# Systematic Assessment of the Patient with Facial Trauma

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**KEYWORDS**

• Facial injury • Trauma • Assessment • Treatment • Intervention

**KEY POINTS**

- The systematic assessment of patients with facial injuries is the culmination of wisdom from trials and errors, audits of failures and successes, careful and mindful reflection of current practice, and a willingness to change.
- Emerging technology has positively impacted the practice of management of facial trauma.
- A systematic evaluation and physical examination of the trauma victim remain the gold standard and the first step toward effective care.

Traumatic injuries affect thousands of individuals and account for billions of dollars in direct and indirect expenditures annually. More than 9 people die every minute from injuries and violence according to the World Health Organization. In the last 2 decades or so, a system-wide improvement in assessment, resuscitation, and management of trauma has improved overall outcomes, thus reducing the impact of traumatic injuries on the society as a whole. Dissemination of this information from the developed to the developing world has had a positive impact.[1]

The committee on Trauma of the American College of Surgeons established Advanced Trauma Life Support (ATLS) in 1980 and has since developed, refined, and defined a system for accurate and systematic assessment of injury based on protocols. Approximately 25% to 30% of deaths caused by trauma can be prevented when this systematic and organized approach is used.[2–5]

The main goal of a systematic initial assessment of a trauma patient is to recognize the patient with severe life-threatening injuries, establish treatment priorities, and manage them efficiently and aggressively. Toward this, at presentation, all trauma injuries can generally be divided into the 3 following categories:

- Severe injuries: pose an immediate threat to life. These injuries represent more than 50% of traumatic deaths. These patients will present with a major disruption of their vital physiologic function and will benefit from acute intervention.
- Urgent injuries: these patients usually present with stable vital signs but have injuries grave enough that require an intervention, but are not usually life-threatening.
- Nonurgent injuries: most common injuries, fortunately. These patients do not present with an immediate threat to life, but generally require an intervention after a thorough evaluation and possibly observation.

## ASSESSMENT PRINCIPLES IN TRAUMA

The principles in systematic assessment of the trauma patients as outlined by the ATLS protocols are as follows[1]:

- Preparation and transport
- Triage
- Primary survey (ABCDEs)
- Resuscitation
- Adjuncts to primary survey and resuscitation including monitoring and radiography

Disclosures: The author has nothing to disclose.
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Oral Maxillofacial Surg Clin N Am 25 (2013) 537–544
http://dx.doi.org/10.1016/j.coms.2013.07.009
1042-3699/13/$ – see front matter Published by Elsevier Inc.

- Consideration for the need for patient transfer
- Secondary survey—head-to-toe evaluation, patient history
- Adjuncts to secondary survey—special investigations, such as computed tomographic (CT) scanning or angiography
- Continued postresuscitation monitoring and ongoing reevaluation
- Definitive care

Over time, this system of assessment and intervention has seen the development of trauma scores, identification of factors highly correlated with life-threatening injuries, identification of anatomic factors correlated with high mortality, simple reproducible systems of assessment, and development of protocols of treatment based on collective wisdom, experience, and observational studies. All aspects of treatment both clinical and medico-legal have had a positive evolution within this system. Despite this systematic reproducible methodology of assessment, the incidence of missed injuries following trauma continues to be reported as between 4% and 65%.

Although most maxillofacial injuries (other than penetrating wounds to neck or other life-threatening injuries) are identified and addressed following the primary survey and resuscitation efforts following the ATLS protocol, the same principles of this protocol are often applied in the early assessment and treatment planning of these injuries as well.[6]

Accordingly, facial injuries could be addressed based on the urgency to treat.

- Severe facial injuries: those that require immediate and often resuscitative treatment. These injuries could include injuries to the airway, injuries causing severe hemorrhage, cranial injuries including facial injuries, ophthalmologic traumatic emergencies, and severe facial soft tissue injuries, including special structures such as ducts or nerves whereby acute intervention would presumably yield better outcomes.
- Urgent facial injuries: facial injuries that can often wait a few hours until the trauma team has completed their primary survey and successful resuscitation. These injuries are often soft tissue injuries or contaminated wounds.
- Nonurgent facial injuries: injuries that may be addressed safely in a delayed manner, such as most facial fractures.

