

Diagnosis of sports-related dermatoses

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Introduction

A wide variety of dermatoses are associated with participation in specific athletic activities. These dermatoses can result from mechanical injuries, exposure to environmental factors and infectious agents, contact dermatitis to sports equipment, and other factors. Proper diagnosis requires familiarity with their characteristic clinical presentations, which are sometimes bizarre and perplexing. For example, swimmers can develop greenish discoloration of the hair, caused by prolonged exposure to copper-based algicides in swimming pools. Tennis players may develop talon noir, which presents as a small black macule on the heel that resembles acral-lentiginous melanoma, but is in fact caused by bleeding into the thick stratum corneum of the heel. Unless one recognizes these features and enquires about participation in specific sports, these disorders can be difficult to diagnose. In this article, we review clinical features of various dermatoses that have been associated with participation in specific sports.

Swimming and other aquatic sports (Table 1)

Swimmer's xerosis is caused by dilution of natural sebum and is made worse by the common habit among swimmers of taking long hot showers.^{1,2} This condition can be treated by limiting the immediate post-swim shower to a quick rinse-off and application of oil-based ointment immediately after pat-drying with a towel, and it can be prevented by application of petrolatum to the skin before entering the pool.¹

Seabather's eruption presents as a pruritic vesiculopapular or urticarial eruption on areas covered by a bathing suit. It occurs in saltwater swimmers, especially in waters off the

Florida and Bermuda coasts and the Caribbean.¹ It is due to larvae of *Edwardsiella lineate* and all three swimming stages of *Linuche unguiculata*.^{1,3} Patients develop a stinging sensation, followed by a maculopapular rash that can last for 3–7 days, and sometimes up to 6 weeks.¹ Fortunately, patients often respond to antihistamines and topical corticosteroids.¹ **Swimmer's itch** is caused by the fresh water schistosome larva.⁴ When the bather comes out of the water, there is an itchy, transient erythematous eruption which subsides within a few hours. About 10–15 h later, itchy erythematous macules and papules develop throughout parts of the body that were immersed, but these resolve within several days.⁵

Hot tub folliculitis is caused by *Pseudomonas aeruginosa*, which is adapted to survive in water up to 41.1 °C.⁶ It can occur as outbreaks among people who use hot tubs, whirlpools, and swimming pools. Lesions may be follicular, maculopapular, vesicular, pustular, or a combination of all these types. The rash affects mostly submerged parts of the skin, including lateral aspects of the trunk, axillae, proximal extremities, and buttocks.⁷ The palms and soles are spared.⁸ *Pseudomonas folliculitis* has also been reported in fresh water and salt water divers; it is believed that superhydration and maceration of the stratum corneum caused by wetsuits decreases the natural antimicrobial defenses of the skin.⁹ The condition is self-limiting, and symptoms can last from 7 to 10 days.⁸ **Otitis externa** caused by *P. aeruginosa* is more common in swimmers than nonswimmers.¹⁰ Mild pain and itching are the most common symptoms, but fever and general malaise can occur in severe cases.¹ Preventive measures include gentle suction or irrigation of the ear canal after swimming, and prophylactic instillation of 2% acetic acid in propylene glycol.¹ **Pseudomonas hot foot syndrome** is a

Table 1 Dermatoses associated with swimming and other aquatic sports**Bacterial infections**

Hot tub folliculitis (*Pseudomonas aeruginosa*)
 Otitis externa (*Pseudomonas aeruginosa*)
 Pseudomonas hot foot syndrome (*Pseudomonas aeruginosa*)
 Swimming pool granuloma (*Mycobacterium marinum*)

Other infections

Tinea pedis (superficial dermatophytes)
 Plantar warts (human papillomavirus)
 Seabather's eruption (*Edwardsiella lineate*, *Linuche unguiculata*)
 Swimmer's itch (*Schistosoma* larva)

Dermatoses caused by swim gear

Scuba diver facial dermatitis
 Diving suit dermatitis
 Purpura goggelorum
 Bikini bottom

Miscellaneous dermatoses

Swimmer's xerosis
 Surfer's nodule
 Waterslide alopecia
 Swimmer's shoulder
 Green hair
 Aquagenic urticaria
 Melanoma

self-limited condition that has been described as an outbreak characterized by tender nodules on the soles of children who used a community wading pool.¹¹ Treatment is symptomatic, and most patients improve spontaneously.¹¹

Tinea pedis and **plantar warts** are common infections in swimmers. They can be transmitted through contact with swimming pools, pool decks and shower floors.¹²

Swimming pool granuloma is caused by *Mycobacterium marinum*, and presents with a small red papule on the nose, knees, elbow, or dorsal surface of the hands and feet. Infections can be due to exposure in home aquariums or swimming pools. One outbreak involved 290 cases from a single pool.¹³ This condition responds to treatment with clarithromycin or other macrolide antibiotics.⁷

