Athletic Skin Injuries

Combating Pressure and Friction

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In Brief: Because the skin is the athlete's first line of defense, it is exposed to friction and pressure in nearly every athletic setting. Whether applied acutely or chronically, friction and pressure often cause skin trauma, such as abrasions, chafing, calluses, blisters, talon noir (black heel), and acne mechanica. Sports medicine clinicians, who regularly see skin injuries, can speed healing by making a timely diagnosis, recommending effective treatment, and discussing prevention strategies.

The integument, positioned at the interface between the athlete and the sporting environment, represents not only the body's largest organ, but also the one that experiences disruption from acute or long-term application of sports-related friction and pressure. Prevention and treatment of injuries that develop in this setting can greatly enhance a participant's ability to compete successfully over short and long periods in various settings.

Abrasions

Acute abrasions are produced when the granular and keratinized skin cells are abruptly removed from the underlying dermis or "true skin." Trauma denudes the epidermis, thereby exposing the more substantive lower papillary and reticular dermis, and punctate bleeding occurs from the severed arterioles of the dermal papillae. These pinpoint areas of bleeding within a larger patch of tissue exudate contribute to what is often clinically referred to as a "raspberry" (figure 1) or "strawberry."
The terms "mat burns" or "road rash" generally refer to deeper intrusion of the athletic surface into the dermis. A related injury, "turf burn" (figure 2), develops when an athlete, most commonly a football player, slides an exposed area of skin across artificial turf. Because artificial turf has a lower coefficient of friction than natural grass, especially when wet, the athlete slides a greater distance, thus generating heat and producing an injury that is part abrasion and part burn.

Treatment is determined by the severity of the injury. Initial treatment of minor abrasions consists of very gentle cleansing with a mild detergent or soapless cleanser, such as Cetaphil antibacterial cleanser (Galderma Laboratories, Fort Worth, Texas). Cleansing with a mentholated shaving gel precludes the need for keeping clean water on the sideline of the athletic arena. Applying bacitracin zinc ointment and a dry dressing provides a moist environment that promotes healing with a minimum of scarring.

Larger abrasions, especially in a dirty environment, require more aggressive immediate care.
Newer approaches focus on minimizing additional trauma and discourage aggressive scrubbing, especially with washes such as hydrogen peroxide or povidone iodine that may be cytotoxic. These topical antimicrobial cleansers impede the repair functions of fibroblasts and other cells responsible for normal cutaneous healing.

Improved methods for treating abrasions include flushing the wound with a nontoxic surfactant, such as SAF-Clens AF (ConvaTec, Skillman, New Jersey) or a 0.9% sodium chloride solution using a bulb or pistol-type syringe. Cleansing is followed by the application of a hydrocolloid or semiocclusive hydrogel dressing that provides a moist healing environment to promote optimal cell migration and prevent crust formation. Hydrocolloid dressings such as DuoDerm (ConvaTec, Skillman, New Jersey) and Cutinova Hydro (Beiersdorf Inc, Wilton, Connecticut) absorb exudates rather than allowing them to evaporate, which is also a function of semipermeable membranes, including Bioclusive (Johnson & Johnson, New Brunswick, New Jersey) and Nexcare Tegaderm (3M Company, St Paul). Both types of barriers can remain in place for up to 7 days and may be covered with tape and/or padding to permit participation in practice or competition.

Preventive measures for abrasions require a commonsense approach to protect skin that may potentially receive trauma. Protective equipment, such as sliding pads, long-sleeve shirts, long socks, "biker" shorts or a self-adhesive bandage, such as Nexcare Coban (3M Company, St Paul) may be worn over vulnerable exposed areas.

Chafing

In contrast to the immediate, direct injury to the epidermis and upper dermis caused by acute abrasions, other cutaneous conditions appear from more insidious long-term friction. Chafing, encountered in nearly all sports, is caused by mechanical rubbing of the skin by other body parts or by clothing. Frequently affected regions include the neck, axilla, and upper inner thighs, with the latter usually being the most troublesome. Excess thigh bulk from fat or muscle, sweat, and improperly fitted trunks contribute to the problem. Tennis players and bicyclists seem to be particularly prone to this injury, because they naturally develop disproportionately large thigh muscles.