It is not the goal of this article to summarize the detailed ATLS protocol for the multisystem evaluation in a trauma patient. However, polytrauma patients often present with maxillofacial injuries that may or may not be readily apparent at primary survey. The ATLS approach is applied regardless of the anatomic presentation. For instance, a patient that presents with a gunshot wound to the face and neck would have his maxillofacial injuries addressed on presentation to the trauma bay according to ABCDEs of primary survey: *A*irway maintenance with cervical spine protection, *B*reathing and ventilation, *C*irculation with hemorrhage control, *D*isability and neurologic status, and *E*xposure, environmental control.

Similarly, a patient with multiple injuries, including long-bone injuries, sternal and possibly intracranial injuries, may not have a nasal fracture identified until the secondary survey is completed and adjunctive investigations are completed.

If the patient's maxillofacial injuries are secondary and the patient has been stabilized, it always helps to obtain a history of the presenting condition and a brief review of systems from either the patient or a representative.

The pneumonic *AMPLE* serves as an easy template while obtaining the history of the patient:

- A, Allergies
- M, Medications
- P, Pregnancy, past illnesses
- L, Last meal
- E, Events related to admission

In the alert patient, it also helps immensely to obtain a review of pertinent systems: continued headache, nausea, and vomiting following the injury may suggest neuro-trauma; double vision, blurry vision, headache, and so on might suggest ocular or orbital injuries; a clear discharge from nose or ears may suggest a base of skull fracture; complaints of lack of sensation on the face may indicate an underlying facial skeleton; a change in bite and limited mouth opening suggest a fracture of the maxilla or mandible, and hoarseness or stridor may suggest laryngeal fracture.

The systematic assessment of the patient with facial trauma should follow the same principles of primary survey, intervention, secondary survey, and definitive care.

## AIRWAY WITH CERVICAL SPINE PROTECTION

Penetrating neck trauma, complex multiple facial soft tissue, and bony injuries of the maxillofacial skeleton necessitate immediate intervention to protect the anatomic airway. Foreign bodies, gastric content regurgitation, and tracheal or laryngeal fractures may not be dramatically apparent. Whenever possible, an endotracheal intubation is preferred and attempted and a

surgical airway is sought only when the endotracheal intubation is not practical or possible.

Bilateral mandibular body or parasymphysis fractures causing a flail segment that is pulled back by the genial musculature in a supine patient can also cause airway embarrassment. Positioning the patient properly, and in dentate patients, simply bridling a wire between teeth stabilizing these segments may be simple and effective interventions that assist in keeping the airway patent.

A typical chin lift or jaw thrust maneuver may not be easy in patients with mandibular fractures. Pain, dislodgment of loose teeth into the airway, a new hematoma formation,and so forth may be risked when a broken jaw is manipulated.

Although laryngeal fractures are rare, pain, stridor, odynophagia, hoarseness, hemoptysis, and subcutaneous emphysema are the common presenting symptoms in these injuries. The presence of stridor and hemoptysis are suggestive of major injury. Early surgical intervention is recommended for all major injuries to ensure a good outcome.[7,8] Not all of these patients require airway intervention, but many do.

Examination for a direct airway injury or a major vascular injury in the neck is important before intubation in patients with facial trauma.

Endotracheal intubation is often performed orally with a rapid sequence tracheal intubation. Care must be taken to applying cricoid pressure to prevent aspiration.

When routine intubation is not possible because of profuse hemorrhage, severe edema, or other inability to intubate, a surgical airway must be established. In the emergency setting, in an adult, a cricothyroidotomy is preferred over a tracheotomy because of its ease of performance and reduced bleeding. Cricothyroidotomies however often need to be converted to formal tracheotomies for the prolonged airway maintenance in a nonacute setting.

