

Management of Le Fort III Fracture: A Case Report and Review of Maxillofacial Surgical Treatment

Syarifa Nova Amiza Zam¹, Faizal Reza¹, Dinar Ali², Dela Martha Devi², Habib Rizqi Samdani²

¹ Department Oral and Maxillofacial Surgery, Faculty of Dentistry, University of Muhammadiyah Semarang, Indonesia

² Clinical Student, Faculty of Dentistry, University of Muhammadiyah Semarang, Indonesia

*Corresponding Author: drg.syarifahnova@unimus.ac.id

ARTICLE INFO : Received, April 12, 2024; Revised, August 4, 2024; Accepted, November 12, 2024; Published, December 16, 2024
ORCID : Zam SNA, ([0000-0002-7923-1017](https://orcid.org/0000-0002-7923-1017)); Reza F ([0009-0007-8930-0841](https://orcid.org/0009-0007-8930-0841)); Ali D ([0009-0003-7570-6542](https://orcid.org/0009-0003-7570-6542)); Devi DM ([0009-0006-3868-0111](https://orcid.org/0009-0006-3868-0111)); Samdani HR ([0009-0009-0513-8352](https://orcid.org/0009-0009-0513-8352))
DOI [10.24815/jds.v9i2.44429](https://doi.org/10.24815/jds.v9i2.44429)

ABSTRACT

Background: Maxillofacial trauma is a common occurrence, with midface fractures being serious injuries requiring thorough evaluation and appropriate management. Le Fort III fractures involve multiple fractures of the zygomatic bone, orbit, nasal bones, maxillary sinuses, and nasal septum. **Case Report:** A 36-year-old male presented to the emergency department of SULTAN FATAH Hospital, Demak, Indonesia with facial injuries following a traffic accident. The patient exhibited facial swelling, raccoon eyes, persistent nasal bleeding, and difficulty opening his mouth. A CT scan confirmed a Le Fort III fracture. Management included stabilization of the zygomaticomaxillary articulation, fracture segment repositioning via a gingivobuccal incision, and fixation with miniplates and screws. **Discussion:** The leading causes of maxillofacial fractures include traffic accidents, falls, physical assaults, sports injuries, and occupational hazards. The management of Le Fort III fractures involves early stabilization, anatomical reduction, and immobilization to ensure optimal recovery. Repositioning and fixation with miniplates and screws are essential for maintaining facial stability and occlusal function. **Conclusion:** Midface fractures require a comprehensive evaluation and appropriate treatment. This case highlights the importance of imaging for diagnosing Le Fort III fractures and the role of surgical intervention in restoring facial structure and function.

Keywords: Maxillofacial trauma, Le Fort III fracture, fracture management, anatomical repositioning, bone fixation.

ABSTRAK

Latar Belakang: Trauma maksilofasial sering terjadi, dengan fraktur sepertiga tengah wajah sebagai cedera berbahaya yang memerlukan evaluasi dan penanganan tepat. Fraktur Le Fort III melibatkan multipel fraktur pada tulang zygoma, orbit, hidung, sinus maksilaris, dan septum nasal. **Laporan Kasus:** Seorang pria 36 tahun datang ke UGD RS SULTAN FATAH, Demak, Indonesia dengan cedera wajah akibat kecelakaan lalu lintas. Pasien mengalami pembengkakan wajah, mata rakun, perdarahan hidung, dan kesulitan membuka mulut. CT scan menunjukkan fraktur Le Fort III. Penanganan dilakukan dengan stabilisasi zigomatomaksilaris, reposisi segmen fraktur melalui insisi gingivobukal, serta fiksasi menggunakan miniplate dan sekrup. **Diskusi:** Penyebab utama fraktur maksilofasial meliputi kecelakaan lalu lintas, jatuh, serangan fisik, cedera olahraga, dan kerja. Manajemen fraktur Le Fort III mencakup stabilisasi awal, reduksi anatomis, dan imobilisasi untuk pemulihan optimal. Reposisi dan fiksasi dengan miniplate serta sekrup diperlukan untuk menjaga stabilitas wajah dan fungsi oklusal. **Kesimpulan:** Fraktur sepertiga tengah wajah membutuhkan evaluasi menyeluruh dan penanganan yang tepat. Kasus ini menunjukkan bahwa diagnosis fraktur Le Fort III melalui pencitraan dan penanganan bedah yang sesuai dapat memulihkan struktur serta fungsi wajah pasien.