Applying lubricating ointments or 1% or 2.5% hydrocortisone ointment will often relieve symptoms and help prevent further chafing. Aquaphor (Beiersdorf Inc, Wilton, Connecticut) or simple petrolatum may be particularly helpful for prevention. Biker or "bun hugger" shorts made of elasticized fabric that extends from waist to midthigh and sports shorts made of low-resistance polyester fabric are also excellent options.

A more site-specific form of chafing produced by persistent friction at the nipples and areolae of serious runners is known as "jogger's nipples." Surprisingly, this malady is more common in men than women, probably because most women athletes wear some type of soft, protective sports bra. Anyone who has observed the finish of a marathon is familiar with the blood-stained shirts worn by some of the participants. An obvious preventive measure for men is to simply run without a shirt. Wearing a shirt made of cotton, silk, or some other soft fabric, and avoiding shirts with rubberized logos are also of great benefit. Lubricating ointments may work on short runs but will quickly rub off. A circular piece of tape, cut to the size of the areola, may be the best preventive measure. Although a distracting annoyance, chafing rarely requires
modification of a training or competition schedule.

**Calluses**

Calluses are the skin's compensatory attempt to protect itself from chronic friction. They form most commonly on the weight-bearing areas of the soles of the feet (figure 3) and on the palms where rackets or golf clubs rub the skin over the distal metacarpal heads. Although calluses are generally asymptomatic, they may cause discomfort when they become too thick. In certain sports, such as gymnastics, they may actually provide a competitive advantage by preventing injury to the dermis.

![Figure 3. Extensive calluses on the sole of a 35-year-old recreational long-distance runner resolved without treatment.](http://www.physsportsmed.com/issues/2004/0504/basler.htm)

An asymptomatic callus generally does not require intervention. If the callus impairs an athlete's performance or if a blister forms beneath the callus, careful paring of the thickened skin with a scalpel is advised. After soaking the area and applying salicylic acid preparations, abrasive reduction of the hyperkeratotic skin with a file, rasp, or pumice stone is also effective. Prevention may not be entirely possible; however, properly fitted shoes, gloves, or cushioned grips on rackets can minimize callus formation.

Pressure exerted on a specific point, especially a minor skeletal defect of the foot, may cause a painful corn or clavus, sometimes referred to as a plantar keratosis. Although a clavus may interfere with competition, it can be treated simply with daily filing and by wearing a doughnut-shaped pad. Proper shoes and cushioned socks may also be helpful.

**Blisters**

Most athletes view blisters as an annoyance and an unavoidable result of vigorous training. Blisters rarely exclude an athlete from participation, but they can impair athletic performance, and preventive measures should be taken. Blisters occur most commonly on the palms and soles from repeated friction. They appear as tender vesicles filled with clear fluid (figure 4) or blood, or, if ruptured, as erosions with remnants of the epidermal roof.
Treatment depends on the site and the size of the blister. No treatment is necessary for small blisters. When possible, the epidermal roof should be left intact to serve as a natural barrier against infection. Large blisters (>1 cm in diameter) should be drained by puncturing the roof with a sterile needle or scalpel to prevent further expansion from peripheral pressure. Once drained, the blister can be covered with a membrane dressing such as DuoDerm to protect against additional friction.

Blister prevention involves reducing moisture and friction applied to the skin by gradually increasing the intensity of one's exercise routine, especially when breaking in a new pair of shoes or a racket. Well-fitted shoes and acrylic socks can diminish friction and keep feet dry by wicking away perspiration. Lubricating the skin or applying powders such as Zeasorb (Stiefel Laboratories, Inc, Coral Gables, Florida) may also help reduce friction and subsequent blisters.