Anesthesiologists may be reluctant to pass nasotracheal tubes for intubating patients with mid face fractures. This reluctance is based on the prudence of causing an inadvertent passage of tubes (nasogastric or suction catheters) intracranially through an undetected skull base fracture. A careful evaluation of the patient's CT scan for these skull base fractures are important to alleviate such unfounded fear.

Care must be taken in ensuring that the cervical spine is stable in these patients while attempting airway stabilization. Many epidemiologic studies have looked at the prevalence of cervical injury in patients with maxillofacial trauma. In the setting of an isolated mandible, nasal, orbital floor, malar/maxilla, or frontal/parietal bone fracture, cervical spine injury ranged from 4.9% to 8.0%. In the setting of 2 or more facial fractures, the prevalence of cervical spine injury ranged from 7.0% to 10.8%.[9] All patients that require airway intervention, regardless of concomitant maxillofacial injuries, must be assumed to have an undetected cervical injury, and care must be taken to avoid hyperflexion or hyperextension of the neck. Excessive movement of the neck can result in neuronal deficit and paralysis. The presence of distracting injuries, especially in the head and neck, can often lead to missed cervical injuries. A cervical collar is placed until a cervical injury is definitively cleared in secondary survey or during the hospital stay.

In patients with a cervical injury that has not been cleared, a trip to the operating theater for surgery of the maxillofacial region would mean that this cervical collar should be temporarily relieved, which is done by stabilizing the neck on either side with sandbags and taping the patient's head tightly to the operating table. Tilting the table is often needed instead of turning the patient's head, should that be required.

## BREATHING AND VENTILATION

ATLS suggests exposure of the neck and chest and ensuring immobilization of the head and neck. Tracheal deviation, signs of airway obstruction, and subtle signs such as cyanosis of the lips suggestive of hypoperfusion are not to be missed. Transient brain hypoxia can cause severe secondary brain injury. Simple maneuvers such as stabilizing the mandible can improve breathing and ventilation, preventing long-term hypoxia-related neuro-deficits.

## CIRCULATION WITH HEMORRHAGE CONTROL

As in primary survey for polysystem trauma, circulation is a priority only following stabilization of airway and ensuring breathing and ventilation.

Structures of the head and neck are extremely vascular and can often cause significant extravasation of blood that can contribute to shock. An assessment for bleeding should be systematic, complete, and thorough, addressing all evident and occult bleeding from vessels of the maxillofacial region.

Occult bleeding could occur acutely or in a chronic manner from blood vessels of the neck, especially at the base of the skull. The neck is divided into horizontal zones to help manage penetrating injuries (**Fig. 1**):

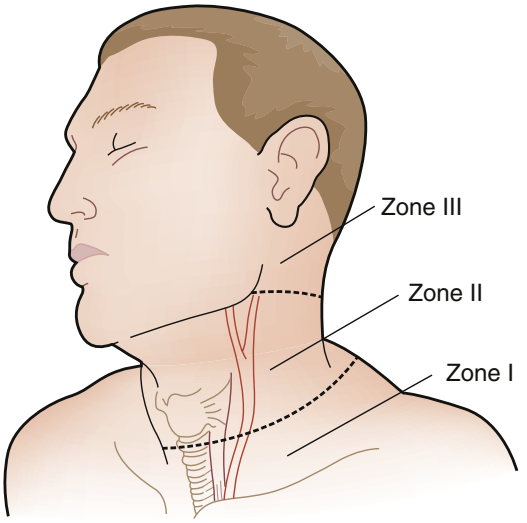


**Fig. 1.** Zones of the neck. (*From* Townsend CM, Beauchamp RD, Evers BM, et al. Sabiston textbook of surgery. Philadelphia: Elsevier; 2008. p. 490; with permission.)

- Zone 1: horizontal zone extending superiorly from sternal notch to cricoid cartilage.
- Zone 2: horizontal zone extending from cricoid cartilage to inferior border of mandible.
- Zone 3: horizontal zone from inferior border of mandible to base of skull.