Kata Kunci: Trauma maksilofasial, fraktur Le Fort III, manajemen fraktur, reposisi anatomis, fiksasi tulang.

1. Introduction

Oral and maxillofacial trauma is a common occurrence. General dentists are often the first healthcare professionals consulted when patients experience oral cavity injuries.¹ Their role includes diagnosing and providing initial treatment for dentoalveolar trauma or referring patients to oral and maxillofacial surgery specialists when more complex management is required.² The current

approach to oral and maxillofacial trauma involves a multidisciplinary strategy to achieve optimal treatment outcomes.³

Fractures of the middle third of the facial bones are among the most frequently encountered and severe maxillofacial injuries.⁴ These fractures require thorough evaluation and appropriate management to restore function and aesthetics while preventing complications.⁵ In 1901, René Le Fort conducted experimental studies on cadaveric skulls, exposing them to varying degrees and directions of blunt trauma.⁶ His research demonstrated that fractures tend to occur in specific weak areas of the facial skeleton, following predictable patterns depending on the direction of the applied force. Le Fort's classification system, comprising Le Fort I, II, and III fractures, remains a cornerstone in maxillofacial trauma management. Fractures of the midface often coexist with Le Fort fractures, including palatoalveolar and mandibular fractures, both of which significantly impact occlusion and influence treatment planning.⁷

This paper presents a case of a 36-year-old male patient, referred to as Mr. S, who sustained severe facial injuries following a traffic accident. Upon arrival at the hospital, the patient exhibited multiple facial fractures and associated symptoms, including facial swelling, raccoon eyes, persistent nasal bleeding, and difficulty opening his mouth. A CT scan of the face confirmed the diagnosis of a Le Fort III fracture, characterized by multiple fractures involving the zygomatic bones, the medial walls of both orbits, the nasal bones, the anterior-medial and lateral walls of the maxillary sinuses, and the nasal septum. The management of such fractures requires careful assessment, stabilization, and surgical intervention to restore both functional and aesthetic aspects of the patient's facial structure.⁸

2. Case Report and Case Management

2.1 Case Report

A 36-year-old male patient presented to the emergency department of Sultan Fatah Hospital, Demak Regency, on June 16, 2023, following a traffic accident in which his motorcycle collided with a truck, causing him to fall face-first onto the road. According to his family, he was not wearing a helmet at the time of the accident. Upon arrival at the emergency room, the patient was in a somnolent state, with severe facial swelling, raccoon eyes, persistent nasal bleeding, and difficulty opening his mouth. His vital signs were stable, with a blood pressure of 141/83 mmHg, a temperature of 36°C, and a respiratory rate of 20 breaths per minute. Intraoral examination revealed fractured anterior maxillary teeth.

Figure 1 shows the image depicts a patient with severe maxillofacial trauma. Significant facial edema and hematoma are evident, particularly in the maxillofacial region. Extensive lacerations and abrasions are observed around the lips, cheeks, and nose, accompanied by active nasal bleeding (epistaxis), indicating a possible nasal bone fracture. A noticeable facial deformity suggests a complex fracture involving the zygomaticomaxillary complex or Le Fort fractures. Additionally, dentoalveolar fractures are apparent, with anterior maxillary teeth exhibiting fractures and avulsion, exposing soft tissues and underlying bone. The presence of periorbital ecchymosis (raccoon eyes) further indicates a potential skull base fracture or severe midface trauma. These findings suggest high-impact blunt force trauma, such as a traffic accident, necessitating further evaluation with a CT scan to assess the severity of fractures and determine the appropriate treatment plan.



Figure 1. Extraoral Condition Examination

A CT scan of the head and facial bones confirmed a Le Fort III fracture, characterized by multiple fractures involving the zygomatic bones, medial orbital walls, nasal bones, anterior-medial and lateral maxillary sinus walls, and nasal septum. Based on these findings, a provisional diagnosis of Le Fort III fracture was established, requiring immediate surgical intervention.