**Talon Noir**

Talon noir (black heel) is associated with sports involving frequent, sudden starts and stops, such as tennis and basketball. The repeated lateral shearing force of the epidermis sliding over the rete arteriosum subpapillare causes intra-epidermal and, ultimately, intracorneal hemorrhage.4 Talon noir appears as a blue-black plaque composed of multiple pigmented puncta (figure 5), usually on the posterior or posterolateral heel.5 The lesion is referred to as black palm when it occurs on the palm of the hand in racket sports or weight lifting.
The condition is self limited and will resolve spontaneously over time. Black heel and black palm are asymptomatic skin changes that do not impair athletic performance; however, patients may see a physician because of a perceived similarity in appearance with the "seeds" of plantar warts, or, more significantly, malignant melanoma. Using a scalpel to gently pare the horny layer of the affected skin will demonstrate that the black color is merely surface pigment and should alleviate the patient's fear. Preventive measures include wearing properly fitted shoes and gloves.

**Acne Mechanica**

Acne mechanica is a somewhat more obscure result of chronic friction and pressure that is often seen in athletes. Inflammatory papules and pustules that sometimes progress to cysts and nodules are seen under protective padding or less bulky equipment. In 1975, Mills and Kligman first used this term to underscore that mechanical stresses on the skin, rather than follicular infection by cutaneous organisms, are the primary cause. Friction and pressure work with other exogenous factors, including occlusion and heat—elements that are nearly universal under athletic apparel from leotards to football helmets.

Although friction applied with pressure, occlusion, and heat may be present in a number of athletic environments, acne mechanica seems to be particularly prevalent among football players. This is probably caused by the maximum bulk of their protective padding coming into contact with dense areas of sebaceous units, specifically the face, shoulders, and upper back (figures 6 and 7). Because the total number of participants in football, from elementary school boys through adult professionals, is large compared with other contact sports, this acneiform eruption is often referred to simply as "football acne."
Preexistent acne vulgaris in football players does not appear to be a necessary precursor of acne mechanica, although the cause of the latter can be expected to exacerbate more typical cases of acne. Underscoring the role that friction and pressure play is the distribution pattern, which is usually not seen in standard cases of acne vulgaris. It is also not seen during the first days of practice before protective equipment is worn and starts to improve immediately after the season is over. Acne mechanica very rarely warrants withholding the athlete from practice or competition. The chin seems to be most often affected, possibly because of chemical irritation from components of the chin strap or from a player's cosmetic or shaving preparations.

Because the cause of acne mechanica differs from acne vulgaris, the treatment needs to be streamlined for the specific sport. Dramatic improvement in the condition, if not complete resolution, is noted by most affected athletes at the end of the competitive season. However, since acne mechanica is an annoyance during the season, and some activities (eg, dance, weight lifting) are carried out nearly indefinitely, preventive measures and treatments can be of great benefit.

For the shoulders and upper trunk, a clean absorbent cotton T-shirt worn under uniforms and equipment may help diminish all four of the contributing physical factors (occlusion, heat, friction, and pressure). Football players have long been aware of the benefit of wearing a T-shirt under shoulder pads, although less attention is often paid to the value of its being clean. Most women are unwilling to sacrifice fashion to wear a T-shirt under a leotard during aerobic exercise or under a sports bra. Removing the apparel immediately after exercise and showering, cleansing the upper back with a gentle soap and back brush or loofah-type sponge, is particularly useful. Following the shower, a topical astringent lotion or tretinoin gel may be applied.
Because of the role played by physical factors in the pathogenesis of acne mechanica, systemic antibiotics, generally used to treat acne vulgaris, seem to be of considerably less help. Isotretinoin, while of considerable value, must be used with caution because common side effects, such as muscle and joint pain and lethargy, may seriously interfere with athletic performance, and women should be cautioned to avoid pregnancy during treatment.

**Integral to the Integument**

Well-informed sports medicine practitioners are as indispensable in the care of cutaneous injuries as they are in other medical conditions. Most skin problems brought about by the effects of friction and pressure in athletic practice or competition can be prevented through thoughtful planning and preparation. More serious trauma, as seen with acute abrasions, requires immediate intervention, but it will usually not interrupt participation.

**References**


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**Disclosure information:** Drs Basler and Hunzeker and Mr Garcia disclose no significant relationship with any manufacturer of any commercial product mentioned in this article. No drug is mentioned in this article for an unlabeled use.