FACIAL INJURIES IN SPORTS

Background

1. Sports related facial injuries account for 6-8% of all facial soft tissue injuries[1]
    - 11-40% of all sports injuries involve the face
    - There are several general categories for facial trauma
        - Soft tissue injuries-contusions, abrasions, lacerations, punctures, hematomas
        - Facial-orbital, nasal, zygomaticomaxillary, mandibular bones
        - Dental injuries-tooth fractures, displacement, and avulsions
2. General Information
    - Male to female ratio is approximately 10-14:1[2]
    - Peak incidence 16-20 years of age
    - Vast majority of injuries occur from direct contact with a ball or head to head contact
    - Nasal fractures account for ~60% of facial fractures
    - Other facial fractures:
        - Zygomaticomaxillary 10-20%
        - Mandibular 10-15%
        - Orbital 3-5%

Pathophysiology

1. Anatomy of face
    - Soft tissues-extremely vascular
        - Blood supply derived from internal and external carotid arteries
        - Sensation
            - 3 branches of trigeminal nerve
        - Motor function
            - 5 branches of facial nerve and motor division of trigeminal nerve.
        - Infections are uncommon
        - Elasticity of skin aids in healing
    - Facial bones-divided into thirds
        - Upper third:
            - Frontal bone-ends at level of supraorbital ridge
            - Fractures in this area usually involve frontal sinus
        - Middle third
            - Most prominent and complex
            - Extends from below supraorbital rims to incisal edges of upper teeth
            - Consists of orbits, nasal bones, zygoma, maxillary bones
            - Orbital space-cone shaped and consists of 7 bones
                - Zygoma, sphenoid, lacrimal, maxillary, palatine, ethmoid, nasal
            - Periorbital rim
                - Serves as attachment for suspensory ligaments of eye

        - Protective framework for globe, optic nerve
    - Zygoma/maxilla-provide malar protection of mid-face anteriorly
        - Articulates laterally to form zygomatic arch
    - Nose-projects from mid-face, composed of cartilage/bone
        - Experiences highest incidence of fracture due to projection from face
- Lower third-mandible/teeth
    - Condylar processes considered a part of lower third even though they articulate with temporal bone to form temperomandibular joint[3]

2. Incidence/Prevalence-most common in direct body contact sports[4]
    - Highest risk in soccer (38.1%)
    - Baseball (16.1%)
    - Basketball (12.7%)
        - Nasal fractures account for more that 50% of all sports related maxillofacial fractures[5]
        - 15% of those fractures are recurrent
3. Risk Factors
    - Participation in direct body sports
    - Most who sustain facial bone fractures should not return to game
        - Second impact increases risk of converting simple non-operative fracture to complex disfiguring surgical fracture
4. Morbidity / Mortality
    - Poorly managed nasal fractures lead to chronic nasal deformities and breathing difficulties
    - Misdiagnosed maxillary fractures have been associated with:
        - Respiratory distress due to structural deformity
        - Intraoral bleeding and edema
    - Important to identify quickly[6]

Diagnostics

1. History
    - Mechanism of injury
    - Location of pain
    - Swelling
    - History of past injury
    - Associated symptoms (numbness, tingling, lost of senses)
2. Initial evaluation-basic principles of trauma evaluation
    - Assessment of airway, breathing, circulation, disability

- The airway must be protected from compromise:
    - Bleeding
    - Tooth fragments
    - Dental appliances
    - Severe mandibular fractures
- All unconscious patients must be considered to have a head or neck injury and require appropriate neurologic evaluation and neck stabilization
- Once life threatening injuries are ruled out, further exam for soft tissue injuries and facial fractures
    - Extensive bleeding may occur from facial wounds
    - Direct pressure usually sufficient for hemostasis
    - Injury to soft tissue between bone and overlying skin result in varying degrees of swelling, tenderness, ecchymosis
    - Lacerations most commonly occur over bony prominences in linear or stellate patterns.

3. Physical Examination
    - Upper third of face-check:
        - Facial nerve (frontal branch)
            - Raise eyebrows
        - Trigeminal nerve (ophthalmic branch)
            - Light touch intact on forehead
        - Supraorbital rims
            - Palpation of supraorbital rims
    - Middle third-check eyes, nose, zygoma, maxilla, facial nerve (zygomatic and buccal branches), trigeminal nerve (maxillary branch)
        - Examine eyes for vision changes, extra-ocular muscle function, globe integrity
        - Check for widening of mid face, pain with palpation or step off points in this region
        - Facial Nerve (zygomatic and buccal branches)
            - Close eyes, smile, purse lips, puff out cheeks
        - Trigeminal Nerve (maxillary branch)
            - Light touch intact on cheeks
        - Palpate nose, intranasal examination important for thorough nasal injury exam
    - Lower third- check lips, tongue, cheeks, all teeth, mandible, facial nerve (mandibular and cervical), trigeminal nerve (mandibular branch).
        - Observe for any lacerations especially involving the vermillion board of the lip
            - Requires careful re-approximation
        - Sublingual ecchymosis is a sign of mandibular fracture
        - Evaluate the temperomandibular joint for dislocation
        - Examination of the ear for hematoma, hearing deficiencies, or presence of fluid in auditory canal or behind tympanic membrane
            - May be indicative of underlying skull base fracture[Error! Bookmark not defined.]
        - Facial nerve (mandibular and cervical)

