Majalah Kedokteran Gigi Indonesia
Vol 11 No 1 – April 2025
ISSN 2460-0164 (print), ISSN 2442-2576 (online)
Available online at https://jurnal.ugm.ac.id/mkgi
DOI: http://doi.org/10.22146/majkedgiind.94436

CASE STUDY

Complex management of multiple facial traumas using a bottom-up approach

Wilson Wijaya*✉, Endang Sjamsudin*, Melita Sylvyana**

*Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Padjadjaran University, Bandung, West Java, Indonesia
**Department Oral and Maxillofacial Surgery, Hasan Sadikin General Hospital, Bandung, West Java, Indonesia
*Jl Raya Bandung-Sumedang Km 21 Jatinangor, Sumedang, West Java, Indonesia; ✉ correspondence: wilson21001@mail.unpad.ac.id

ABSTRACT

Blunt trauma, particularly from traffic accidents, is a leading cause of multiple facial fractures. Managing such injuries can be extremely challenging for surgeons, especially when multiple facial regions are involved. Inadequate stabilization of fractured bones may result in permanent deformities. This case report outlines the principles and techniques of managing complex facial trauma, focusing on achieving harmonious bone alignment and balanced occlusion through proper segmental reduction. We present the case of a 28-year-old male with multiple facial fractures sustained in a traffic accident. Clinical and radiological examinations revealed fractures of the left orbital rim, Le Fort I level, left zygomaticomaxillary complex, mandibular symphysis, and right parasymphysis, accompanied by tooth avulsion. The patient underwent open reduction and internal fixation (ORIF) under general anesthesia using a bottom-up approach, followed by four weeks of intermaxillary fixation. This resulted in improved facial contour and satisfactory intermaxillary relationship. Effective management of multiple facial fractures requires comprehensive planning and meticulous technique to restore facial aesthetics, mastication, and anatomical landmarks. This can be achieved through either a top-down or bottom-up approach, depending on the stability of the fractured segments. In this case, ORIF was initiated with mandibular fixation due to the relative stability of the mandibular fragments, supporting the use of a bottom-up strategy. Thorough planning and precise execution are crucial to achieving optimal anatomical and functional outcomes and preserving the patient's quality of life.

Keywords: bottom-up approach; multiple facial trauma; occlusal relationship; ORIF

INTRODUCTION

Maxillofacial trauma involves injury to the soft or hard tissues of the face, often resulting in fractures of the facial skeleton. These fractures can be life-threatening or cause significant morbidity, facial disfigurement, and functional impairment. Maxillofacial fractures include those of the nasal, orbital, zygomatic, maxillary, and mandibular bones.[1,2]

Facial fractures most commonly result from traffic accidents, high-impact trauma, workplace injuries, or sports-related incidents. A 2008 study in Saudi Arabia reported the leading causes of facial fractures as interpersonal violence (36%), traffic accidents (32%), falls (18%), sports injuries (11%), workplace trauma (3%), and gunshot wounds (2%). Males are affected more frequently than females, with a ratio of approximately 4:1.[3]

Multiple maxillofacial fractures are typically managed using open reduction and internal fixation (ORIF). Successful outcomes require high-resolution diagnostic imaging (e.g., CT scans), surgical expertise, and access to appropriate instrumentation. Challenges arise due to the varying patterns and complexity of fractures among patients, especially in settings with limited resources or surgical capabilities. Inadequate management may lead to complications such as malocclusion, facial asymmetry, and disfiguring scars.[4,5]

Maxillofacial fractures can be treated using two primary approaches: the top-down or bottom-up technique. The choice depends on the type and location of the fracture, with treatment beginning at the most stable fracture site. The top-down approach is commonly used when the lower facial fractures are comminuted and the upper region presents with simpler

Majalah Kedokteran Gigi Indonesia. April 2025; 11(1): 65-70
ISSN 2460-0164 (print)
ISSN 2442-2576 (online)

fractures, starting reduction and fixation from the upper facial bones. Conversely, the bottom-up approach begins with reduction and fixation from the lower facial structures upward, especially when the mandibular fragments are more stable.[6,7] This case report presents surgical management of complex multiple maxillofacial fractures using a bottom-up approach, based on the greater stability of the lower-third craniofacial structures.

METHODS

A 28-year-old male presented with oral bleeding following a traffic accident in which the left side of his face struck the sidewalk. The patient reported wearing a half-face helmet at the time of injury. There was no history of loss of consciousness, nausea, vomiting, or ear bleeding, but bleeding from the mouth and nose was noted. There was no history of alcohol intoxication. He was brought to the Emergency Department of Hasan Sadikin General Hospital for further treatment.