2.2 Case Management

The patient was initially managed following standard trauma protocols, focusing on airway stabilization, hemodynamic control, and bleeding management. Oxygen supplementation was provided, and nasal packing was used to control persistent epistaxis. Neurological evaluation ruled out traumatic brain injury, and the cervical spine was immobilized to prevent further complications.

After stabilization, definitive surgical intervention was performed. Open reduction and internal fixation (ORIF) was carried out using miniplates and screws to restore facial skeletal integrity. A gingivobuccal incision was made to expose the maxillary buttresses, and intermaxillary fixation (IMF) with arch bars and wires was applied to stabilize occlusion. Palatal fractures were realigned and secured with miniplates and screws, ensuring proper maxillary segment positioning. Additionally, soft tissue injuries were sutured, and the patient received antibiotics and analgesics for infection prevention and pain management.

Figure 2 report the image presents pre-operative CT scan and cephalometric radiographs of a patient with suspected Le Fort III fracture. The first and last images display standard radiographic projections, including anteroposterior and lateral skull views, which exhibit significant structural disruption in the midface region. The central images represent 3D reconstructed CT scans, providing a detailed visualization of the craniofacial skeleton from multiple angles, including frontal and lateral perspectives. These scans reveal multiple fractures affecting the zygomaticomaxillary complex, nasal bones, and orbital walls, consistent with a high-impact maxillofacial injury. The cephalometric view further emphasizes the displacement of the fractured segments and potential alterations in occlusion. These findings confirm the severity of the trauma and are essential for surgical planning and fracture management.



Figure 2. Pre-operatif of CT scan and cephalometry

Postoperatively, the patient was closely monitored for airway patency, facial swelling, and signs of infection. Follow-up CT scans and occlusion assessments confirmed proper fracture healing and facial symmetry. The patient was advised on maintaining oral hygiene, preventing further trauma, and attending scheduled follow-ups to ensure long-term recovery. This case underscores the importance of early diagnosis, prompt surgical intervention, and a multidisciplinary approach in managing Le Fort III fractures to achieve optimal functional and aesthetic outcomes.

3. Discussion

Maxillofacial fractures can result from various etiological factors, including falls, traffic accidents, physical assaults, sports injuries, and occupational hazards. Each of these causes presents unique injury mechanisms and associated risks. Traffic accidents are recognized as the most frequent cause of maxillofacial trauma, contributing significantly to morbidity and mortality worldwide.⁹ The dynamics of traffic accidents can be further classified based on the nature of the collision, such as motorcycle accidents, pedestrian injuries, bicycle-related trauma, and high-impact car crashes.¹⁰ Notably, motorcycle accidents contribute to the highest proportion of facial fractures, particularly in individuals not wearing helmets.¹¹

Work-related injuries also play a substantial role in maxillofacial trauma. The severity of injuries varies depending on the occupational setting, with construction workers, factory employees, agricultural laborers, and forestry workers being at the highest risk due to exposure to falling objects, machinery-related accidents, and high-altitude work environments.¹² Additionally, sports injuries, particularly from contact sports such as boxing, football, and martial arts, have been reported to cause significant fractures of the midface, including zygomatic, orbital, and nasal bone fractures.¹³

The treatment of maxillofacial fractures follows well-established protocols, emphasizing early definitive management, anatomical repositioning, and rigid fixation to ensure proper healing and functional restoration.¹⁴ Initial management of midface fractures, particularly Le Fort fractures, should adhere to the fundamental principles of trauma care, including airway stabilization, bleeding control, and evaluation of associated injuries such as cervical spine and neurological trauma.¹⁵ Le Fort III fractures necessitate stabilization of the zygomaticomaxillary articulation, given their extensive involvement of the midface skeleton.¹⁵