- Purse lips and grimace (activates platysma)
- Trigeminal nerve(mandibular branch both sensory and motor)
  - Light touch intact on mandible
  - Open/close mouth, clench teeth (muscles of mastication)

- Dental Injuries-Dental Trauma in Athletes

4. Diagnostic Testing
   - Imaging
     - Consider CT scan for all suspected facial fractures, especially maxillary, zygomatic[Error! Bookmark not defined., Error! Bookmark not defined.]
     - X-ray for maxillary sinus injuries
       - 3 view Water's, Cauldwell, lateral
     - Panoramic views for maxilla and mandible injuries

Differential Diagnosis

1. Key Differential Diagnoses
   - Upper Third:
     - Fracture of orbital rims
   - Middle Third:
     - Fracture of nose
       - Septal hematoma
     - Zygoma
     - Maxilla
   - Lower Third:
     - Fracture of skull base
     - Fracture of mandible
     - Dental trauma
     - TMJ dislocation
2. Extensive Differential Diagnoses-lacerations, abrasions, contusions to all regions of face

Therapeutics

1. Acute treatment-evaluate for severe head and neck injuries with all facial injuries
   - If evaluation reveals need for airway protection or cervical stabilization perform immediate treatment and transport immediately to ED
     - Facial fractures-no return to practice or contest
       - Orbital fractures
       - Nasal fractures
       - Septal hematoma
       - Epistaxis
       - Maxillary fracture:
         - Classified as LeFort I, II, or II
         - LeFort I- maxilla separated from nasal-septal structures, entire maxilla moves as one unit
         - LeFort II- maxilla and nasal complex separated from the orbital-zygomatic structures, maxilla and nose move as one unit

        - LeFort III separate the maxillary, zygomatic, nasal, orbital structures from cranial base
        - All cases are surgical open reduction internal fixation(ORIF)**Error! Bookmark not defined.**
    - Zygomatic fracture- "tripod fracture"
        - Zygoma fractures at attachment points on temporal, frontal, and maxillary bones
        - Palpation reveals "step-off" sign-at any attachment point of zygoma
            - 75% displaced inferiorly, medially, and posteriorly
            - 70% of pts with fracture have pain on palpation[7]
        - Referral to specialist for evaluation within 1-2 days**Error! Bookmark not defined.**
        - Soft diet for several days to weeks
        - AVOID blowing nose for several weeks to prevent further fracture displacement, subcutaneous emphysema (especially around orbit, which could lead to vision loss).[7]
    - Mandibular fracture- subcondylar regions are most frequently fractured areas
        - Obvious when $\geq$2 teeth move as a unit
        - Emergency management of airway
        - Check for intraoral debris
        - Assessment of cervical spine
        - Assess for concussion.
        - Mandible should be supported by a Barton bandage or a soft cervical collar
        - Transport for open reduction and internal fixation[8]
- Contusions, abrasions, burst lacerations, hematomas[9]
    - Keep head elevated
    - Apply ice for 15-20 minutes every 2 hours
    - Expect resolution in several weeks
- Mandible dislocation
    - Jaw usually deviates to contralateral side from fracture
    - Needs to be treated quickly to avoid resistance from muscle spasm and edema
    - Condylar fracture must be ruled out
    - With patient seated, place hands on either side of mandible
    - Use a steady downward and backward force to allow condyle to slip into glenoid fossa
    - Sedation or muscle relaxant may be required if muscle spasm has occurred**Error! Bookmark not defined.**
- Epistaxis
    - Most commonly involves anterior chamber of nose, Kiesselbach's plexus
    - Can usually be controlled with:

- Direct pressure by pinching nares together
- And/or application of vasoconstrictive spray (oxymetazoline hydrochloride, phenylephrine hydrochloride)[10]
- Brisk bleeding, caused by disruption of sphenopalatine artery or posterior epistaxis requires nasal packing and referral to emergency department for further treatment
- Return to play immediately in absence of active bleeding or other associated traumatic findings-obvious deformity, neurological deficit[11]
- Fracture reduction on sidelines with gentle external and septal (soft probe) manipulation

▪ Lacerations

- Apply pressure to achieve hemostasis
- Re-examine, cleanse with saline or tap water.
- Re-approximate wound with adhesive bandages, skin adhesive
  - For deeper and/or jagged lacerations may consult plastic surgery for best aesthetic outcome**Error! Bookmark not defined.**
- Intraoral lesions are treated same way
- May be re-approximated with absorbable suture material
  - Cheek (through and through) lacerations-carefully re-approximate with two-layer closure of skin and muscle to prevent intraoral pocket formation
  - Mucosal surface lacerations
    - ▪ Let heal by secondary intention to reduce chance of infection
- Consider antibiotic therapy for contaminated wounds
- Determine tetanus status

