Cerrahpaşa Med J 2023; 47(S1): 69-71 INVITED REVIEW

Facial Injuries in Disaster and Earthquake Treatment

Ersin Yavuz, Anıl Demiröz

Department of Plastic, Reconstructive and Aesthethic Surgery, İstanbul University-Cerrahpaşa Cerrahpaşa Faculty of Medicine, Istanbul, Turkey

Cite this article as: Yavuz E, Demiröz A. Facial injuries in disaster and earthquake treatment. *Cerrahpaşa Med J.* 2023;47(S1):69-71.

Abstract

Facial injuries are commonly observed in multitrauma patients. Due to vast blood supply, primary closure should be performed as quickly as possible to prevent infection and blood loss. Although facial fractures can be mostly electively operated on, emergent interventions may be necessary in cases where airway is compromised or visual loss is suspected.

Keywords: Earthquake injuries, facial injury, maxillofacial fracture

Introduction

Facial injuries constitute an important percentage of earthquake-related traumas. Due to lack of protective properties, face is prone to damage during trauma. Facial injuries may be presented in various forms, from simple abrasions or lacerations to complex injuries characterized by soft tissue losses or bone fractures. The importance of treatment in facial injuries is not only to save the life of the patient. It is of great importance to prevent secondary bad results.

Diagnosis

General Examination

First aid and triage organization is essential for the medical care of those trapped under the rubble after the earthquake. The first step after the earthquake is the rescue of those trapped under the rubble. Rescued patients should be transported quickly to safe areas for further treatment.

In the early period in the field, the first thing to consider is the evaluation of the airway in accordance with the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach of the advanced trauma life support. There are specific elements that can obstruct the airway in facial injuries. Some of these can be listed as foreign bodies, teeth, or ruptured soft tissue elements. Apart from these, hematomas that will accumulate in the mouth, edema that will develop in the mouth area, a backward tongue due to facial fractures, especially mandibular fractures, or accumulation of soft tissues in the airway due to advanced maxilla and mandibular fractures or laryngeal trauma can be counted as factors that will obstruct the airway. After evaluation of breathing, circulation examination is started.

Although there is no significant vascular damage, due to vast blood supply, facial injuries can bleed heavily. As long as neck trauma is not ruled out, keeping the patient in head elevation with cervical collars will reduce bleeding. Pressure can be applied. In cases of nasal bleeding, the patient can be bent forward and blown tightly, and then pressure can be applied to the alae of the nose and the bleeding can be stopped by applying pressure for 5-10 minutes. Adrenaline and saline impregnated gauze pads and nasal packings can be placed.

The examination should be continued with inspection in order to determine the degree of involvement of the patient whose primary examination has been completed. Injuries can range from abrasions to cuts to the deep bone. In the absence of lacerations, information about the underlying bone structure can be obtained depending on the positions of the nose and eyes, which are the cardinal elements of the face. Eyes standing too far apart from each other, elongated facial appearance, and over or under protruding eyes are clues to identify bone pathologies. Stuck in eye movements, asymmetry, or discrepancies in the levels of both eyes may be indicative of orbital fractures. The presence of hematoma in the septum, the presence of fractures in the nasal region,[1] the presence of hematoma in the mouth, and the presence of a change in the alignment of the teeth should raise suspicion in terms of jaw fractures. In cases of displaced facial bone fractures, step deformities can be palpated. Loss of sensation under the eye and in the upper lip should raise suspicion for fractures of the maxilla, and loss of sensation in the lower lip should raise suspicion for fractures of the mandible.

