A Review Paper

Medical Issues in American Football: Eyes, Teeth, and Skin

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Abstract

Providing care to football players often involves recognizing and treating nonorthopedic conditions. We report on common ophthalmologic, dental, and dermatologic conditions seen by the football team physician.

Orthopedic conditions are only one of the many medical issues football team physicians may face. In this review, we cover the management of a few of the most common nonorthopedic medical issues football team physicians are likely to encounter, including eye injuries, dental concerns, and skin conditions.

Eye Injuries

More than 2.5 million eye injuries occur each year, with 50,000 people permanently losing part or all of their vision.[1] Eye injuries account for over 600,000 yearly emergency department visits; over 30% of these eye injuries were attributed to a sports injury.[1] Football is classified as high risk for eye injury, along with baseball, hockey, basketball, and lacrosse.[2] Common eye injury mechanisms are categorized as blunt, penetrating, and radiating. Blunt injuries are most common.[2] When evaluating an athlete on the sideline, relevant history would include the size of the object, the level of force, and the direction from which the impact occurred. An examination should include best-corrected visual acuity using an eye chart, confrontational visual fields, assessment of extraocular movements, assessment of red reflex, and pupil evaluation with a light source.[2]

Cornea Injuries

The outermost layer of the eye, the cornea, can be subject to blunt and penetrating injuries. Corneal abrasions often occur from mechanical trauma, such as one from the fingernail of an opposing player, that disrupts the integrity of the corneal epithelium. A corneal abrasion can be identified by applying fluorescein strips after application of a topical anesthetic. Abrasions appear fluorescent green when viewed with a cobalt blue light. If an abrasion is identified, management includes preventing infection and treating pain. Prophylactic topical antibiotics can be applied, particularly for contact lens wearers. Patching has not shown benefit in treatment of pain.[3] The physician can consider using topical nonsteroidal anti-inflammatory drugs, such as diclofenac or ketorolac, with a soft contact lens to treat the pain.[4] The patient should follow up frequently for monitoring for infection and healing.

Orbital Fractures

Orbital fractures should be considered when an object larger than the orbital opening, such as an elbow or knee, causes blunt trauma to the surrounding bony structures, or a digital poke occurs to the globe.[5] The floor of the orbit and medial wall are thin bones that often break sacrificially to protect the globe from rupture. Examination findings may include diplopia, sunken globe, numbness in the distribution of infraorbital nerve, or periorbital emphysema.[6] Urgent evaluation should be considered to rule out associated intraocular damage. Imaging and a physical examination can help guide surgical management, if indicated. The most common outcome after this injury is diplopia with upper field gaze.[5]

Retina Issues

Trauma to the face or head may result in a separation of the retina from the underlying retinal pigment epithelium and allow vitreous fluid to seep in and further separate the layers, causing a retinal

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detachment. Symptoms may include flashes of light (photopsia), floaters, and visual field defects. Emergent referral is indicated, as the outcomes from this condition are time-sensitive. Consider placing an eye shield to prevent any further pressure on the globe.

Globe Injuries and Rupture

Another emergent ophthalmologic condition that can occur in football is globe rupture. Clinical findings usually prompt the clinician to consider this diagnosis. Hyphema (the collection of blood in the anterior chamber) may be seen in globe injuries. The most common clinical finding of athletes requiring hospitalization after an ocular injury is macroscopic hyphema (**Figure 1**).[7-9] Hyphema should be monitored with serial intraocular pressure evaluations, as increased pressure may lead to secondary complications. Another clinical finding that should cause the physician to consider possible globe rupture is the presence of severe subconjunctival hemorrhage encompassing 360° of the cornea.[8] Pain and decreased vision occur with globe rupture. Placement of an eye shield to protect the globe from further pressure and immediate referral should be arranged. Prevention of endophthalmitis is key and prophylactic antibiotics are utilized.