Clinical examination revealed facial asymmetry, depression of the left zygomatic arch, and mobility ("floating") of the upper jaw. These findings were accompanied by periorbital and cheek edema with hematoma on the left side. Multiple lacerations were present in both intraoral and extraoral regions. An open fracture of the maxilla and mandible involving the dentoalveolar segments of the upper and lower jaws was observed, along with avulsion of the anterior teeth. The patient also exhibited an anterior open bite, with flared maxillary and mandibular arches (Figure 1).

Radiological evaluation using 3D computed tomography (CT) revealed multiple comminuted fractures in the midfacial third, including the left orbital rim, left zygomatic arch, nasal bones, and a Le Fort I fracture. Additionally, two simple mandibular fractures were identified in the lower facial third, involving the symphysis and right parasymphysis regions (Figure 2). Based on clinical and imaging findings, the patient was diagnosed with mild head trauma, a left orbital rim fracture, Le Fort II fracture, type V palatal fracture, mandibular symphysis and right parasymphysis fractures, dentoalveolar fractures, and multiple intraoral and extraoral lacerations.

(A) (B) (C) (D)

Figure 1. (A) Facial profile, (B) Left zygomatic arch depression, (C&D) Anterior open bite. specify what each image represents (e.g., sagittal, coronal, or axial views)

(A) (B) (C)

Figure 2. Pre-operative CT scan; (A) right lateral view, (B) anterior view, (C) left lateral view

(A) (B) (C) (D)

Figure 3. (A) ORIF at lower jaw, (B&C) ORIF at upper jaw and ZMC, (D&E) ORIF at orbital rim

(A) (B)

Figure 4. (A) Facial profile post operative 1 day, (B) Intra oral condition post operative 1 day

(A) (B)

Figure 5. (A) Facial profile post operative 33 days, (B) Intra oral condition post operative 33 days

Surgical intervention was performed using a bottom-up approach under general anesthesia. Treatment included ORIF and primary closure of soft tissue lacerations (Figure 1). Fixation of the fractured orbital rim was performed by an ophthalmologist. Surgery commenced five hours after the injury.

ORIF was carried out using 1.5 mm and 2.0 mm mini-plates and screws. Intraoral incisions were made to access the maxillary and mandibular fracture sites. After anatomical reduction of the fractured segments, plates were positioned along the contours of the mandible and maxilla, and fixed using 8 mm and 10 mm screws placed perpendicular to the plates, following buttress and Champy's principles. The surgical sites were irrigated and inspected for hemostasis. The vestibular incisions were closed with interrupted 4-0 silk sutures. Interdental wiring was then installed to facilitate intermaxillary fixation.

The patient was hospitalized for four days postoperatively. Intermaxillary fixation with elastics was initiated on postoperative day one and later replaced with interdental wiring, which was maintained for 33 days (Figures 3 and 4). The patient was advised to maintain strict oral hygiene. Follow-up evaluations every two weeks demonstrated satisfactory facial aesthetics and masticatory function.

DISCUSSION

The increasing population and advancements in transportation have contributed to a rising incidence of injuries, particularly facial trauma. According to the Indonesian Central Bureau of Statistics, traffic accidents in Indonesia reached 103,645 cases in 2021, an increase of 3.62% from the previous year, which recorded 100,028 cases. Oral and maxillofacial fractures can take complex forms, depending on the mechanism of injury. The most common causes include traffic accidents, physical assaults, occupational injuries, sports-related trauma, and falls.[8]

The classification, pathophysiology, and biomechanics of facial fractures have been thoroughly discussed in the literature, guiding

Majalah Kedokteran Gigi Indonesia. April 2025; 11(1): 65-70
ISSN 2460-0164 (print)
ISSN 2442-2576 (online)

current approaches to fracture reduction and fixation. The evaluation of maxillofacial fractures should consider two primary components: (1) the anatomical structure and buttress system of the facial skeleton, and (2) the mechanism and pathogenesis of injury.[2,9]

Assessment of facial trauma begins with a primary survey, focusing on airway, breathing, circulation, and level of consciousness. In severe cases, urgent management is essential to address potential intracranial and extracranial complications. Once the patient is stabilized and ruled out for cervical spine or brain injury, a detailed evaluation of the maxillofacial region can proceed. Establishing an accurate diagnosis requires a comprehensive trauma history obtained through patient and eyewitness interviews, along with clinical and radiographic examinations. Additional background information, including the patient's pre-injury facial condition, occlusion, and functional status, can be critical to successful treatment outcomes. This information may be gathered from photographic documentation and medical records.[9,10]

