The management of facial trauma

Robert Stuart McCormick
Graham Putnam

Abstract

Facial or maxillofacial trauma occurs as a consequence of physical injury to the face and can include damage to soft tissue and bony structures either in isolation or combination. There is a male predominance with highest incidence in the age group of 20–40 years. The range of injuries include soft tissue damage, bruising, lacerations, burns and fractures of the underlying facial skeleton including the zygomatic complex, mandible, maxilla, orbit and nasoethmoidal complex. The concentration of special senses in the head and neck region means that even seemingly minor injuries can have a significant impact upon the long-term outcome for a patient. Careful assessment of an injured patient must include a full ATLS evaluation to ensure that associated potentially life-threatening injuries are not missed. This article describes the signs, symptoms and treatment of maxillofacial trauma, including management of hard and soft tissue trauma.

Keywords Hard tissue facial injuries; mandibular fractures; maxillary fractures; maxillofacial trauma; soft tissue facial injuries; zygomatic fractures

Introduction

Maxillofacial injuries are common. The causative factors of facial injury have changed in developed countries in recent years from predominantly motor-vehicle accidents to interpersonal violence as the major aetiological factor. The association of alcohol with interpersonal violence and consequently facial injury is significant.[1] Social policy, legislation and changing of group behaviours are required to influence the actions that lead to interpersonal violence. The introduction of drink-driving and seat belt legislation, improved driving and road conditions and the advancement in the safety features of modern vehicles has led to a fall in maxillofacial injuries attributable to road traffic accidents (RTAs) in the developed world. Falls, particularly in the elderly, is an increasing problem and has been attributed to the trend towards ageing populations in advanced nations.

Initial assessment

Careful initial assessment of the injured patient is imperative. Patients may present with simple minor facial injuries or potentially life-threatening ones and ATLS principles should be utilized with primary and secondary surveys and careful assessment of the airway with appropriate intervention if required. Severe life threatening bleeding can occur as a result of facial trauma and its management should take priority over definitive fracture fixation.

Soft tissue injuries

These range from simple oedema, haematoma, lacerations, abrasions, puncture wounds, wounds associated with thermal, chemical or blast damage as well as human and animal bites.

With the cranialization of specialist senses in the head and neck region careful assessment should be made of the potential for damage to underlying structures such as the lacrimal apparatus, the facial nerve and major salivary gland ducts. Additionally, assessment should be made of intraoral and intranasal structures to ensure their integrity. Whilst the soft tissue injury may be the most visible element of trauma, an appropriate assessment should be made of the underlying bony structures to facilitate a full assessment of the patient.

Special mention should be made of scalp lacerations, which have a propensity for degloving, leading to significant blood loss and haematoma formation. Closure of this type of laceration may require the use of vacuum drainage and pressure dressings to reduce the incidence of post-treatment haematoma.

The muscles of facial expression are unique in that rather than being inserted into bone they are attached to skin and thereby facilitate the extensive range of facial expression that humans are capable of. When a facial laceration occurs this can lead to marked separation of wound edges giving the impression of tissue loss. Whilst tissue loss is possible in facial injury a careful assessment and mobilization of tissues should be carried out to ensure that the perceived tissue loss is not just in fact tissue separation. The excellent blood supply of facial tissues means that extensive tissue debridement is rarely necessary and attempts at tissue preservation should be considered, where possible.

The aesthetic importance of the face cannot be overemphasized and in the presence of lacerations great care should be taken in appropriate approximation of the tissues. Following debridement and antiseptic cleansing of the wounds, careful approximation of the distinct soft tissue layers should be made utilizing a resorbable suture for deep layers and a fine monofilament suture for skin. Where a laceration crosses an important aesthetic unit such as the vermilion portion of the lip the first skin suture should be placed at the junction to ensure accurate alignment. Early suture removal reduces the epithelial ingrowth along suture tracts and improves the aesthetic outcome. The use of tissue adhesives may be suitable in some circumstances.

If following assessment it is considered that damage to the important underlying structures has occurred then specialist referral should be made.

Antibiotics are not generally indicated in the management of simple uncomplicated lacerations. However, if a wound has significant contamination or has been caused by a human or animal bite then antibiotics should be used to reduce the incidence of postoperative infection.

Soft tissue injuries can also occur to the intraoral tissues and laceration to vascular structures such as the tongue can lead to significant bleeding. Degloving injuries can occur around the

Robert Stuart McCormick *BDS MFDS MBBS MRCS is a Specialty Trainee in the Northern Deanery, UK. Conflicts of interest: none declared.*

Graham Putnam *BDS FDSRCS MBBCh FRCS is a Consultant OMFS/Head and Neck Surgeon at North Cumbria University Hospital NHS Trust, Carlisle, UK. Conflicts of interest: none declared.*

maxilla and mandible and may be difficult to reapproximate without causing scarring in the vestibular tissues.