Examination of Other Injuries

After general examination and before dealing with facial injuries, it should be ensured that the patient does not have intracranial injury, cervical vertebral injury, and/or airway damage. If available, history may provide enough information about the extent of the damage especially in conditions where detailed imaging opportunities of tomography are not available.[2] Physical examination of the cervical spine requires careful examination and palpation from the nuchal ridge to the first thoracic vertebrae. First, place opposing thumbs on the spinous processes of C2, applying progressive systematic gentle circular pressure down the midline to detect the presence of tenderness. In cases of tenderness in any area, palpable edema or swelling, and step deformity between vertebrae during the examination, cervical vertebral damage should be considered. During the neurological examination, sensory, motor, and reflex examinations of all dermatomes and the presence of focal neurological deficits should be screened. If there is a suspicion

Received: March 03, 2023 **Accepted:** July 07, 2023
Publication Date: December 29, 2023
Corresponding author: Anıl Demiröz, Department of Plastic, Reconstructive and Aesthetic Surgery, İstanbul University-Cerrahpaşa Cerrahpaşa Faculty of Medicine, Istanbul, Turkey
e-mail: anil.demiroz@iuc.edu.tr
DOI: 10.5152/cjm.2023.23027

Table 1. Glasgow Coma Scale

Behavior	Response
Eye opening response	1. No response 2. To pain 3. To speech 4. Spontaneousl
Verbal response	1. No response 2. Incomprehensible sounds 3. Inappropriate words 4. Confused 5. Oriented to time, person and place
Motor response	1. No response 2. Abnormal extension 3. Abnormal flexion 4. Flex to withdraw from pain 5. Moves to localized pain 6. Obeys command

that there may be cervical vertebral damage, a collar should be worn to secure the neck area without shaking the patient. During the examination of earthquake victims, it should be kept in mind that especially traumatic brain injury or intracranial hemorrhage may occur. Damage may range from a simple concussion to subarachnoid hemorrhage. Intracranial injury should be considered in cases such as headache, severe vomiting, dizziness, or loss of consciousness. All patients should have their Glasgow coma score evaluated for motor, verbal, and auditory commands. The Glasgow coma scale is given in Table 1.[3] In the presence of signs suggesting intracranial damage such as severe headache, loss of consciousness, and epileptic seizure during the examination, the patient should be transported to the hospital quickly and necessary imaging techniques [cranial magnetic resonance imaging (MRI), etc.] should be performed.

Eye and Orbital Injury

One of the most important areas of facial injuries in earthquake victims is eye and orbital injuries. Foreign body penetrations, orbital wall fractures, ocular hematomas, and further vision loss may occur. During the examination, rough and color vision and eye examinations in all directions should be evaluated separately and holistically for each eye. By palpation, all walls of the orbit should be examined, and orbital wall fracture should be suspected when there is palpable tenderness or step deformity. If orbital dystopia is present, it should be kept in mind that there may be an orbital floor fracture. In severe traumas such as earthquake victims, especially those with superior orbital fissure syndrome and orbital apex syndrome should be alerted during the examination because both conditions are an indication for emergency surgery.

The superior orbital fissure is the opening at the apex of the orbit through which the cranial nerves pass, providing the movements of the eyeball (oculomotor, trochlear, and abducens nerves). There is another opening at the apex of the orbit, medial to the superior orbital fissure, called the optic canal, through which the optic nerve passes.

Superior orbital fissure syndrome, also known as Rochon–Duvigneaud's syndrome, is a neurological condition that can occur secondary to compression or fractures reaching the fissure.[4] It is a condition in which the movement of the eye is restricted in all directions (frozen eye); droopy eyelids and double vision occur as a result of the cranial nerves passing through it. In cases of severe trauma, if the existing fracture reaches the optic canal and the optic nerve is affected, and if vision loss also occurs in addition to the above findings, then this is called orbital apex syndrome, and the patient should be urgently operated and the cranial nerves should be released from the fracture segments in these conditions.[5,6]