Traditionally, the platysma had been considered the barrier for penetrating neck injuries. The standard of care was neck exploration for those injuries that penetrated the platysma. However, improvements in imaging technology, particularly CT angiography, have altered the management of patients with penetrating neck injuries. Although some centers still advocate routine exploration for all zone 2 neck injuries penetrating the platysma, many civilian centers in the United States have adopted a policy of selective exploration based on clinical and radiographic examination.[10]

Occasionally, closed tight spaces in the base of the skull, infratemporal region, and so forth, can cause delayed bleeding or formation of pseudoaneurysms that can cause a shunting effect and hemodynamic instability. Interventional radiology techniques have again become the treatment modality of choice for these.[11]

Lacerations of the face are hard to miss and are often superficial and, if deep, readily accessible to repair and control of bleeding. Scalp lacerations, especially of the posterior scalp, are notoriously missed and, if left exposed to bleed or form large hematomas, can cause future infection. A systematic examination of the patient's scalp often reveals a missed occult source of serious bleeding that requires immediate attention. Large scalp lacerations could cause significant blood loss and must be stabilized expeditiously.[12] Repaired scalp lacerations often require a pressure dressing to prevent a hematoma in the acute after-repair phase. This is especially true in patients who are pharmacologically anti-coagulated or have a bleeding disorder.

Lacerations to the muscles of the cheek and tongue cause a significant amount of blood loss. Pressure application, primary repair, and temporary packing help to reduce the blood loss. Bleeding from broken ends of bones, especially of the mandible, can be stopped by pressure packing or by placing a bridle wire or temporary maxilla-mandibular fixation until the definitive treatment.

Epistaxis in facial trauma can impair visualization of the airway, impede a proper examination, cause obstruction of airway, and lead to shock and aspiration. Epistaxis can be fatal. Mid facial trauma can cause significant epistaxis that needs to be recognized and managed efficaciously. Most emergency rooms are equipped with packing materials for both anterior and posterior nose. Packs are at risk of being left in for prolonged periods of time and can cause serious infections. Posterior nasal packs can be inadvertently shoved into the cranial cavity if the patient has a skull base fracture. Often, the reduction of facial fractures will allow for control of the perinasal hemorrhage.

Proper visualization of facial lacerations often requires concomitant control of bleeding. Simple injections of local anesthetic solution with vasoconstrictors or pressure packing help stop most bleeding. In addition, small hand-held mono-polar cautery devices assist in hemostasis. Most emergency rooms also carry silver nitrate sticks that could be useful in intra-oral bleeding (**Fig. 2**).

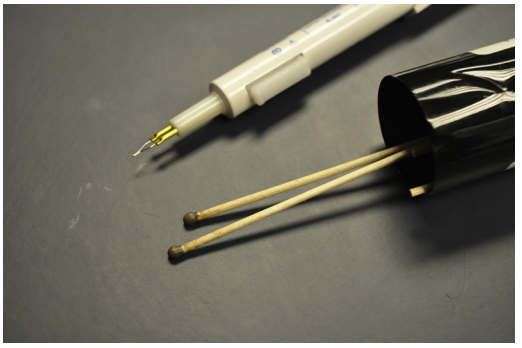

**Fig. 2.** Hand-held electro-cautery unit and silver nitrate sticks—good local measures for control of bleeding in the acute trauma setting.

## DISABILITY (NEUROLOGIC AND FUNCTIONAL EVALUATION)

During the primary survey, a Glasgow Coma Scale establishes a baseline neurologic status for the patient. During the secondary survey and later, this is reassessed constantly using a simple *AVPU* method:

*A*—Patient is awake, alert, and *a*ppropriate
*V*—Patient responds to *v*oice
*P*—Patient responds to *p*ain
*U*—Patient is *u*nresponsive

Pupillary examination is a quick assessment of the cerebral function. Any changes in pupillary response indicates cerebral damage, optic nerve damage, or changes in intracranial pressure. In patients with facial trauma, the ocular examination goes beyond pupillary response. A palpation of the globe for pressure, hard or soft, and ruling out an afferent pupillary defect, is an imperative part of assessment.