Dentoalveolar injuries

Dentoalveolar injuries occur to the tooth-bearing portions of the jaws. They commonly occur in children and are often associated with sports activity. Trauma to the intrinsic structure of teeth should be referred to a general dental practitioner for management.

Management of avulsed permanent teeth[2]

- Ensure the avulsed tooth is a permanent tooth.
- Immediate replantation is the best treatment at the scene of the accident. If the tooth is contaminated washing it briefly and gently under running water without touching the root should be carried out prior to replantation.
- Immediate dental attention should be sought to splint the replanted tooth
- If the tooth cannot be immediately replanted it should be stored in a glass of milk before seeking dental attention.

Management of dentoalveolar fractures

- A fracture of the tooth bearing bone of the jaw.
- Segment mobility and dislocation with several teeth moving together are common findings.
- The displaced segment should be repositioned and splinted paying attention to the occlusion. Adjacent teeth can be utilized for splinting.

Hard tissue facial trauma

The facial bony anatomy can be divided into upper, middle and lower facial thirds. The upper third comprises the frontal bone and sinus. The middle third is made up of the orbits, zygomatic bones, nasal bones and maxilla. The lower third comprises the mandible. Fractures involving two or more facial thirds are known as panfacial fractures.

The severity of an injury is proportional to the mass of the object that hits the face and the speed at which it comes into contact, kinetic energy (the energy required to accelerate a given mass to a given velocity). High kinetic energy trauma (such as RTAs) tend to result in a greater extent of facial injury, leading to panfacial trauma or fractures to the midface and frontal regions. A comminuted fracture pattern tends to be the norm. In contrast, low kinetic energy injuries such as the use of a fist or a bottle in the more common forms of interpersonal assault leads to more localized fractures to the nasal bones, mandible, zygoma and orbital regions.

Fractures are commonly classified anatomically. Additional considerations include whether the fracture is simple or compound, displaced/undisplaced, comminuted (the bone is fractured into several segments), greenstick (involving only one cortex – common in paediatric cases), pathological (has occurred secondary to a disease process or lesion in the line of the fracture) or complex/complicated (when there is involvement of other non-bony structures, e.g. neural or vascular structures).

General assessment

A history of the mechanism of injury may help to determine a specific fracture pattern and identify concomitant injuries common to facial fractures such those to the eye, cervical spine or brain. It may also help identify concerning mechanisms such as in the elderly who have fallen and require further evaluation.

Many patients presenting with such injuries have been assaulted and for medicolegal purposes it is important to have contemporaneous documentation of the circumstances surrounding an alleged assault in the event that the medical team are approached by the police for witness statements in the future.

It is important to exclude hard tissue trauma in situations that may initially appear to affect the soft tissues alone. Examination should include those structures that can be injured in association with fractures to the maxillofacial skeleton. Assess for the possibility of cranial, base of skull or intracranial injury. Palpate the cranium and bony facial skeleton for tenderness, boggy swelling, step deformity or depressions particularly at the orbital rims, zygoma, zygomatic arches, bridge of nose and at the lower border of the mandible. Look for nasal deformity and deviation. In the presence of nasal fracture, remember to exclude the presence of a septal haematoma.

Bleeding from the external auditory canal may be a feature of a fracture to the mandibular condyle or haemotympanum in association with a base of skull fracture. Visual symptoms and signs may be a feature of orbital fractures. However, direct visual inspection of the eyes, assessment of visual acuity, pupillary reactions, determining the range of eye movements and for the presence of diplopia are essential to rule out concomitant sight threatening injuries. An intraoral examination is essential to exclude dental injuries and assessment of the patient's occlusion. A focussed cranial nerve examination should be undertaken.

Mandibular fractures

Mandibular fractures represent the most common injury to the maxillofacial skeleton, apart from simple nasal fractures. A fracture can occur at any of the anatomical subunits which include the mandibular condyle, coronoid process, angle, body, parasymphysis and symphysis. The mandibular condyle is the most common site to fracture in isolation. However, mandibular fractures are commonly multiple with fractures to the mandibular parasymphysis and angle or fractures to the mandibular parasymphysis and condyle being the most common combinations.

Symptoms include pain, swelling, restricted jaw movements, restricted mouth opening (trismus), inability to close the teeth together completely and abnormalities to the bite (occlusion). Specific signs of mandibular fractures include the presence of a sublingual haematoma (seen with symphyseal/parasymphysis fractures), steps or mobile segments within the mandibular dental arch, altered occlusion and anaesthesia/paraesthesia in the distribution of the mandibular division of the trigeminal nerve, presenting as a numb lip.

A Guardsman's fracture is a specific fracture pattern in the mandible that occurs when the force that results in fracture is focussed at the mandibular symphysis. This results in fractures at the symphysis and bilateral condyles. This is commonly seen following an unexplained collapse in elderly patients who fall without an attempt to save themselves with outstretched hands. They characteristically present with a sublingual haematoma and an abnormal occlusion manifesting as an anterior open bite