MANAGEMENT OF FACIAL BONE FRACTURES WITH FRONTONASAL OPEN HEAD INJURY: CASE REPORT

Albertin Jane Tanusantoso†,1, Seto Adiantoro*, Endang Sjamsudin** and Harmas Yazid Yusuf**

†Department of Oral and Maxillofacial Surgery, RSUP Dr. Hasan Sadikin, Faculty of Dentistry, Padjadjaran University, Bandung 40161, Indonesia;
**Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Padjadjaran University, Bandung 40161, Indonesia.

ABSTRACT

Introduction: Patients with a facial fracture with open depressed frontal fracture and head trauma required prompt management. Delayed management of head trauma caused massive bleeding, infections, damage to brain function, or even caused by death. This case report aimed to explain the emergency treatment of facial trauma accompanied by an open depressed frontal bone. Case report: A 34-year-old female patient came with bleeding from the mouth to Hasan Sadikin Emergency Department ± 1 day before admission, she had a history of the traffic accident. Extraoral examination there was edema at the facial region, post situational suturing at frontonasal, left palpebra and lower lip region, and lacerated wound at left palpebra region. Intraoral examination there was an open bite, hematoma, and edema at the upper lip, gingiva, and vestibule region. The patient was diagnosed with a facial fracture with open depressed frontal fracture and head trauma. This article will be reported a case about the management of open depressed fracture frontal with facial fractures by controlled bleeding to prevented aspiration. After the emergency management, the patients are treated at the ward for 4 days and the management of facial fractures by open elective reduction with internal fixation (ORIF). Conclusion: Immediate and appropriate treatment of facial trauma accompanied by head injury at the frontal region can prevent complications and morbidity of the patient.

KEYWORDS
Facial fractures, open depressed frontal fracture, elective ORIF

Introduction

In developing countries such as Indonesia, the incidence of a traffic accident that causes head injuries were high in numbers. The incidence of head trauma is 27% of all accidents involving pedestrians and is dominated by children and the elderly. Whereas for motorcycle riders, the incidence of head injury is up to 75%, which is dominated by the age group of adolescents and young adults. The incidence of head injury is one of the causes of the high mortality rate in the young adult age group, following heart disease and malignancies.[1]

Head injury is a mechanical trauma to the head that occurs either directly or indirectly which may result in impaired neurologic function, physical function, cognitive, psychosocial, either temporarily or permanently.[1] These head injuries often involve other injuries in the maxillofacial area. This occurs based on the mechanism of trauma to the head and face area.

Skull fracture is the result of blunt trauma or penetration. This fracture can be categorized into linear cranial base fractures and depressed fractures. The relatively weak sites at the cranial base are the sphenoid sinus, foramen magnum, the temporal connection with the petrocldeum, and the inner sphenoid ring. Cranial base fractures with torn dura are very prone to infection and may result to fistules in the dura mater marked by leakage of cerebrospinal liquid (LCS) shown as bleeding from the ear (retro auricular or echymosis battle sign) nose and eyes (racoon eyes), describing the presence of lesions on the ear, nose and eyes with possible baseline fractures of the cranial, which can also be known from the occurrence of rhinorrhea or otorrhea due to leakage from LCS. This is confirmed by conducting a hallow test to determine whether or not blood coming out of the nose
Depressed fracture of the skull is a fracture caused by forces localized in one place on the head (Figure 1). If the force is great enough or concentrated in a narrow area, the bone is pushed down, resulting in a depressed fracture. This situation depends on the amount of collision and flexibility of the skull. It is called an open depressed fracture if a scalp laceration is present and is deep enough that the bone fracture fragment could be seen. In cases of open depressed fractures, emergency surgery (craniectomy debridement) must be carried out immediately given the risk of intracranial infection. Surgery should be carried out before 24 hours.

Clinical manifestations of facial injuries may present as lateral periorbital oedema as well as ecchymosis, giving rise to racoon sign. A form of malocclusion that often occurs is an open bite. The steps that occur can be palpated on the base of the orbit and nasofrontal sutures. Blow out fractures (orbital base) often accompany these fractures. Rhinorrhea and otorrhea can be found due to the tear of the dura mater. Epistaxis is also often found.

The main purpose of emergency treatment for open depressed fractures is removing bone fragments that are contaminated with foreign objects such as sand, other impurities, debridement of the scalp (SCALP - skin, connective tissue, aponeurosis or galea aponeurotica, loose connective tissue and pericranium), dura mater and brain, and closing of the dura with continuous water-tight suture if the dura is torn. Closing the dura is important to prevent CSF leakage from the wound, preventing herniation of the brain to the fracture area. Dura mater also acts as a barrier against bacteria. Meanwhile, the purpose of facial bone fracture treatment is maximum rehabilitation of the patient, rapid bone healing, normalizing the occlusion and mastication function, improvement of speech function, achieving aesthetic arrangement of the teeth and face. Internal fixation with bone plates and screws and fixation of bone segments in three dimensions and various sizes will result in good stability of post-operative conditions.