The relation between swimming and risk of developing **melanoma** has been a matter of some debate.¹ In a case-control study of 507 patients with melanoma, Holman *et al.*¹⁴ reported an odds ratio (OR) of 1.14 (95% confidence interval, 0.72–1.82) for those who swam once or more a week, and concluded there was “little evidence” of relationships between melanoma and swimming. In another case-control study of 474 patients with melanoma, Osterlind *et al.*¹⁵ reported a relative risk of 1.3 (95% CI, 1.0–1.6) for “ever” vs. “never” swimming, and relative risk of 1.5 (95% CI, 1.2–2.0) for duration of swimming habits of more than 24 years. In another case-control study of 128 melanoma patients,

Nelemans *et al.*¹⁶ found that, before age 15 years, melanoma patients participated more often in swimming in swimming pools (OR of 2.20, 95% CI, 1.05–4.62), and in polluted open waters (OR of 2.41, CI 1.04–5.58). They suggested that carcinogenic agents in water, possibly chlorination byproducts, may play a role in melanoma etiology. Such factors, however, require further clarification with additional studies.

Several rare but distinctive dermatoses are caused by swim gear. **Scuba diver facial dermatitis** presents as facial dermatitis which spares the central portion of the face, eyes, and nose, and is due to allergic contact dermatitis to isopropyl parphenylenediamine, which is present in facial masks.^{17,18} **Diving suit dermatitis** presents as dermatitis of the neck, trunk, and extremities, and is due to contact dermatitis to the thiourea compound found in the rubber diving suit.¹⁹ Diving suit dermatitis has also been used to describe *P. aeruginosa* folliculitis caused by occlusion of the diving suit. Contact dermatitis to nose clips, earplugs, fins, and fin straps has also been described.²⁰ Contact dermatitis to swim goggles presents with well-demarcated periorbital erythema (Fig. 1a and b), and is usually due to contact allergy to the rubber accelerators that are used to make the black neoprene rubber padding.¹ Rarely, patients may present with raccoon-like periorbital leukoderma, which is believed to result from a toxic reaction to the foam padding.²¹ This periorbital leukoderma is distinct from **purpura goggelorum** (ocular purpura), which presents with eyelid purpura. It is caused by excessively tight application of swim goggles, creating a negative pressure under the goggles that causes suction purpura on the peri-ocular soft tissues whenever the goggles are pulled away from the face.²² It can also be caused by direct trauma between the goggles and the peri-ocular skin.¹ **Bikini bottom** is a deep bacterial folliculitis associated with damp, tight-fitting swimwear, and is more common in women. Patients develop firm, inflamed, deep nodules over the inferior gluteal crease 3–5 days after wearing a tight, damp bikini at the beach or lake, and may require systemic antibiotic therapy.¹

Swimmer's shoulder presents as an erythematous, slightly rough plaque on the right anterior shoulder. It is caused by repeated rubbing of the unshaven beard against the right shoulder with each breathing turn of the head during the breast stroke.²³

Waterslide alopecia refers to loss of hair at sites of friction with the waterslide, such as the calves.^{7,24}

Surfer's nodule presents as a fibrotic, nontender lump on the pretibial area of the leg, and occasionally the mid-dorsum of the foot, and is caused by continuous contact between the surfboard and the bony prominences, leading to local injury, repeated hemorrhage and scar formation.^{25,26} Some authors believe that surfer's nodule is a foreign body reaction to a grain of sand or other types of foreign material.^{12,27}

Green hair presents as greenish discoloration of swimmers with natural or tinted blond, gray, or white hair. It is believed

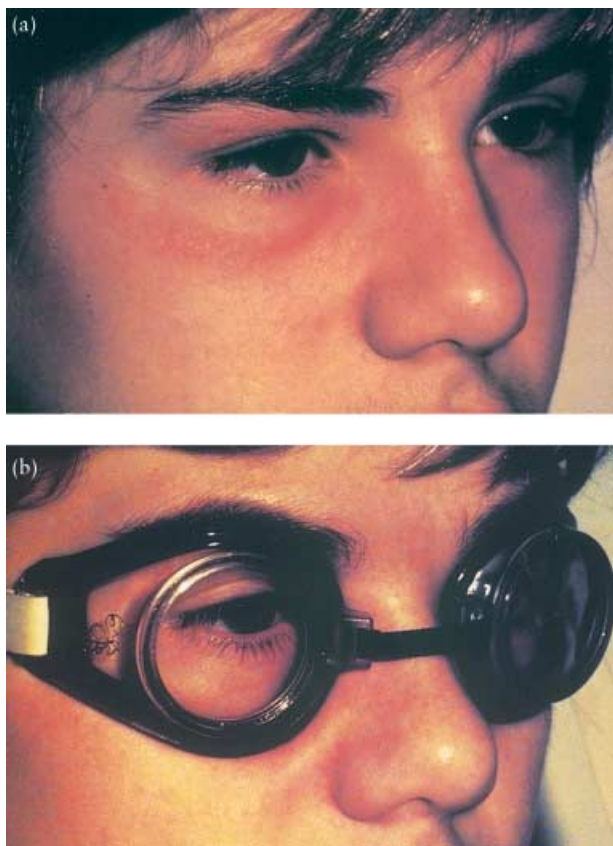


Figure 1 (a) Erythema and edema over periorbital area, caused by contact reaction to swim goggles (reproduced with permission from Basler *et al.*,¹ fig. 2). (b) Swim goggles in place, showing the erythema corresponding to the area of contact with rubber padding (reprinted with permission from Basler *et al.*,¹ fig. 3)

to be caused by copper derived from algicides or from copper pipes used in construction of older swimming pools.^{1,28}

