

Treatment of Maxillary and Zygoma Fractures Involving Head Injury: A Case Report

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Abstract: ***Introduction:** Head injuries often accompany maxillofacial trauma. Neurologic assessment needs to be done in head trauma to determine the severity of the head injury. Careful examination and treatment are necessary for maxillofacial fractures involving head injuries to prevent further complications. **Purpose:** Writing this case report is to report and discuss the management of maxillary and zygoma fractures accompanied by head injuries due to motorcycle accidents. **Case report:** A 32-year-old female patient complained of facial and jaw injuries due to an accident while riding a motorbike at moderate speed. On clinical examination, facial asymmetry was found with edema and hematoma in the superior and inferior palpebral areas, Anterior open bite occlusion without difficulty opening the mouth. The CT scan showed the impression of multiple fractures of the facial bones without any signs of intracranial hemorrhage. The patient was diagnosed with Mild head injury, left frontal fracture, zygoma complex fracture, and maxillary fracture. Treatment, in this case, included observation of head injury, wound debridement, and ORIF of the zygoma and maxillary fractures. **Conclusion:** Treatment of maxillofacial fractures accompanied by head injuries must be prioritized in assessing and treating head injuries. Treatment of facial bone fractures involving the zygoma and maxilla with Open reduction internal fixation obtains good results both functionally and aesthetically.*

Keywords: maxillofacial trauma, head injury, zygoma fracture, maxillary fracture

1. Introduction

Oral and maxillofacial trauma caused by a significant impact is almost always accompanied by head and neck trauma. Its management must be carried out in an integrated and comprehensive manner. The leading cause of trauma in Indonesia is traffic accidents. In patients with head trauma, emergency management is carried out according to Advanced Trauma Life Support. Trauma management begins with a primary survey and treatment, followed by a secondary survey. Impact on the bone can cause injury to one or several layers of the skull bone. The skull consists of 3 layers: outer tabula, diploe, and inner tabula. The consequences of the collision are determined by several things, including the magnitude of the impact force, the direction of the impact, the geometric shape of the object that hit, and the location of the impacted skull bone.^{1,2}

The initial management of the trauma patient requires a systematic approach. The primary survey is designed to identify and correct life-threatening conditions and requires assessing airway, respiration, circulation, and disability. A variety of factors can influence neurological assessment. A neurological assessment can be performed using the Glasgow Coma Scale (GCS), which can help determine the severity, treatment, and prognosis of a patient's head injury.³ The Glasgow coma scale objectively describes the extent of impaired consciousness in all types of medical and acute trauma. This scale assesses patients based on aspects of responsiveness seen from the eye-opening, motor, and verbal responses.⁴

Head trauma has more severe consequences and requires early treatment. There are three classifications of head injuries based on the GCS score, namely Mild Head Injury, Moderate Head Injury, and Severe Head Injury. Most cases of head trauma are Mild Head Injuries. This patient can be discharged if the neurological examination results are normal, with minimal risk of developing intracranial lesions. Consideration for observation for 4 to 6 hours if the CT scan does not show an intracranial lesion. The risk of head injury increases as the incidence of maxillofacial fracture increases and the GCS value decreases. Patients with maxillofacial fractures should be carefully evaluated to determine if there is a head injury and to reduce the incidence of mortality ratio.^{3,5}

The proximity of the maxillofacial bone to the cranium indicates a possibility of cranial injuries that can co-occur in cases of head trauma. Previously, it was thought that the bony structures of the face could cushion shocks to the head to protect the neurocranium from severe injury. Currently, based on the statistical results of the association between head injuries and maxillofacial trauma, it is found that facial fractures do not prevent head injuries but can be a marker of the possibility of head injuries.³

Fractures occurred most often due to acts of violence (35.6%) or motor vehicle accidents (20.7%), with an average age of 37.8 years. The incidence of fractures of the left zygomaticomaxillary complex is about 6.7%, while the right side is 24.5%.⁶ Signs and symptoms of zygomaticomaxillary complex fractures include pain on pressure, ecchymosis, edema in the protruding area of the zygomatic bone, lateral

orbit, upper eye fold, and below, loss of shape of the zygomatic bone.⁷

This complex zygomaticomaxillary fracture can be treated by internal fixation using a plate and screw via a vestibular approach. 3-point fixation for the treatment of zygomaticomaxillary fractures is recommended.⁸ Surgical treatment of zygomatic fractures may pose a risk of visual disturbances on the surgical side. In addition, if the fracture reduction is inadequate, the anatomy of the zygomatic complex will be unstable.³ The purpose of writing this case report is to report and discuss the management of maxillary and zygoma fractures accompanied by head trauma due to motorcycle accidents.