The evaluation of multiple maxillofacial fractures includes subjective history-taking and a thorough physical examination supported by radiological modalities. The physical exam should be performed systematically, from forehead to chin and from the nasal tip to the occipital region, along with intraoral assessment to identify both soft and hard tissue injuries. Common findings include facial edema, hematoma, and lacerations on the forehead, orbital rim, nasal bridge, lips, and chin. Bony deformities may present as loss of nasal projection, midfacial depression, facial asymmetry, or vertical facial shortening. Special attention should be paid to the nasoethmoid region, the palate, ocular structures, and facial motor function, including the orbital rim and condylar processes. Intraoral examination helps detect hematomas, mucosal lacerations, and tissue avulsions. A condylar fracture may be suspected when crepitus, abnormal mandibular movement, or limited range of motion is observed upon palpation of the external auditory canal while the patient opens and closes their mouth.[7–9]

Computed tomography (CT) is now considered the gold standard for diagnosing maxillofacial fractures, surpassing conventional radiographic techniques such as Waters' view or skull X-rays. Transverse two-dimensional CT scans provide a detailed assessment of craniomaxillofacial trauma, free from the superimposed structures that limit traditional imaging. Coronal and sagittal views offer critical information about fractures of the orbital walls, maxillary sinuses, and mandible. Three-dimensional CT imaging enhances visualization of fracture lines, bone deformities, and displacement, enabling clinicians to establish accurate diagnoses and develop appropriate surgical plans.[9,11,12]

The thick regions of the maxillofacial skeleton, known as buttresses, provide structural support for overlying soft tissues. These vertical and horizontal buttresses vary in height, width, and anteroposterior projection, and they serve as key reference points for the placement of plates and screws during open reduction and internal fixation (Figure 6).[2,11,13]

The treatment of maxillofacial fractures often involves maxillo-mandibular fixation (MMF) to establish proper occlusion, which serves as a guide for intraoperative ORIF and supports postoperative masticatory function. One of the primary concerns in postoperative care is airway management, as multiple fractures may compromise both hemodynamic stability and the airway. In most cases of complex facial fractures, definitive airway management, such as nasal intubation or even tracheostomy, is required to

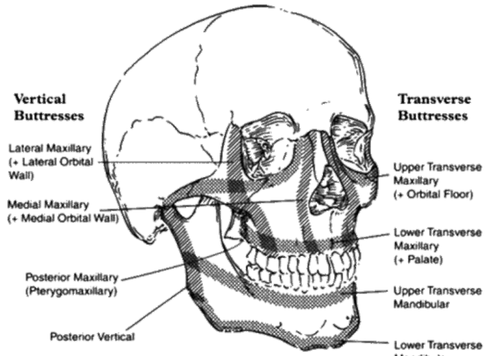

Figure 6. Facial buttresses (vertical and horizontal)[13]

secure the airway without interfering with fracture reduction and fixation.[6,7,14]

The sequencing of fixation in multiple facial fractures presents a clinical challenge and varies based on both clinical and radiological assessments.[6,7,15]: (1) Bottom-up approach: This technique begins with the restoration of the maxillo-mandibular unit, using occlusion as a guide. The mandible and maxilla are stabilized with semi-rigid or rigid fixation methods such as quick-fix plates or interdental wiring. Reconstruction proceeds superiorly in a "build-out" manner, using the stabilized maxillo-mandibular unit as a foundation for fixing other facial structures. (2) Top-down approach: This method starts with reduction and fixation at the upper third of the face and proceeds inferiorly. Although the sequence begins from the top, achieving proper occlusion with MMF remains essential and is completed prior to the rigid fixation of Le Fort I or mandibular fractures.

In the present case, the patient was diagnosed with a left orbital rim fracture, Le Fort II fracture, type V palatal fracture, symphyseal fracture, and right parasymphyseal mandibular fracture. Given the number and complexity of the fracture sites, an ORIF approach was selected to allow better visualization for debridement and more efficient fixation of the fractured bone segments using plates and screws.

The surgical procedure employed a bottom-up approach, beginning with the mandibular fractures due to their relatively stable and simple configuration. This allowed for easier reduction and provided a reliable reference base for subsequent fixation of the midfacial and upper facial fractures. This approach led to satisfactory esthetic and functional outcomes. The patient was later referred to the prosthodontics department for denture fabrication to replace the avulsed teeth.