Facial injuries often cause cranial nerve trauma. Facial lacerations can cause trauma to the facial nerve and its branches. Distal branches are often not amenable to repair but the larger proximal branches could be attempted to be primarily anastomosed with micro-neuro-surgical repair. Lacerations of the face lateral to a line drawn perpendicular to the outer canthus of the eye should be examined for parotid duct injury. Primary repair of this must be attempted on detection of the same.

## EXPOSURE

Patients that present with a helmet (sports-related or motorcycle-related) should have the helmet removed while the head and neck are held in a neutral position using a 2-person technique. The American College of Surgeons provides a poster entitled, "Techniques of Helmet Removal from Injured Patients" (www.facs.org/trauma/publications/helmet.pdf).

Dentures and other removable appliances that may not have caught the attention of the resuscitating team may become evident on secondary survey by the practitioner assessing facial injuries. These devices must be removed, preserved, and could be potentially used in repair of fractures when patient is stable. Avulsed teeth must be accounted for. Aspiration should be considered a potential in the unconscious patient and the routine chest radiograph must be checked for aspirated teeth. Subluxed teeth must be considered a potential aspirate and must be stabilized or removed.

Patients that wear contact lenses must have them removed at examination. Prolonged retention of these in patients that are intubated or with low levels of consciousness can cause severe corneal injuries.

The skin of the scalp and face and neck must be inspected for embedded foreign bodies and dirt or debris. These foreign bodies could become future sources for infection.

## SYSTEMATIC CLINICAL EXAMINATION OF THE FACIAL TRAUMA PATIENT

To minimize not finding injuries, and optimizing the assessment in a busy trauma bay, a systematic assessment pattern is recommended in examining patients with facial trauma. It is best to examine every patient the same way every time and record the findings comprehensively every time to ensure a thorough examination.

For purposes of the physical examination, the face and neck are divided into different zones and structures in each zone will be inspected and palpated and then correlated with findings of adjuncts such as a CT scan to formulate a diagnosis of the patient's injuries.

### *Soft Tissues*

Injuries to the soft tissues of the face may be the most apparent trauma on the patient as the examiner begins assessment. The soft tissue wounds must be qualified and quantified by location, depth, and layers of involvement, involvement of vital or crucial structures, and treatment rendered. Superficial wounds often do not require any more treatment than cleansing and dressing. Deeper wounds might require repair with varying levels of complexity either in the emergency room setting or in an operation theater. Scalp wounds may be easy to miss in patients with thick hair or if the wounds are in the back of the head on a patient lying supine. Oral wounds require special attention; muscles may require reapproximation before mucosa. Bleeding control is an essential part of wound repair, as discussed earlier.

Often facial lacerations serve as excellent access for repair of underlying fractures. Definitive repair of such lacerations may be deferred until fracture repair; however, cleaning and decontaminating these wounds serve better results in the future.

Soft tissue injuries involving eyelids, external ear, lacrimal system, parotid duct, nerves, and vessels require specialized attention and repair. If the laceration is in the vicinity of such structures, careful attention must be paid during assessment to the patency and integrity of these structures.

Tetanus vaccination status should be checked and dosing regimen followed.

## Frontal Region

### Inspection

The forehead and frontal region are inspected for lacerations, contusions, or step deformities. In an awake and alert patient, loss of sensation of the skin over the forehead must be checked. In patients with thick hair, lacerations in the scalp or within the eyebrows must be inspected. Previous injuries such as scars should also be inspected.

### Palpation

Obvious or subtle step deformities should be palpated. In an awake or responsive patient, pain on palpation should be checked as well as for crepitus.

## Ear

### Inspection

Obvious signs of lacerations or deformities should be inspected and also signs of previous injuries, such as a cauliflower ear deformity. A speculum examination following cleaning of the external auditory canal for blood, debris, and cerumen will allow for inspection of the tympanic membrane. Hemorrhage or cerebrospinal fluid (CSF) otorrhea may indicate base of skull or temporal bone fractures. Integrity of the tympanic membrane is important to record.

Battle sign or postauricular ecchymosis may be suggestive of temporal or skull base fractures (**Fig. 3**).