2. Case Report

A 32 years old female patient came to Hasan Sadikin Hospital in Bandung complaining of injuries to her face and

jaw. About seven days earlier, the patient had an accident while riding a motorbike in the Cikubang area at a moderate speed. The patient loses balance after avoiding a pedestrian passing by; then, the patient falls because his face hits the asphalt first. The patient was taken to a private clinic in the Cikubang area, but no treatment was performed; then, he was referred to a private hospital and was treated for two days and was referred to Oral Surgery at Hasan Sadikin Hospital. History of fainting (-), nausea, and vomiting (-). History of bleeding from the mouth (+), bleeding from the nose (+), history of bleeding from the ears (-), and history of alcohol intoxication (-).

Extra oral examination of the face was asymmetrical, and there was edema and hematoma in the left upper and lower lid areas (figure 1). On intra-oral examination, an open bite occlusion was found on the anterior (open bite anterior) without difficulty opening the mouth. There is a hematoma in the area of the left palate that is bluish-red (figure 2).



Figure 1: The face looks asymmetrical, with edema and hematoma in the left and superior palpebral areas.



Figure 2: Intraoral occlusion, anterior open bite, left palatal hematoma



Figure 3: Intraoral after arch bar placement, anterior open bite occlusion

On CT scan of the head without contrast, there were impressions of fracture of the left maxillary and zygoma bones, left orbital rim inferior margin, anterior and posterior walls of the left maxillary sinus, right anterior maxillary

wall, left ethmoid bone and left frontal bone. Bilateral maxillary hematosinus and left ethmoid, bilateral turbinate hypertrophy, and no signs of intracranial hemorrhage (figure 4).

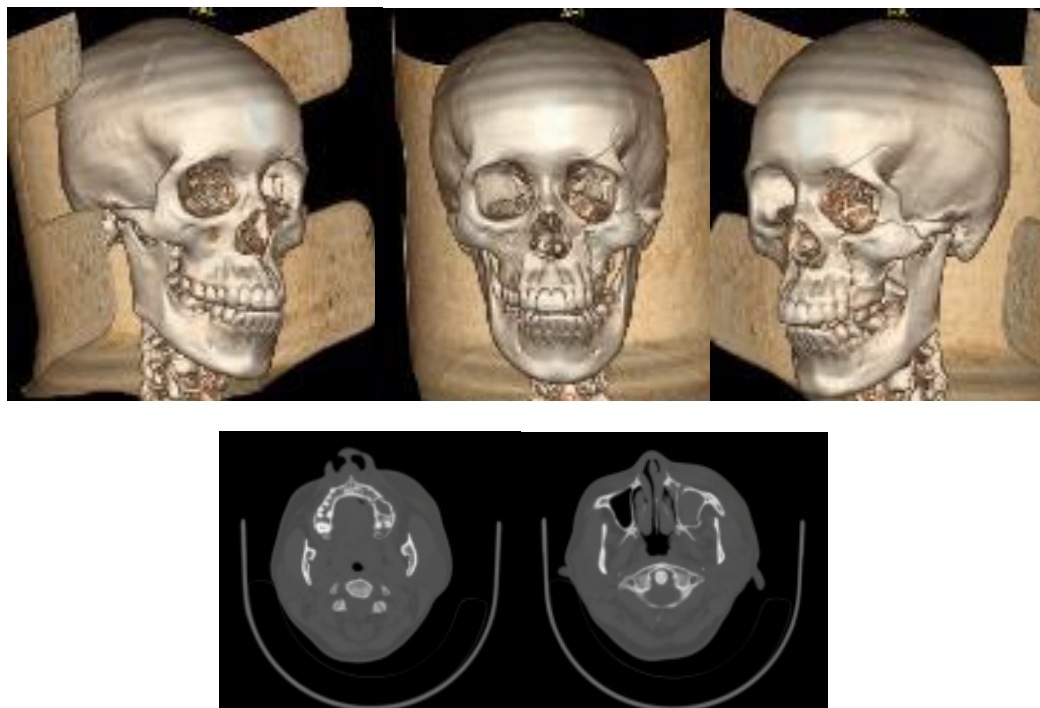


Figure 4: CT scan of the head shows the fracture line of the left maxillary bone, left zygoma, left orbital rim inferior margin, left ethmoid bone, and left frontal bone.