Figure 1. Layering of red blood cells in the anterior chamber following blunt trauma. This grade 1 hyphema has blood filling in less than one-third of the anterior chamber.
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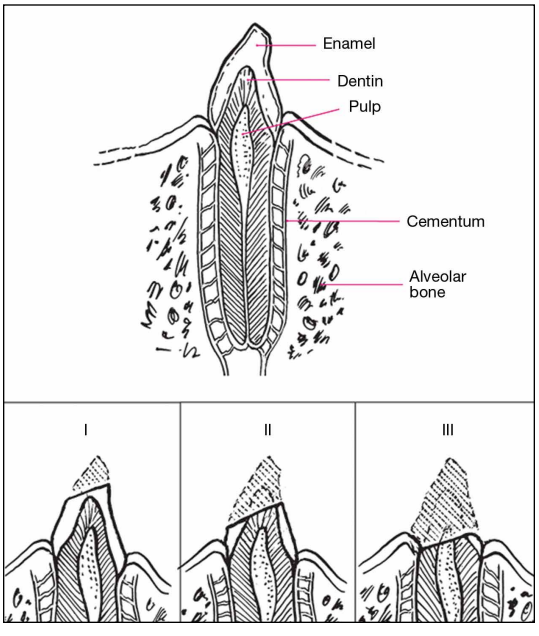

Figure 2. Dental anatomy.
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Prompt referral is warranted when there is a sudden decrease or change in vision, pain during movements, photophobia, and floaters and/or flashes.[2] Consideration of return to play should take into account the patient's vision and comfort level, which should not be masked by topical analgesics. Protective eyewear has been mandated in several sports, and has decreased the rate of eye injuries.[10] Polycarbonate lenses of 3-mm thickness are recommended due to the significant comparable strength and impact-resistance.[2] During the preparticipation physical for high-risk sports, the utilization of protective eyewear should be discussed.

Dental Concerns

Dental injuries may present a challenge for the sports medicine clinician. Contact injuries from elbows, fists, and other nonprojectile objects typically result in low-speed, lower-energy injuries, such as soft tissue lacerations and contusions. On the other hand, high-speed injuries occurring from balls, pucks, and sticks may result in more significant trauma. Baseball accounts for the highest percentage of sports-related dental injuries (40.2%), while basketball was second (20.2%) and football third (12.5%). Over 75% of these injuries occurred in males.[11]

On-field management of dental injuries should always start with the primary trauma survey, including assessment of the athlete's airway, breathing, and circulatory function, as well as a targeted cervical spine evaluation. When obtaining a history, one should recognize the mechanism of injury and assess for signs of concomitant injuries, ie, respiratory compromise, concussion, leakage of

cerebrospinal fluid, and teeth alignment. Findings from this initial evaluation may reveal critical conditions that will require management in addition to the dental injury.

Of central concern in managing dental trauma is preserving the viability of the injured structures. Therefore, much attention is paid to the pulpal and root vitality of injured teeth. The International Association of Dental Traumology Dental Trauma Guidelines recommend a biological approach to the urgent care of dental injuries:[12]

1. Stabilize the injury by carefully repositioning displaced entities and suturing soft tissue lacerations.
2. Eliminate or reduce the complications from bacterial contamination by rinsing and flushing with available liquids and use of chlorhexidine when possible.
3. Promote the opportunity for healing by replanting avulsed teeth and repositioning displaced teeth.
4. Make every effort to allow continued development of alveolar ridges in children.

Mouth guards are the single most effective prevention strategy for most contact sport dental injuries. One meta-analysis demonstrated a pooled 86% increased risk of orofacial injuries in nonusers.[13]

To review the anatomy (and injuries) of the tooth, one must consider the Ellis classification of enamel, dentin, and pulp injuries (**Figure 2**). Class I involves only the enamel, class II involves the dentin and enamel, and class III involves the pulp, dentin, and enamel.