Formal conductive and neurosensory examination may not be practical in a busy trauma bay. However, an ear examination is not complete without at least a cursory whispering test and loss of hearing may indicate cranial nerve VIII damage.

**Fig. 3.** Battle's sign: postauricular ecchymosis.

## Eyes and Orbit

### Inspection

Inspection of the orbit and the eyes can be challenging in patients with facial injuries. Early edema in the peri-orbital area and neurologic impairment may make a thorough examination difficult.

The inspection of position and alignment of eyes must be grossly examined. Increased orbital volume from orbital fractures can cause the sinking of the contents of the orbit, causing enophthalmos and vertical dystopia. An increase in orbital volume can cause exophthalmos, suggestive of a foreign body or a retrobulbar hematoma. Edema might obscure these findings in an acute setting.

The eyelids should be inspected for evident lacerations, or previous scarring, in addition to ectropion, entropion, or ptosis. Inspection of the conjunctiva and sclera will disclose conjunctivitis, chemosis, and subconjunctival hemorrhage, all indicatiing orbital and/or ocular trauma. In addition, blood in the anterior chamber of the eye or hyphema is an important finding.

Inspection of the pupils is important to test due to the pathways involved. They are innervated by both the sympathetic and the parasympathetic systems and can give a general indication of the neurologic condition. Normal pupillary response and reactivity to light tests sensory and motor function of the eyes. Afferent pupillary defects or Marcus Gunn pupil is tested with the swinging flashlight test. Pupillary size is noted. Miosis refers to pupillary diameter less than 2 mm and mydriasis or a "blown pupil" may be suggestive of orbital trauma, head injury, or drugs. Anisocoria or unequal pupillary diameter may be suggestive of actual globe injury. Epiphora in the medial canthus may suggest injury or disruption of the lacrimal drainage apparatus.

In patients who are awake and responsive to commands, it helps to check range of motion of the extraocular muscles of the eyes. Extraocular muscles are tested for movement in an H pattern. Examination would reveal entrapment of muscles in between fracture fragments of the orbit. In addition to causing diplopia, prolonged entrapment may lead to necrosis and permanent mobility restriction.

### Palpation

Palpation of the globes for pressure of the contents can often reveal retro-bulbar hematoma, or other causes for proptosis. Palpation of the orbital rims will elicit step deformities suggestive of fracture and displacement of the orbital skeleton. Edema may confound findings initially and, as with anything in trauma, repeated examination

and secondary surveys may help unfold injuries that were not apparent at first presentation.

### *Naso-orbito-ethmoid Region*

The naso-orbito-ethmoid (NOE) region must be included in the examination, right after examining the eyes and orbits.

#### *Inspection*

Peri-orbital ecchymosis and circumorbital edema giving the patient an appearance of raccoon eyes is a hallmark of NOE fractures. Subconjunctival hemorrhage is often seen as well. NOE fractures with displacement can cause depression of the nasal projection. Disruption of the medial canthal ligament attachments can cause telecanthus and blunting of the medial palpebral fissures. Intercanthal distance measurement is an imperative part of the examination. Racial differences in norms should be considered for this measurement but, in general, the intercanthal distance should be about 50% of the interpupillary distance. Loss of volume of the orbit from the medial orbital/ethmoid fractures can cause enophthalmos.

#### *Palpation*

Mobility and crepitus of the NOE complex is the hallmark of this fracture. Mobility may be tested with an instrument inserted in the nose with its tip placed deep to the medial orbital area and the fingers and thumbs of the other hand supporting the NOE region. Moving the instrument will then generate movement of the medial canthal and NOE complex. In addition, a "bowstring" test can elicit movement of medial tendon when tugging on the lateral canthal tendon.

### *Nasal Skeleton*

The nasal skeleton would be the next logical area on the face to examine. Nasal complex requires good lighting, suction, and a nasal speculum to illuminate and examine properly.