Surgical intervention for Le Fort III fractures is primarily performed using a gingivobuccal incision, facilitating exposure of the vertical buttress and repositioning of the fractured segments. Miniplates and multiple screws are commonly placed over the anterior maxillary bone to achieve rigid fixation, ensuring stability and occlusal alignment.¹⁶ Special care must be taken to prevent iatrogenic trauma to the tooth roots, as improper placement of fixation devices can lead to pulpal necrosis and root resorption.¹⁷ For palatal fractures, different surgical approaches are used depending on the fracture type. Sagittal-type palatal fractures are typically managed with arch bars and wires, which serve to stabilize the alveolar ridge and maxillary buttress. In contrast, transverse-type fractures require intermaxillary fixation (IMF) followed by miniplate and screw placement at the posterior alveolar ridge.¹⁸

Facial trauma frequently involves soft tissue injuries, dentoalveolar fractures, and skeletal disruptions, including zygomatic, maxillary, naso-orbital-ethmoid (NOE) complex, and supra-orbital fractures.¹⁹ In some cases, concomitant injuries to other organ systems may complicate management, requiring a multidisciplinary approach involving oral and maxillofacial surgeons, neurosurgeons, and otolaryngologists.²⁰ Despite advances in surgical techniques, the fundamental principles of fracture management have remained consistent since they were first described by Hippocrates more than twenty-five centuries ago. These principles include accurate reduction of fracture segments and immobilization during the healing phase.²¹ Recent studies emphasize the role of biocompatible fixation materials and regenerative approaches, such as biodegradable plates and stem-cell-based therapies, in improving fracture healing outcomes.²²

Maxillofacial fractures, particularly Le Fort III fractures, require comprehensive assessment and well-structured management strategies to optimize functional and aesthetic recovery. The most common cause of such fractures remains traffic accidents, with helmets and protective gear playing a crucial role in injury prevention. Proper surgical techniques, rigid fixation methods, and interdisciplinary collaboration are essential in ensuring successful treatment outcomes. Future research may focus on advanced biomaterials and digital surgical planning to enhance patient prognosis and long-term rehabilitation.

4. Conclusion

Fractures of the middle third of the facial bones are common and require thorough evaluation and precise management to ensure optimal functional and aesthetic outcomes. Maxillofacial fractures can result from various causes, including falls, traffic accidents, physical assaults, and occupational or sports-related injuries. In this case, the patient sustained a Le Fort III fracture, involving multiple fractures of the zygomatic bones, medial orbital walls, nasal bones, maxillary sinuses, and nasal septum. Management follows established guidelines, emphasizing early definitive intervention, anatomical realignment, and rigid fixation using open reduction and internal fixation (ORIF) with miniplates and screws. A multidisciplinary approach is crucial to address potential complications and ensure comprehensive patient care.

5. Acknowledgments

We sincerely thank the medical and surgical teams at Sultan Fatah Hospital, Demak Regency, for their expertise in managing this case. Appreciation is also extended to the radiology department for their detailed imaging assessments and to the patient's family for their cooperation. Lastly, we acknowledge our colleagues and mentors for their valuable insights and support.