Tooth Subluxation

Tooth subluxations usually occur secondary to trauma and cause loosening of the tooth in its alveolar socket. A root fracture should be suspected in the setting of a subluxation. On exam, the tooth may be excessively mobile with gentle pressure. If unstable, immobilization with gauze packing or aluminum foil with dental follow-up is recommended.

Fractures

Ellis class I fractures are small chips in the enamel. There should be uniform color at the fracture site. A dental referral may be warranted to smooth rough enamel edges, but if no other injuries are present, these athletes may continue playing with some protection of the fractured surface. A mouth guard may be helpful to avoid mucosal lacerations.

Figure 3. Ellis Class II dental fractures.
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Figure 4. Tooth avulsion.
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Ellis class II fractures often present with sensitivity to inhaled air and to hot and cold temperatures. Yellow dentin is visible at the fracture site (**Figure 3**). The athletes should be restricted from contact activities, a calcium hydroxide dressing should be placed, and the fracture site should be covered with gauze or aluminum for protection. The athlete should be evaluated by a dentist within 24 hours.

Ellis class III fractures may also present with air and temperature sensitivity. Finger pressure may expose a large fracture. Pink or red pulp is visible at the fracture site. Wiping the fracture site with sterile gauze may reveal bleeding from the pulp. This is considered a dental emergency. Immediate restriction from contact sports participation and urgent dental evaluation is indicated for root canal and capping and to prevent abscess formation.

Tooth Avulsion

Tooth avulsions occur when a tooth is completely displaced from the socket (**Figure 4**). Primary teeth

Figure 5. Methicillin-resistant *Staphylococcus aureus* abscess.
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Figure 6. Tinea corporis.
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should not be re-implanted, but every attempt should be made to preserve the viability of adult teeth. When adult teeth are re-implanted within 20 minutes, there is an up to 90% rate of preserving the tooth's viability. Ideally, this should be done in 5 to 10 minutes. If the tooth is out more than 6 hours, then there is a <5% chance of preserving tooth viability. Before attempting re-implantation immediately after the injury, gently trickle or rinse any debris from the tooth with sterile saline. Do not rub or scrub the root, as this will efface and damage the delicate periodontal ligaments crucial for the health of the root. Close attention should be paid to ensure the tooth is re-implanted in the correct orientation. Prophylactic antibiotics (such as amoxicillin-clavulanate) are indicated and a tetanus booster if the athlete's immunization status is unknown or not up-to-date. If unable to re-implant, transport in sterile saline, Hank's Balanced Salt Solution, milk, or in the athlete's cheek. If any teeth are aspirated, they should be removed by bronchoscopy. Dental referral is warranted for repositioning, splinting, possible root canal therapy, and long-term follow-up. After consultation with a dentist, a number of athletes may return to play in 2 to 4 weeks with a splint, mouth guard, or mask.

Skin Issues

Dermatological issues are some of the most common medical conditions faced by a football team physician. Skin infections in particular can pose a significant challenge both diagnostically as well as from a clearance-to-play perspective, given the potential for infections to affect other participants, such as other members of the team. Skin infection rates vary by sport and age group, with one study reporting 28.56 infections per 100,000 athletic exposures in high school wrestlers, which was more than 10 times that of football.[14] Still, football players are at a higher risk of skin infections given the contact nature of the sport and close person-to-person proximity. A precise diagnosis may be difficult early in the course of a skin eruption, and with differing guidelines from various professional societies, it may be best suited for medical personnel familiar with these conditions, such as a sports medicine physician or dermatologist, to manage these athletes. A thorough and systematic evaluation is recommended, as athletes are often treated with unnecessary antibiotics, which contributes to antibiotic resistance. Previous antibiotic use may also be a risk factor for developing community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA).[15]

Two terms sports medicine clinicians must be familiar with are "adequately protected" and "properly covered." The National Collegiate Athletic Association (NCAA) defines a wound or skin condition as adequately protected when the condition is considered noninfectious, adequately treated by a healthcare provider, and is able to be properly covered. A skin infection is considered properly covered when the lesion is covered by a securely attached bandage or dressing that will contain all drainage and remain intact throughout the sport activity.[16]