The patient was diagnosed with Mild head injury, left frontal fracture, zygoma complex fracture, and maxillary fracture. Treatment, in this case, was wound debridement, open reduction internal fixation for maxillary and zygoma fractures with an incision through the vestibule approach and lateral eyebrow incision, and installation of IMF, which was maintained for 21 days. IMF is opened for control visits every week to allow patients to train their jaw muscles by opening and closing their mouth movements before they are re-attached to IMF, then IMF and IDW are released after 21 days. Internal fixation uses a 3-hole plate with two screws in the left frontal region, a 6-hole L plate with 4 6 mm screws,

four holes with two screws, and a 3-hole plate with two screws in the left zygomaticomaxillary region (figure 5). The patient received postoperative medication in the form of Ceftriaxone injection 2x1 gram intravenously, Ketorolac injection 2x30 milligram intravenously, Omeprazole injection 2x40 milligram intravenously, and Dexamethasone injection 3x5 milligram intravenously, mouthwash containing hyaluronic acid and chloramphenicol to treat intraoral and extraoral scars. The patient signed an informed consent agreement for treatment measures and approval to publish scientific activities.



Figure 5: Intra-operation shows the installation of plate and screw fixation, as well as IMF rubber



Figure 6: Postoperative day 2 the face still looks oedematous and the occlusion is normal with resistance



Figure 7: Postoperative control day 21, facial oedema is no longer visible, and occlusion is normal.

During the 21st day of control, the patient's oral cavity condition showed significant improvement. The patient can close both jaws until they meet; no open bites were found (figure 7). The patient can also open and close his mouth normally.

3. Discussion

According to the GCS assessment, mild head trauma is included in the score of 13-15. This condition cannot be ignored because this condition is often found can result in severe morbidity and even mortality, depending on the history of trauma, history of health status, and physical and neurological examination of the patient while in the hospital. Mild head trauma is caused by direct impact or by the effects of encephalic deceleration, which causes temporal and spatial disorientation, post-traumatic amnesia, or unconsciousness for up to 20 minutes. Patients who come to the Emergency Department with GCS 13-15 are usually not

accompanied by neurological lesions.⁸ In cases of maxillofacial trauma accompanied by minor head injuries, as in this patient, the initial assessment must be carried out comprehensively and accurately, involving multidisciplinary. Head injuries need to be prioritized before the treatment of maxillofacial fractures. Examination of patients with head injuries accompanied by maxillofacial fractures consists of 3 stages, initial examination and treatment of life-threatening conditions, general clinical examination of the patient, and local examination of the maxillofacial and cervical areas.^{9,10}

In this case, the treatment of facial fractures was carried out after the head injury status was declared clear by the neurosurgery department after being observed for approximately 8 hours. Patients with maxillofacial trauma with or without fractures are always at risk for developing traumatic brain injury. Therefore, all patients with maxillofacial injuries must undergo neurosurgery

observation with periodic follow-ups.¹¹ Further management is carried out on the part of the fractured facial bone. High-energy trauma to the face usually causes comminuted facial fractures. In this type of trauma, nasal and orbital fractures occur together with Le Fort fractures. The bony pillars of the facial skeleton can absorb a large amount of force in the direction of this force originates from below and flows along its lines. However, these columns crack easily when the force is perpendicular. Significant damage to soft and hard tissue occurs according to kinetic energy intensity. The most common subgroups of high-energy trauma facial injuries can be classified as gunshot and motor vehicle crash injuries. The most common facial fractures in this type of trauma are the nasal, orbital, maxillary, zygomatic, and mandibular bones.¹²