6. References

1. Fonseca RJ. Oral and Maxillofacial Surgery-Inkling Enhanced E-Book: Oral and Maxillofacial Surgery-E-Book: Elsevier Health Sciences; 2017.
2. Moe JS, Abramowicz S. Diagnosis and Management of Dentoalveolar Trauma. *Oral and Maxillofacial Surgery, Medicine, and Pathology for the Clinician* 2023;101-11.
3. Mahashetty S, Swathi B, Reddy NV, Reddy MA. Interdisciplinary surgical management of maxillo-facial trauma in children. 2017.
4. Chukwulebe S, Hogrefe C. The diagnosis and management of facial bone fractures. *Emergency Medicine Clinics* 2019;37(1):137-51.
5. Ghosh R, Gopalkrishnan K. Facial fractures. *Journal of craniofacial surgery* 2018;29(4):e334-e40.
6. Rogers-Hoffman GM, Allen RC. Le Fort Fractures. *Smith and Nesi's Ophthalmic Plastic and Reconstructive Surgery* 2021:1271-84.
7. Nam AJ, Davidson EH, Manson PN. Assessment of the patient with traumatic facial injury. *Facial Trauma Surgery: Elsevier*; 2020. p. 1-15.
8. Gadzhaliyeva AR, Anzorova ER, Sayarsanova MV, Gostyaeva AA. Comprehensive rehabilitation of patients after injuries of the facial region: interaction of dentists and surgeons. *Cardiometry* 2024(33):102-09.
9. Abosadeh MM, Rahman SA. Epidemiology and incidence of traumatic head injury associated with maxillofacial fractures: A global perspective. *Journal of international oral health* 2018;10(2):63-70.
10. Wahi RR-h. Towards an understanding of the factors associated with severe injuries to cyclists in crashes with motor vehicles [Queensland University of Technology; 2018.
11. Fitzpatrick D, Goh M, Howlett D, Williams M. Bicycle helmets are protective against facial injuries, including facial fractures: a meta-analysis. *International journal of oral and maxillofacial surgery* 2018;47(9):1121-25.
12. Mersha H, Mereta ST, Dube L. Prevalence of occupational injuries and associated factors among construction workers in Addis Ababa, Ethiopia. *Journal of public health and epidemiology* 2017;9(1):1-8.
13. Lozada K, Kadakia S, Abraham MT, Ducic Y. Complications of midface fractures. *Facial plastic surgery* 2017;33(06):557-61.
14. Afzali P, Joy R, Smith J, et al. Free Papers-Oral Presentations. Paper presented at: 23rd International Conference on Oral and Maxillofacial Surgery, 2017.
15. Dreizin D, Nam AJ, Diaconu SC, et al. Multidetector CT of midfacial fractures: classification systems, principles of reduction, and common complications. *Radiographics* 2018;38(1):248-74.
16. Aliabadi E, Eskandari F, Zanjani M, Babouei M. Post-BSSO condylar position stability: a comparison of miniplate and lag screw fixation. *BMC Oral Health* 2024;24(1):728.
17. Moolla A, Gehrke SA. Dental Trauma and Adverse Oral Conditions: Practice and Management Techniques: BoD-Books on Demand; 2023.
18. Priscilla Valentin N, Budi AS, Zarasade L. Palate Fracture Profile in Plastic Reconstructive and Aesthetic Surgery of Dr. Soetomo General Academic Hospital: January 2012-December 2017. *Jurnal Rekonstruksi & Estetik* 2019;4(1).
19. Bitar G, Touska P. Imaging in trauma of the facial skeleton and soft tissues of the neck. *British Journal of Hospital Medicine* 2020;81(6):1-15.
20. Canzi G, Novelli G, Talamonti G, Sozzi D. Updates in the management of complex craniofacial injuries. *The High-risk Surgical Patient: Springer*; 2023. p. 815-38.
21. Scott H, Marti J, Witte P. Fracture fixation methods: principles and techniques. *Feline Orthopaedics: CRC Press*; 2022. p. 61-87.
22. Łuczak JW, Palusińska M, Matak D, et al. The future of bone repair: emerging technologies and biomaterials in bone regeneration. *International Journal of Molecular Sciences* 2024;25(23):12766.

Authors Contribution

Contribution	Zam SNA	Reza F	Ali D	Devi DM	Samdani HR.
Concepts or ideas	√				
Design	√				
Definition of intellectual content	√	√	√	√	√
Literature search	√			√	√
Experimental studies	√	√	√	√	√
Data acquisition	√			√	√
Data analysis	√	√	√	√	√
Statistical analysis					
Manuscript preparation	√	√	√	√	√
Manuscript editing	√			√	√
Manuscript review	√	√	√	√	√



JDS (Journal of Syiah Kuala Dentistry Society) is an Open Access Journal licensed under a Creative Commons Attribution-ShareAlike 4.0 International License. This license authorizes the utilization, replication, modification, distribution, and reproduction of the article in any medium or format, provided that due credit is given to the original Author (s) and the source, a link to the Creative Commons license is provided, and any alterations made to the article are duly indicated.

Citation Format: Zam SNA, Reza F, Ali D, Devi DM, Samdani HR. Management of le fort iii fracture: a case report and review of maxillofacial surgical treatment. J Syiah Kuala Dent Soc. 2024; 9(2): 147–152.

Publisher's Note: The authors of this article assert that all claims made herein are exclusively their own and may not necessarily reflect the views of their respective affiliated institutions or those of the publisher, editors, and reviewers. The publisher does not provide any guarantee or endorsement for any product subject to evaluation in this article or any claim made by its manufacturer.