**Case report**

A 34-year-old female patient presents with bleeding from the mouth after an accident. ± 1 day before admission, the patient was driving a motorcycle with the medium speed at Karawang. On the way down, the brake was broken so she lost her balance the fell with mechanism her head hit a wall in front of her. The patient has a history of using helmet (half face) and there was unconsciousness for ±30 minutes, but there was no nausea and vomiting. There was no bleeding from the ear or nose, but there

**Figure 2:** Clinical appearance of extraoral examination open depressed of frontal bone fracture and facial bone fracture; A. Lateral right view; B. Frontal view; C. Lateral left view.

**Figure 3:** Clinical appearance of intraoral examination A. Hematoma and edema on the upper lip, upper vestibulum and buccal along with lacerated wound on the lower lip, gingiva, and upper vestibulum; B. Hematoma on the upper lips and lacerated wound on the upper vestibulum.

**Figure 4:** Frontal and lateral head 3D CT scan examination (a) the fracture line on the frontal, (b) fracture of orbital rim bone medial aspect, (c) fracture of nasal bone, (d) fracture of left zygomaticomaxillary bone (e) fracture of left maxilla.

**Figure 5:** CT scan shows discontinuity on the frontal.
was bleeding from her mouth, then the patient was brought to a public hospital in Karawang area for head CT scan, blood examination, fluid resuscitation and injection of medicine, then the patient was referred to the Hasan Sadikin Hospital Emergency Department, Bandung for further treatment.

In Hasan Sadikin Hospital Emergency Department, the patient underwent an examination of primary survey (principles of ATLS) and fluid resuscitation by the Neurosurgery Department and followed by a secondary survey. The patient was diagnosed with mild head injury with open depressed frontal bone <1 tabula fracture and 1/3 medial of the left clavicle fracture. Then the patient was consulted to the Oral and Maxillofacial Surgery Department for oral bleeding and multiple facial fractures.

Extraoral examination we found bleeding mouth, oedema and hematoma in the bilateral periorbita, oedema in the left cheek and post situational suturing in the frontonasal, left palpebra and lips. Intraoral examination showed oedema and hematoma of the upper lip, vestibulum and buccal mucosa, lacerated wound on the lower lip, gingival tooth 23, and dental vestibulum 21-23 (Figures 2 and 3).

On palpation at left periorbita, there were crepitation in the right orbital rim bone, left zygomaticomaxillary and the movement of bone fragments in the nasal region. In the head CT scan 3D there was fracture lines at left orbital rim medial aspect, nasal left zygomaticomaxillary, and left maxilla bones (Figure 4).

Emergency treatment from neurosurgery department were closed observation and resuturing at the frontal area. The prior CT scan showed a frontal bone discontinuity (Figure 5).

Emergency treatment from the oral and maxillofacial surgery department was oral wound debridement, suturing the intraoral lacerated wound and resuturing at the extraoral region, and interdental wiring using erich bar. Then the patient was hospitalized for 4 days for closed observation by neurosurgery department then subsequently treated for 4 weeks by the neurosurgery to observe the bone healing process and complications of depressed frontal bone fracture. Once the patient was stable, she has planned a definitive treatment of facial bone fractures by

the oral and maxillofacial surgery department for doing open reduction internal fixation (ORIF) electively under general anesthesia.

This ORIF treatment was done when the patient’s condition has recovered (GCS 15) and there was healing at the cranial base (conservative therapy of the neurosurgery department). Open Reduction Intermaxillary Fixation (ORIF) and refracturing of bone fractures were performed on the 90th day. This elective ORIF is performed to treat the maxillary fracture, an incision was made from the intraoral maxillary vestibule. After dissection, the left maxilla fracture was seen and had undergone a callus formation. The fracture line was then refracted to adjust reposition to normal centric occlusion.

After occlusion was obtained, the occlusion maintained by placing maxillomandibular fixation, proceeded with the repositioning of the fracture fragments and bone plate and screw (Miniplate) placement above the maxillary region (figure 6).

On the first day after surgery, we didn’t do Intermaxillary fixation (IMF) to prevent aspiration if the patient was vomited. Starting on the second day after surgery, the IMF was applied with an elastic rubber band for two days to find the right centric occlusion position (Figure 7). On the 3rd day, the IMF rubber was replaced with a wire (Figure 8) for 6 weeks to immobilize the jaws to achieve bone tissue healing.

During the follow-up, the patient was instructed to perform selective grinding to correct the occlusion (maxillary and mandibular tooth contact). The patient then had no longer complained about teeth contact, and the treatment was declared complete. On the 30th day after surgery, we got a good occlusion (Figure 9), so the IDW and MMF were out and the treatment was finished.

