

Treatment and Prevention of Foot Friction Blisters

Most of us who walk, run, hike, or bike are well aware of the pain and discomfort caused by a simple foot friction blister. These hot spots and eventual blisters can make what was supposed to be an enjoyable workout a miserable hobbling experience. The U.S. military is well aware of the detrimental effects of blisters on mission readiness and complications from what seemed to be a simple foot problem. Blisters have been shown to reduce a soldier's mobility in the field, lessen his or her concentration, and affect critical decision-making skills (12,17). Complications from blisters including cellulitis, sepsis, and death are reported and occur between 2.5% and 5% in military personnel (2,13). Health and fitness professionals and recreational and elite athletes alike should have basic knowledge of those factors that influence blister formation, how to treat blisters should they occur, and, most importantly, how to prevent them.

Foot blisters may be the most common sports injury. The incidence of blisters in marathon runners is 0.2% to 39% (15). During military training, the blister incidence ranges from 5.4% to 69% (8,9,17). During Operation Iraqi Freedom I (OIF I), 33% of deployed military reported friction blisters during their deployment (4). Hikers also experience blisters with an incidence up to 48% (12). Clearly, blisters are a common problem among recreational athletes, elite athletes, and military personnel.

A friction blister is caused by frictional shear forces that cause a split or cleavage within the outermost layer or epidermis of the skin. As the forces or number of cycles of friction increase, a blister cleft forms and fills with plasma-like fluid, forming

the blister within the epidermis (1,7). Friction blisters only form on those areas of the body where the stratum corneum section of the epidermal layer is quite thick; palms of the hands and soles of the feet. Note that chaffing occurs on other areas of the body where the stratum corneum is relatively thin. For example, friction blisters do not form on our inner thighs where the skin is much thinner.

By identifying those factors that most influence blister formation, an athlete may reduce the risk by avoiding them or preparing for them. Common factors include moist damp feet, foot temperature greater than 104°F, emollients like petroleum jelly after an hour of exercise, tobacco use, heavier pack loads, and lack of an ability to train in a shoe (*i.e.*, “foot harden”) (11,16). Among women aged 26 to 34 years who had a history of blisters and those soldiers who were not able to “foot harden” before their deployment, the highest risk of blister formation during OIF I was observed (4).

The goals of treatment are to minimize pain, limit the size and severity of the blister, prevent complications such as skin infections, and optimize return to full sport/recreational activities. Clinicians have varying opinions about how to treat blisters. However, a classic article by Cortese *et al.* elucidates the most accepted method of treatment (5). Blisters smaller than 5 mm and “hot spots” should be managed conservatively. They should

not be unroofed or drained. Instead, protect the blister from pressure with a protective covering such as moleskin, a doughnut pad, a Blist-O-Ban dressing (SAM Medical Products, Tualatin, OR), or a hydrocolloidal gel pad (3). One product has not been proven to be superior over another. For blisters larger than 5 mm, wait 24 hours, clean the skin well, and then drain the blister under sterile technique from the periphery of the blister. Do not unroof the blister unless the “roof” is torn and likely to curl or wrinkle, causing more irritation to the underlying skin. Also, if the fluid material drained appears cloudy, opaque (possible infection), or foul smelling, then the blister should be unroofed and consider starting oral antibiotics. Cover the drained blister with an antibacterial ointment and check daily for signs of infection. Moleskin or another protective covering can be applied to minimize pressure and frictional forces on the healing blister. Many other anecdotal treatment options exist, and some may have validity; however, scientifically sound research needs to be done to confirm their efficacy.



As with the treatment options, there are many anecdotal reports of prevention strategies claimed by clinicians, athletic trainers, and military personnel. Some of these methods may be effective; however, there are proven prevention strategies that should be considered first. Socks composed of an acrylic, polyester, or polypropylene fiber have been shown to reduce the number and severity of blisters significantly (6,10). These fabrics wick moisture away from the skin, reducing friction and ultimately reducing blisters. Cotton and wool socks absorb sweat and moisture and, as a result, create greater friction with the skin. These fabrics should be avoided in those athletes who are prone to foot blisters. Also, a solution of 20% aluminum choridehexahydrate (Drysol) reduced friction blisters by 27% in a placebo-controlled study at the U.S. Military Academy at West Point (12). The solution was applied to the soles of the feet for five consecutive nights before bedtime. The protective effect was maintained by applying the solution only once a week; however, cadet compliance was poor because of drying and burning of the skin. This is an effective prevention option for those athletes who can tolerate the drying effect of this product.

Cushioned insoles are used by athletes and soldiers for comfort and cushioning. Two studies using Spenco (Waco, TX) insoles have been shown to reduce blisters by approximately 25% (18,19). Blist-O-Ban bandage (SAM Medical Products) also has been shown to reduce the incidence of foot friction blisters on the soles, toes, and heels (20). Finally, a common misconception is that the footwear should be “broken in” to help prevent blisters. The key to prevention is the gradual and progressive wearing of the activity-specific footwear, causing an adaptive response in the epidermal layer

of the skin: “foot hardening” (14,16). This, coupled with a proper fit, will reduce the incidence of blisters.

Friction blisters occur among military personnel and in people of varying athletic abilities and activity levels. There are many preventive options for those who are prone to forming debilitating blisters. Treatment is simple, but complications such as skin infection and sepsis can occur. Treatment should be focused on pain management, rapid healing, and infection prevention.

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