#### *Inspection*

Obvious deformities and lacerations are noted; the depth of these lacerations must be examined, and involvement of cartilage must be noted. Nasal deformities must be examined facing the patient, from a worm's eye view and from a bird's eye view. Intranasal examination must be performed after cleaning out dried blood, CSF, and debris, with good lighting and using a nasal speculum. Intranasal examination should focus on obvious lacerations, septal fractures, perforations or hematomas, and sources of bleeding. Septal hematomas require early recognition and management. These septal hematomas can detach the perichondrium from the septal cartilage, thus strangulating its blood supply, and can possibly cause septal necrosis, leading to loss of septal support and resulting in a saddle nose esthetic deformity. A simple lance and drain or needle decompression with or without packing or splinting will help manage this problem when identified. Active CSF rhinorrhea must be examined when base of skull fractures are suspected.

#### *Palpation*

Nasal bones must be palpated for obvious mobility and crepitus.

### *Zygomatic o-maxillary Complex*

#### *Inspection*

Peri-orbital edema and ecchymosis, obvious facial asymmetry, and malar depression with or without difficulty to open the mandible wide may be hallmarks of zygomatico-maxillary complex fractures. Acute edema may obscure malar flattening. Malar depression and asymmetry may be more evident when examined from a bird's eye view as opposed to frontal view.

#### *Palpation*

Step deformities at the orbital rim may be part of the zygomatico-maxillary complex fracture. Examination from the bird's eye view along with palpation of the arches may demonstrate malar depression and asymmetry more readily, even in the face of mild to moderate edema of the region.

### *Maxillo-mandibular Structures*

Oral examination and examination of the maxilla, mandible, and dento-alveolar structures should be performed last in the systematic evaluation to avoid contamination of saliva to other facial wounds.

#### *Inspection*

Obvious lacerations in the peri-oral region or within the oral cavity must be examined for debris, contaminants, and loose teeth. In awake and responsive patients, the maximum incisal opening should be checked with the patient opening voluntarily; any deviations while opening may be suggestive of location of fractures of the mandible.

Ecchymosis in the buccal vestibules or floor of the mouth often indicates a fracture of a bone nearby.

Evaluation of the occlusion is performed with care and can often be suggestive of the location of the fracture as well, which could be a challenge in orally intubated patients.

### *Palpation*

Palpation for step deformities and obvious tenderness and mobility indicate fractures. Mobility of the maxillary complex indicates a disjunction of the maxilla from the remaining facial skeleton. Depending on the level of this disjunction, the area of mobility may vary. For instance, in Le Fort I level fractures, only the dento-alveolar segments of the maxilla may elicit mobility, whereas in Le Fort II and III level fractures, the area of mobility would be higher up on the face according to the pattern of fracture sustained. It is useful to Gently support the nasal complex while checking for mobility of the maxilla. Manual stretching of the mandible may cause coronoid impingement on a displaced zygomatic arch.

### *Correlating Physical Examination to Radiographic Findings*

The gold standard for radiographic evaluation of facial injuries has become the helical CT with its multiplanar reconstructions. It has largely replaced single-view plain radiographs in almost all instances except perhaps the isolated mandible fracture in an ambulatory patient. The added ability to obtain a 3-dimensional reformatted image not only helps to plan treatment but also to obtain stereolithographic models from 3-dimensional printing and virtual surgical planning. Advanced imaging technology now allows better resolution, rapid scanning time, and added ability to use navigation and involves lesser radiation.

CT, however, remains an adjunct to diagnosis and is never to be replaced by the act of the systematic physical examination and assessment. Correlation of the findings of the physical examination with the radiographic assessment would lead to an accurate diagnosis and assistance with treatment planning.

Axial, coronal, and sagittal views on a CT scan of the face all provide different perspectives of the same injury. In addition, CT angiography has an increased role in both diagnosis and management of maxillofacial vascular injuries, as discussed earlier.

## SUMMARY

The systematic assessment of the patient with facial injuries as practiced today is the culmination of the collective wisdom from trials and errors, audits of failures and successes, careful and mindful reflection of current practice, and a willingness to change. Emerging technology has positively impacted the practice of management of facial trauma. Regardless, a systematic evaluation and physical examination of the trauma victim remain the gold standard and the first step toward effective care.

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