Based on anamnesis, physical examination, and supporting examinations, this case was diagnosed with a mild head injury. Head injuries are one of the leading causes of death and disability in the productive age group, and most occur due to traffic accidents. The initial management of head-injured patients aims to monitor as early as possible, prevent secondary head injuries, and improve general conditions as optimally as possible so that they can assist in healing diseased brain cells. Cerebral contusions, hematomas, and diffuse axon injuries are included in the group of primary head injuries. In contrast, secondary head injuries consist of changes that occur after a trigger (primary injury): systemic hypotension, hypoxia, and increased intracranial pressure. In mild head injury cases, observation for at least 4 to 6 hours is considered if no intracranial lesions are found.^{5,12}

Zygoma is the protruding bone in the face and will experience the most potent impact force on a traumatized face. The zygomatic bone is intimately associated with the maxillary, forehead, and temporal bones. Because these bones are usually involved when the zygomatic bone is fractured, it is more accurately termed a complex zygomatic fracture.³ ZMC fractures may be characterized by swelling with periorbital hematoma and subconjunctival hemorrhage, asymmetric facial contours, crepitus, and nosebleeds on the fracture site. The zygomaticomaxillary complex (ZMC) has an essential role in the face's structure, function, and aesthetic appearance. The ZMC provides normal cheek contour and separates the contents of the orbit from the temporal fossa and maxillary sinus. The Zygoma is the attachment site for the masseter muscle. Therefore its damage will affect the mastication process.^{3,12} In this patient, there were bone discontinuities in the four supporting walls of the left Zygoma: zygomaticomaxillary, frontozygomatic, zygomaticosphenoid, and left zygomaticotemporal.

In this case, depression was found in the zygomatic bone, which is one of the indications for fracture treatment with open reduction. The incision was made through a lateral eyebrow incision and vestibular approach. The lateral eyebrow incision approach can be used to reach the zygomaticofrontal suture. The brow area lacks essential neurovascular structures, and the scar can be camouflaged because it is on the brow line. The vestibular approach is used in the majority of midfacial fractures and can be used to access the zygomatic arch to the infraorbital rim. This approach is necessary for the visualization of the

zygomaticomaxillary buttress, and in this approach, access can be performed quickly, and complications are minimal.⁶ In zygomaticomaxillary fractures with displacement of the fracture fragments, treatment with reduction and fixation is required. The goal is to achieve skeletal fixation while minimizing morbidity to the facial soft tissues.⁸

Complications in zygomaticomaxillary injuries include soft tissue dehiscence, hematoma or seroma, lymphedema, and the presence of scars. In addition, paresthesia of the infraorbital nerve can also occur due to interference with the nerve, which may be caused by compression, edema, ischemia, or laceration.¹³ Complications in the surgical treatment of complex zygomatic fractures include diplopia, enophthalmos, extraocular muscle entrapment, facial asymmetry, malar prominence flat, neurosensory disturbances in the infraorbital nerve, malocclusion, and limited mandibular movement. These complications can arise from initial trauma, surgical intervention, or inaccurate surgical treatment.³

In this case, the patient underwent interdental and intermaxillary wiring to maintain the position of the teeth and jaws in their anatomical position. Intermaxillary fixation is maintained for some time in a closed jaw condition.¹³ Intermaxillary fixation or maxillomandibular fixation is a technique of immobilizing the mandibular segment by locking the occlusion from the external using the teeth as a stable point.¹⁴ The maxillary arch bar can be removed after 6-8 weeks of installation.¹³ Patients with fractures The maxillary zygomatic complex (ZMC) may experience edema, subconjunctival hemorrhage, periorbital edema, and enophthalmos.¹⁵ According to the patient's condition, in this case, there was a left periorbital area hematoma in left zygomatic and maxillary bone fractures. As many as 4-12% of ZMC fractures result in major ocular injuries, and as many as 63% results in minor ocular injuries. Assessment by an ophthalmologist should be considered if an open globe injury, lens dislocation, retrobulbar hematoma, or hyphema is suspected. The best way to perform an assessment is to use your fingers combined with a CT scan to diagnose facial fractures, especially in the maxillary and mandibular areas.¹⁵ Treatment of fractures with moving or displaced fragments can be treated with open reduction internal fixation (ORIF)¹⁶, as was the case in this case.

4. Conclusion

The assessment and treatment of head injuries must prioritize the treatment of maxillofacial fractures accompanied by head injuries. Treatment of facial bone fractures involving the zygoma and maxilla with Open reduction internal fixation obtains good results both functionally and aesthetically.

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