-A rare case report. Annals of Maxillofacial Surgery. 2022;12(1):110-3. DOI: 10.4103/ams.ams_293_21
10. de Santana IH, Viana MR, Palhano-Dias JC, Ferreira-Júnior O, Sant'Ana E, Shinohara ÉH, et al. Orbital floor fracture (blow out) and its repercussions on eye movement: A systematic review. European journal of medical research. 2024;29(1):427. DOI: 10.1186/s40001-024-02023-y
11. Koryczan P, Zapała J, Gontarz M, Wyszyńska-Pawelec G. Enophthalmos as a prognostic factor in blow-out fracture of the orbit. Retrospective study of over 700 cases. Folia Medica Cracoviensia. 2020;60(3). DOI: 10.24425/fmc.2020.135795
12. de Lima Junior MO, Soares CF, Catunda IS, de Holanda Vasconcellos RJ. Surgical treatment of blow-out fracture: A new perspective. Journal of Craniofacial Surgery. 2023 Jun 1;34(4):e391-3. DOI: 10.1097/SCS.0000000000009319
13. Hassan B, Resnick E, Er S, Liang F, Redett R, Yang R, et al. The impact of surgical timing in orbital fracture repair: A new paradigm. Plastic and reconstructive surgery. 2025;155(1):132e-40e. DOI: 10.1097/PRS.0000000000011420
14. Gugliotta Y, Roccia F, Demo PG, Rossi MB. Characteristics and surgical management of pure trapdoor fracture of the orbital floor in adults: A 15-year review. Oral and Maxillofacial Surgery. 2023;27(4):625-30. DOI: 10.1007/s10006-022-01099-2
15. Prince J, Shetty P, Ramanathan A, N S. A Comparative analytical study of functional and esthetic outcomes of infraorbital and subciliary incisions to assess the redundancy of the infraorbital approach. The Scientific World Journal. 2025;2025(1):9595176. DOI: 10.1155/tswj/9595176
16. Cho W, Kim CG, Jang EA, Kim KN. Lateral tarsoplasty combined with a full-thickness skin graft for managing severe lower eyelid ectropion following the subciliary approach for infra-orbital rim fracture: A retrospective observational study. Life. 2024;14(3):314. DOI: 10.3390/life14030314
17. Campbell BC, Shipchandler TZ, Ting JY, Nesemeier BR, Geng J, Camp DA, et al. Ocular motility and diplopia measurements following orbital floor fracture repair. American Journal of Otolaryngology. 2021;42(2):102879. DOI: 10.1016/j.amjoto.2020.102879
18. Wee JH, Kim DG, Lee JY, Cho MJ, Shim WS, Jung HJ. A case series of surgical outcomes for orbital blowout fracture with extraocular muscle entrapment. Medicine. 2023 Nov 3;102(44):e34879. DOI: 10.1097/MD.0000000000034879
19. Marella VG, Khetrapal P, Gangasani A, Bhanot R, Uppal A. Titanium mesh versus medpor implant in orbital floor reconstructions: A comparative study. Journal of Pharmacy and Bioallied Sciences. 2021;13(Suppl 1):S76-9. DOI: 10.4103/jpbs.JPBS_553_20
20. Das J. Trauma in otolaryngology. Springer; 2017

21. Kim JS, Kim SH, Hwang SH. Method of lateral osteotomy to reduce eyelid edema and ecchymosis after rhinoplasty: A meta-analysis. The Laryngoscope. 2021;131(1):54-8. DOI: 10.1002/lary.28519
22. Bracaglia R, Servillo M, Fortunato R, Caretto AA, Gentileschi S. Double lateral osteotomy: not only the correction of crooked noses but a relevant aesthetical refinement in structural rhinoplasty. Journal of Personalized Medicine. 2023;13(11):1619. DOI: 10.3390/jpm13111619
23. Pemayun CA, Yuliawati P, Utari NM, Djelantik AS, Hamid AR. Management of blowout fracture with iliac bone graft. Intisari Sains Medis. 2023;14(2):469-76. DOI: 10.15562/ism.v14i2.1742
24. Aftab OM, Randhawa A, Randhawa KS, Khawaja IM, Kumar K, Langer PD, et al. Systemic outcomes in adults undergoing emergent repair of orbital blowout fractures. Indian Journal of Otolaryngology and Head & Neck Surgery. 2024;76(4):3323-9. DOI: 10.1007/s12070-024-04681-0
25. Kumar KM, Nair AS, Das TA, Chanchalesh MC. Case report on combined approach for delayed orbital floor repair. National Journal of Maxillofacial Surgery. 2023;14(1):140-2. DOI: 10.4103/njms.njms_394_21