Nasal and Ear Injuries

Another specific injury group that can be seen in the face area in earthquake victims is ear and nose injuries. During the examination, nasal deformity, epistaxis, presence of rhinorrhea, sensitivity, or step deformity in the nasal examination should be suspicious for nasal fracture. When rhinorrhea is observed, especially skull base fracture should be suspected and supported by imaging techniques. Traumas ranging from simple lacerations to large tissue defects can be seen on the nose, and care should be taken in terms of dressing or surgery depending on the severity of the defect. If it can be done in the presence of a nasal fracture, the fracture should be reduced and an external splint should be applied. Particular care should be taken to ensure airway patency in the presence of severe septal deviations or fractures that may obstruct the airway. Ear examination may reveal injuries ranging from simple lacerations on the ear to ear amputations involving partial or total skin and cartilage defects. In particular, hearing loss should be checked by performing separate hearing examinations in both ears of the patients. Lacerations in the eardrum may occur secondary to barotrauma or direct trauma. In the presence of bleeding from the ear and otorrhea, it should be considered that there may be serious ear pathology, and otoscopic examination should be performed. It should not be forgotten that in existing ear defects, sterile dressings should be made, and if amputate is present, it should be decided that replantation can be done immediately and rapid intervention is required.

Facial Fractures

Particularly, facial fractures in earthquake victims can be classified as upper (frontal and supraorbital), middle (zygoma and maxilla), and lower (mandible) fractures or their combinations. During inspection, the presence of asymmetry on both sides of the face, collapse, tenderness on palpation, or presence of step deformity should be suspicious for fracture. Orbital dystopia, or diplopia, and presence of steps in the orbital rim should be suspicious for an orbital floor fracture. It should be kept in mind that there may be a fracture of the mandible in case of limited mouth opening, early contact of the teeth, or malocclusion. Drawer tests should be performed on patients in terms of mandible or maxilla, and bone stability should be tested. Mandible symphysis fracture should be suspected when hematoma or ecchymosis in the mouth, especially under the tongue, is present. It should be kept in mind that there may be a zygoma or tripod fracture when there is depression in the midface malar region. It should not be forgotten that airway stenosis may occur in bilateral mandibular condyle fractures, and there may be a need for urgent surgical intervention. If there is no suspicion of orbital fissure or orbital apex or airway obstruction, there is no indication for emergency surgery in the examination, and the diagnosis of fracture should be confirmed with the necessary imaging [3-dimensional (3D) thin-section maxillofacial computed tomography (CT)].

Additional Diagnostic Tools

In earthquake victims, when suspicious findings are detected in general physical examination and specific region (eye, nose, ear, etc.) examinations, appropriate additional tests should be

performed for the patients. First of all, it is foreseen that systemic damage such as crush damage and kidney failure secondary to trauma may occur, and biochemistry and hemogram blood tests should be performed in all patients. In the presence of findings suggestive of cervical vertebral damage or if the patient is thought to have an intracranial pathology, cranial MRI should be requested from the patients and treatment should be arranged according to the presence of the detected findings. In the presence of findings suggestive of fracture in the facial bones, especially thin-section (0.625 mm) 3D axial/coronal and sagittal 3-way maxillofacial (CT) should be requested, and if there is a surgical indication in the presence of fracture, appropriate surgical treatment planning should be done. Ophthalmoscopic and fundus examinations should be performed carefully in the presence of foreign body injury, loss of vision, or double vision. Findings such as corneal and ocular lens injuries and detachment should not be overlooked. In the presence of ear findings such as hearing loss and otorrhea, patients should be tested for hearing, and necessary interventions should be made by distinguishing conditions such as eardrum pathologies and fluid accumulation in the middle ear with otoscopic examination.

Treatment

The first intervention should be the extraction of foreign bodies from the airway. The most important thing to be done in the field will be to manually check the inside of the mouth and remove all foreign bodies if present. After ensuring airway safety, it is important to provide appropriate hydration therapy quickly in order to regulate blood pressure and prevent systemic conditions such as crush syndrome. All patients should receive tetanus prophylaxis with appropriate recommendations. Appropriate antibiotic therapy should be arranged for the control of infectious diseases when necessary for all patients. Prophylactic antibiotherapy (vancomycin + ceftriaxone) treatment should be arranged, especially in skull base fractures, considering the risk of meningitis.[7]

For open wounds, after adequate irrigation, closure in layers can be applied. It is appropriate to close facial wounds as soon as possible in order to prevent bad scar formation and infection. It should be kept in mind that facial nerve branches may be affected in lacerations in front of the preauricular region.[2,5] Therefore, the patients with asymmetrical facial mimics and lacerations around the track of the facial nerve should be referred to a plastic surgeon after overall stabilization.