Discussion

The incidence of facial bone fractures range from 3% in mild head injuries to 65% in severe head injuries and might be associated with damage at the dura mater or the underlying brain. Depressed fractures generally occur when an impact is applied to a small contact area and generally result in damage to the cortical area, accompanied by skin laceration (soft tissue). Complications that are commonly found are neurological deficits and seizures, depending on the location. More than 50% of cases of depressed fractures occur in the frontal area and require treatment based on cosmetic indications. Conversely, an open fracture is an emergency and requires closure of the dura mater immediately because of the increased risk of bacterial proliferation after more than 3-4 hours.[1,4]

Facial bone fractures, especially midfacial bone fractures, are often associated with skull base fractures in the form of frontonasal complex or depressed fracture of the frontal bone. If there was direct pressure on the frontal region, there would be a frontal fracture on thin plates of frontal bone such as ethmoid, medial wall and the base of the orbital complex. The severity of facial trauma depended by the structure of the affected bone, resistance and energy absorption and the mechanism of trauma to the head.[15] Diagnosing facial bone fractures requires a careful history of trauma, physical examination and radiographic evaluation. Detailed information pertaining to the condition of the patient’s face, occlusion and function before the trauma is needed. This can be obtained through photographic data and dental medical records.[5,12,13]

In this case, clinical and radiographic examination showed fractures on the facial bone and the cranial base on the frontal region with an open wound on the face. The emergency management at the emergency ward was wound care to manage the bleeding and prevent the infection as well as temporary fixation and immobilization of the maxillary fractures so as not to aggravate bone fragments and cranial base.[15]

Depressed fractures of the skull are when the external tabula of the fracture is located under the internal tabula of the surrounding bone or even deeper, coupled with an open fracture, requires surgery if the damage to the skull reaches the bone tissue. The treatments was varied from local debridement and suturing at the emergency department to cranietomy debridement at the operating room under general anesthesia. Therefore, the closure of the wound, even if it is temporary, is done immediately at the emergency department or before referral to a trauma center. Press bandage is often insufficient to prevent bleeding from large skull injuries. Temporary closure with staples using local anesthesia can be done quickly and effectively to stop the bleeding.[4]

The definitive treatment, in this case, was performed ORIF and refracturing the maxillary fracture on the 90th post-trauma day with consideration of the complications and infection of the depressed frontal fracture by a neurosurgeon. After the closure of the frontal bone was done, and the absence of infection was assessed, the patient was scheduled for ORIF treatment and refracturing, which aimed to correct the patient’s occlusion. Postoperative care was conducted by monitoring the patient’s general and neurological conditions. Stitches were removed on the fifth to seventh day.

The use of occlusion importance as a guide was first written by Salerno in 1180, whereas maxillomandibular fixation was first introduced in 1180. Chopart and Desault then used prostheses to immobilize the fracture segments. Gugliemo Salicetti was the first to use intermaxillary fixation, orthodontic band and arch for intermaxillary fixation. However, Gilmer attempted to improve the treatment of fractures with maxillary and mandibular fixation using arch bar.[11]

Gradual treatment must be considered if facial bone fractures involve the maxilla and other facial bones such as the mandibular bone, beginning with the reduction of the mandibular fracture first, then proceeding with the reduction of the maxillary fracture. This way, it is easier to perform reduction and to restore occlusion as before.[5,13]. Knowledge of occlusion is the basis of treatment for maxillary and mandibular fractures.[14] Discontinuity defects can be treated with maxillomandibular fixation both internally, with intraosseous wiring; bone plates and screws; lag screws, and externally. The closed and opened method of wire requires the use of intermaxillary fixation (IMF) for an average of 6 weeks in order to achieve satisfactory healing of the fracture. Difficulties arising from the long use of the IMF include airway problems, poor nutrition, weight loss, poor oral health, difficulty in speaking, insomnia, social life disturbance, job loss, difficulty to return mouth opening to normal again.[11]

In contrast, the use of rigid or semi-rigid fixation in mandibular fractures may result in gaining normal mobilization and jaw function earlier, controlled airways, better nutritional status, the ability to talk, better oral health, and patients are more comfortable.[11]

Conclusion

Emergency management for open depressed frontal fractures and facial bone fractures were carried out simultaneously, quickly and precisely to prevent the occurrence of shock, in-
fection (sepsis), and decreased consciousness. The definitive treatment of facial bone fractures can be postponed until the patient reaches a stable condition and has improved regarding the cranial base fracture. Occlusion is a priority in the management of maxillofacial fractures. In this case, the patient’s centric occlusion was achieved with open reduction internal fixation using miniplate fixation on the fracture line, interdental wiring with erich bars, and intermaxillary fixation (IMF), and postoperative selective grinding.

**Conflict of Interest**

All authors stated that no conflict could influence their participation in this case report.

**References**

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