2. Further Management (24 hrs)
   - Abrasions with partial-thickness skin loss
     - ▪ Cleanse with antiseptic and apply twice-daily antibiotic ointment
   - Lacerations-after cleansing/repair dressings may include plain petroleum dressing, a synthetic adhesive covering, triple antibiotic ointment
   - Nasal trauma**Error! Bookmark not defined.**
     - ▪ Non-emergent-ice, elevation, topical decongestants
     - ▪ Re-examination in 1-2 days
     - ▪ Otolaryngology referral in 5-10 days when swelling as improved.
     - ▪ Closed nasal fracture reduction yields acceptable function and cosmetic results in >70-80% of patients
   - Contusion-ice until swelling has stabilized, then heat to increase local blood flow and hasten healing.
     - ▪ Pain can be controlled with NSAIDS for 2-5 days
     - ▪ Complete resolution in 2 weeks if there is no additional injury
   - Auricular and septal hematoma-require special attention due to potential for peri-chondral injury leading to necrosis

        - Septal hematoma-purple, grapelike swelling of nasal septum
            - Requires incision and drainage and anterior nasal packing by otolaryngologist
            - Necessary to prevent necrosis causing "saddle nose deformity"
        - Auricular hematoma-ecchymotic fluid collection in helical portion of the ear
            - Requires incision and drainage, closure, and compressive dressing for 3 days**Error! Bookmark not defined.**
3. Long-Term Care
    - Abrasions-not healed in 14 days or full-thickness injuries, refer to plastic surgeon for further evaluation
    - Auricular hematoma
        - After placement of compressive dressing, usually silicone splint, re-examine in 7 days[12]
        - Treat for 14 days total
    - All fractures return to play based on severity and requirement for surgery[6,7,13]
        - Usually earliest is 6 weeks
        - Usually requires protective equipment for return to play (varies based on availability and specialist preference)

Prevention

1. Primary Prevention
    - See NCAA Sports Medicine Handbook for sports specific recommendations
        - www.ncaapublications.com/p-4203-2010-2011-sports-medicine-handbook.aspx
2. Secondary Prevention
    - Based on specialist recommendations otherwise as noted above for specific injuries, or for athletes comfort
    - Once fracture has healed, return to primary prevention equipment recommended for specific sports.

References

1. Tuli T, Hacchl O, Hohlrieder M, *et al.*: Dentofacial trauma in sport accidents. *Gen Dent* 2002, 50:274–279
2. Outcome Analysis of Sports-Related Multiple Facial Fractures. Hwang, Kun MD, PhD; You, Sun Hye MD; Lee, Hong Sik MD Journal of Craniofacial Surgery May 2009 - Volume 20 - Issue 3 - pp 825-829
3. Avrahami E, Frishman E, Katz R: CT evaluation of otorrhagia associated condylar fractures. *Clin Radiol 1994*; 9:877
4. Hwang K, You SH, Lee HS. Outcome Analysis of Sports-related multiple fractures. *J Craniofac Surg 2009*. Jul;20(4):1260-2
5. Handler S: Diagnosis and management of maxillofacial injuries. *Athletic Injuries to the Head, Neck, and Face.* Edited by Torg JS. St. Louis. Mosby Year Book: 1991:611-641
6. Ranalli, DM, Dermas, PN: Orofacial injuries from sports accidents. Sports Med 2002, 32:409-418

7. Lingg M, Laedrach K, Chen J, *et al.:* Classification and treatment of zygomatic fractures: a review of 1,025 cases. *J Oral Maxillofac Surg* Aug 1992, 50(8): 778-90
8. Peacock WF. Face and Jaw Emergencies. *Emergency Medicine: A Comprehensive Study Guide.* Edited by Tintinalli JE, Kelen GD, Stapczynski JS. New York: McGraw Hill 2000
9. Hale W: Skin Wounds: minor lacerations, contusions, and abrasions. *Essentials of Family Medicine*. Edited by Slone PD, Slatt LM, Curtis P, Ebell MH. Baltimore: Williams & Wilkins; 1998
10. Stackhouse T: On-site management of nasal injuries. *Physician Sports Med* 1998, 26:69-72
11. Echlin P, McKeag D: Maxillofacial Injuries in Sport. *Current Sports Medicine Reports 2004,* 3:25-32
12. Lane SE, Rhame GL, Wroble RL: A silicone splint for auricular hematoma. *Physicians Sportsmed 1998,* 26:77-81
13. Mahmood S, Keith DJ, Lello GE. *Current practice of British oral and maxillofacial surgeons: advice regarding length of time to refrain from contact sports after treatment of zygomatic fractures.*Br J Oral Maxillofac Surg 2002, 40:488-490.

Author: Sarah James, DO, *Medical College of Wisconsin, Milwaukee, WI*

Editor: Carol Scott, MD, *University of Nevada Reno FPRP*