If facial bone fractures are suspected, the patient should be referred to a plastic surgeon. Surgical reduction and internal fixation of facial fractures within the first 2-3 weeks is usually sufficient, but orbital floor fracture, superior orbital fissure syndrome, and orbital apex syndrome are surgical emergencies and should be operated in the first 24 hours to prevent permanent vision loss. After the fracture segments are reduced during surgery, they are fixed by selecting the appropriate plate and screw sizes. In superior orbital fissure syndrome or orbital apex syndrome, fracture segments should be identified and reduced rapidly, and muscles and nerves should be released before muscle necrosis and nerve damage settle.

In the presence of a foreign body in the eye, or in the presence of findings such as vision loss and retinal detachment, the patient should be examined by an ophthalmologist quickly, and the foreign body should be removed, and laser or other treatment methods should be applied in the presence of detachment. In the presence of suspected retrobulbar hematoma secondary to trauma, pressure should be reduced by performing a lateral canthotomy quickly without visual loss.

In the presence of eardrum damage, hearing loss, fluid, or hematoma in the middle ear, an otolaryngologist should intervene quickly. When eardrum damage is detected, follow-up and eardrops are applied according to the size of the defect, or eardrum repair is performed in the case of large defects. In the presence of fluid or hematoma, an ear tube should be inserted if necessary. Appropriate treatment methods should be determined according to the type of hearing loss (sensorial and conductive type). While simple ear lacerations can be followed by dressing, in the presence of ear defect, treatment methods vary according to the defect type and should be decided by the plastic surgeon. Repair techniques, ranging from helical advancement flaps to tissue transplantation, should be performed according to the defect formed after appropriate debridement.[8] Likewise, graft applications and local or distant tissue transplantation can be performed after appropriate debridement in laceration or other tissue defects in the facial area.

Conclusion

Facial injuries constitute an important part of earthquake traumas. In the first approach to a patient with a facial injury, the first intervention should be ensuring the airway patency by removing the occlusive materials in the mouth. Bleeding should be taken under control. In the case of facial fractures or injuries to specific structures, such as the facial nerve, it is appropriate to close the wounds as soon as possible and refer the patient to a competent surgical center.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – A.D.; Design – A.D.; Supervision – A.D.; Resources – E.Y., A.D.; Materials – E.Y., A.D.; Data Collection and/or Processing – E.Y.; Analysis and/or Interpretation – E.Y., A.D.; Literature Search – E.Y.; Writing Manuscript – E.Y., A.D.; Critical Review – A.D.; Other – E.Y., A.D.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: The authors declared that this study has received no financial support.

References

1. Hoffmann JF. An algorithm for the initial management of nasal trauma. *Facial Plast Surg*. 2015;31(3):183-193. [CrossRef]
2. Hobday D, Welman T, Horwitz MD, Pahal GS. Facial trauma. In: *Plastic Surgery for Trauma*. Boca Raton: CRC Press; 2022:165-178. [CrossRef]
3. Teasdale G, Jennett B. Assessment of coma and impaired consciousness. A practical scale. *Lancet*. 1974;2(7872):81-4. ([CrossRef]
4. Chen CT, Chen YR. Traumatic superior orbital fissure syndrome: current management. *Craniomaxillofac Trauma Reconstr*. 2010;3(1):9-16. [CrossRef]
5. Choi J, Lorenz HP, Spain DA. Review of facial trauma management. *J Trauma Acute Care Surg*. 2020;88(4):e124-e130. [CrossRef]
6. Colbenson K. An algorithmic approach to triaging facial trauma on the sidelines. *Clin Sports Med*. 2017;36(2):279-285. [CrossRef]
7. Yellinek S, Cohen A, Merkin V, Shelef I, Benifla M. Clinical significance of skull base fracture in patients after traumatic brain injury. *J Clin Neurosci*. 2016;25:111-115. [CrossRef]
8. Smith RM, Byrne PJ. Reconstruction of the ear. *Facial Plast Surg Clin North Am*. 2019;27(1):95-104. [CrossRef]