Although the ORIF procedure was successful in achieving anatomical reduction and fixation, some challenges remained. Due to the position and complexity of the orbital floor fracture, the patient reported residual asymmetry in the orbital region. Nonetheless, the patient expressed satisfaction with the occlusion, restored masticatory function, and overall outcome. It is important to note that in other cases, a top-down approach may be more appropriate, especially when the frontal bone presents a simple linear fracture, the midface shows a Le Fort I fracture, and the mandible has a comminuted fracture. In such situations, beginning with the frontal bone can simplify reduction and fixation, allowing the procedure to proceed downward to the more complex mandibular fractures.[6]

CONCLUSION

A thorough understanding of maxillofacial anatomy is essential for surgeons treating facial fractures using a bottom-up approach. Based on our experience in this case, we conclude that a well-planned surgical strategy, emphasizing minimally invasive techniques and early intervention, can effectively reduce and stabilize fractures using miniplates, resulting in satisfactory esthetic and functional outcomes.

CONFLICT OF INTEREST

The author(s) declare that they have no conflict of Interests.

REFERENCES

1. Hupp JR, Tucker MR, Ellis E. Contemporary Oral and Maxillofacial Surgery E-Book. Elsevier Health Sciences, 2018.
2. Choi J, Lorenz HP, Spain DA. Review of facial trauma management. J Trauma Acute Care Surg. 2020; 88(4): e124. doi: 10.1097/TA.0000000000002589
3. Abouchadi A, Taoufik H, Nacir O, et al. Pan-Facial fractures: a retrospective study and review of literature. Open Journal of Stomatology. 2018; 8(4): 110–119. doi: 10.4236/ojst.2018.84010
4. Jang S-B, Choi S-Y, Kwon T-G, et al. Concomitant injuries and complications according to categories of pan-facial fracture: a retrospective study. J Craniomaxillofac Surg. 2020; 48(4): 427–434. doi: 10.1016/j.jcms.2020.02.018

5. Vijapur M, Ukken NJ, Kattimani V, Kumar DP, et al. Pan facial trauma fracture management: case report & literature review. Journal of Pharmaceutical Research International. 2022; 34(16B): 1–5.
doi: 10.9734/jpri/2022/v34i16B35735
6. Degala S, Sundar S, Mamata K. A Comparative prospective study of two different treatment sequences i.e. bottom up–inside out and topdown–outside in, in the treatment of panfacial fractures. J Maxillofac Oral Surg. 2015; 14(4): 986-994.
doi: 10.1007/s12663-015-0769-2.
7. Choi JW, Kim MJ. Treatment of panfacial fractures and three-dimensional outcome analysis: the occlusion first approach. J Craniofac Surg. 2019; 30(4): 1255–1258.
doi: 10.1097/SCS.0000000000005528
8. Chukwulebe S, Hogrefe C. The diagnosis and management of facial bone fractures. Emerg Med Clin North Am. 2019; 37(1): 137–151. doi: 10.1016/j.emc.2018.09.012
9. McCormick RS, Putnam G. The management of facial trauma. Surgery (Oxford). 2021; 36(9): 587–594. doi: 10.1016/j.mpsur.2021.07.004
10. Dar PMUD, Gupta P, Kaul RP, et al. Haemorrhage control beyond Advanced Trauma Life Support (ATLS) protocol in life threatening maxillofacial trauma – experience from a level I trauma centre. British Journal of Oral and Maxillofacial Surgery. 2021; 59(6): 700–704.
11. Dorafshar AH, Rodriguez ED, Manson PN. Facial Trauma Surgery E-Book: From Primary Repair to Reconstruction. Elsevier Health Sciences; 2019.
12. Ricci JA, Tran BNN, Ruan QZ, et al. Comparing head and facial computed tomographic imaging in identifying operative facial fractures. Ann Plast Surg. 2018; 80(4): S219-S222.
doi: 10.1097/SAP.0000000000001289
13. Hupp J, Tucker M, Ellis E. Contemporary Oral and Maxillofacial Surgery. Sixth. Mosby.
14. Daniels JS, Albakry I, Braimah RO, et al. Experience with airway management and sequencing of repair of panfacial fractures: a single tertiary healthcare appraisal in Najran, Kingdom of Saudi Arabia - A Retrospective Study. Ann Maxillofac Surg. 2020; 10(2): 402–408. doi: 10.4103/ams.ams_202_19
15. Kim J, Choi J-H, Chung YK, et al. Panfacial bone fracture and medial to lateral approach. Arch Craniofac Surg. 2016; 17(4): 181-185. doi: 10.7181/acfs.2016.17.4.181