Impetigo

Impetigo is often caused by *Staphylococcus* and *Streptococcus* subspecies. The classic presentation is a dry, honey-crusted lesion with an ery-

thematous base. Culture or gram stain may be helpful, but treatment may be initiated on a clinical basis without these studies. Topical antibiotics may be used, but in the setting of multiple lesions or an outbreak, systemic (eg, oral) antibiotics are preferred. Oral antibiotics may also shorten the time to return to play. If not responsive to the initial treatment, MRSA should be considered. No new lesions for 48 hours and a minimum of 72 hours of therapy with no moist, exudative, or draining lesions are required prior to return to play. These lesions cannot be covered as the sole means of return to play.

Methicillin-Resistant *Staphylococcus aureus*

MRSA is one of the most challenging skin infections for the sports medicine clinician to manage. Several outbreaks have been reported in the high school, college, and professional settings.[17-20] Standardized precautions and a proactive approach are key in preventing MRSA outbreaks. It appears that different activities within a given sport may contribute to MRSA risk. One study reported football linemen had the highest attack rate, while another study reported cornerbacks and wide receivers to have the highest rate of MRSA infections.[17,20] The elbow area was the most common site infected in both studies.

Abscesses are best initially managed by incision and drainage as well as obtaining wound cultures (**Figure 5**). In the absence of systemic symptoms or cellulitis, oral antibiotics may not be necessary. However, should antibiotics be considered, depending on local resistance patterns, antibiotic choices include sulfamethoxazole-trimethoprim, doxycycline, or clindamycin.

Preventative measures are thought to be useful, especially in the management of teams. The Centers for Disease Control and Prevention has published guidelines for both clinicians and patients. Precautions including hand washing; encouraging good overall hygiene; avoiding whirlpools; discouraging the sharing of towels, razors, and athletic gear; maintaining clean equipment/facilities; and encouraging early reporting of skin lesions.[14,17,21,22] Isolated cases of MRSA do not need to be reported, but if more than one athlete is infected, one should notify the athletic training and team coaching staff. In the setting of an outbreak, the physician may need to notify local or state health agencies. No new lesions for 48 hours and a minimum of 72 hours of therapy with no moist, exudative, or draining lesions are required prior to returning to play. These lesions cannot be covered as the sole means of return to play.

Tinea Pedis

Tinea pedis is a common dermatophyte infection involving the feet and is most commonly caused by Trichophyton rubrum. Its distribution is usually interdigital or along the plantar surface of the foot. Topical antifungals with either allylamines or azoles are usually sufficient. Terbinafine has been shown to have a shorter duration of treatment. Athletes with tinea pedis are not restricted from sports participation during treatment, as long as the lesions are properly covered.

Tinea Corporis

Tinea corporis is a common superficial fungal infection of the body. It classically presents as pruritic, annular lesions, with well-demarcated borders and central clearing (**Figure 6**). The periphery is often scaly. Evaluating a skin scrapping via culture or with potassium hydroxide (KOH) preparation may be helpful when a diagnosis is uncertain. Allylamines may be more efficacious than azoles. For small areas, topical agents should be sufficient, whereas larger areas may better respond to oral agents. This infection requires 72 hours of treatment, absence of new active lesions, and covering with a bio-occlusive dressing before return to play. Athletes with extensive lesions may need to be disqualified from contact sports activities.

Tinea Cruris

Commonly known as "jock-itch," this fungal infection is often very pruritic and involves the groin or genital region. The area is also inflamed and scaly. Treatment usually consists of topical allylamines or azoles. Allylamines amines are often preferred, as they require a shorter duration of treatment. There are no specific guidelines on the return to play with these athletes. Clearance is at the team physician's discretion, but usually there are no restrictions. Athletes with extensive lesions may need to be disqualified from contact sports activities.

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