Aquagenic urticaria is believed to be due to release of a toxic substance when water comes in contact with sebum, which leads to mast cell degranulation.²⁸ Like other forms of physical urticaria, aquagenic urticaria can be managed with oral antihistamines and mast cell degranulation inhibitors, and by avoiding the inciting stimulus.²⁸

Jogging and other running sports

Jogger's nipples present as painful eroded nipples that may bleed. They are caused by repetitive friction of the nipples against a shirt, and are commonly found in women who jog without wearing a brassier (bra), and among men who wear shirts made of hard-fiber fabrics while jogging.^{12,29} Jogger's nipples can be prevented by applying petroleum jelly or adhesive tape to the nipples before jogging, or wearing semi-synthetic or other soft-fiber bras and shirts while jogging.¹²

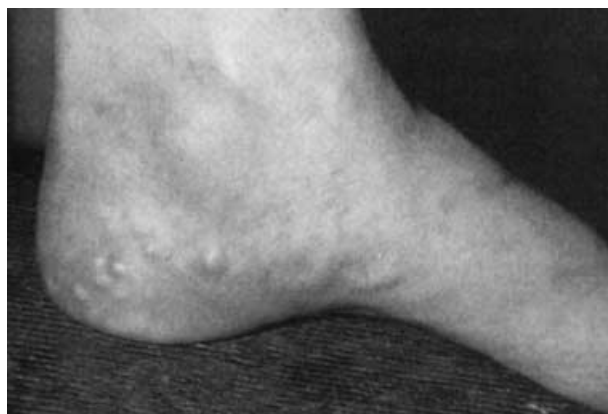


Figure 2 Piezogenic papules on the medial aspect of the foot (reproduced with permission from Pharis *et al.*,²⁷ fig. 2)

Jogger's toe presents as a subungual hemorrhage that often involves the 3rd, 4th and/or 5th toes. It is believed to be caused by constant pounding of the foot on the running surface, and may be associated with throbbing pain.³⁰ The differential diagnosis includes discoloration caused by a subungual melanocytic nevus or malignant melanoma, and if the appropriate history and physical findings of jogger's toe are absent, then removal of the nail and biopsy of the nail bed may be appropriate.³⁰

Traction alopecia can develop in women who jog while wearing a tight-banded, wide-stripped, heavy headphone.^{31,32} This condition can be prevented by wearing a lighter or looser-fitting headpiece.³¹

Runner's rump presents as small ecchymoses on the superior portion of the gluteal cleft in long-distance runners, and is thought to result from constant friction between the cheeks of the buttocks during every stride in running.^{26,27}

Piezogenic pedal papules (Fig. 2) present as skin-colored papules on the sides of the heel, which become obvious upon weight bearing.³³ They are common among long-distance runners, but can occur in nonathletes as well.³⁴

Another common disorder encountered in joggers is friction-induced **blisters** on the feet.⁵³ As in the case of swimmers, **tinea pedis** is common among runners and long-distance walkers.¹²

Skiing

Frostnip (superficial frostbite) of the cheeks and other exposed parts is a common condition occurring due to exposure to wind and cold weather.^{26,34}

Local frostbite reactions are observed in skiers who are frequently exposed to cold. One of the mechanisms of developing local frostbite reactions is by touching metal equipment (e.g. ski poles) with bare skin. It should be noted that frostbite

occasionally occurs after very brief contact with metal, which represents a very efficient heat conductor.³⁴

Recurrent **herpes simplex labialis** has been described in skiers as a result of prolonged sun exposure. It is well-known that recurrences of herpes labialis may be induced by different factors, including exposure to ultraviolet light.³⁵

Mogul skier's palm refers to hypothenar ecchymosis of the palm caused by repeated planting of ski poles.^{27,36}

Skier's toe is a hemorrhage under the plates of the great toenails usually caused by repeated anterior slippage of the distal end of the nail plate into the shoe.^{12,26,27,37}

Hockey

Skate bites represent a form of athlete's nodules in hockey players who wear tight-fitting boots.²⁷

Contact irritant dermatitis has been described among hockey players using hockey sticks containing fiberglass.^{7,34,38} Allergic reactions to dyes in hockey gloves have also been reported.³⁹

Tennis

Tennis toe presents as a painful subungual hemorrhage that often affects the first and second toes, sometimes bilaterally.^{40,41} It is believed to be due to collision of the nails of the longest toes with the top of the sneaker.⁴⁰

Black heel (Fig. 3) (talon noir, calcaneal petechiae) is a black discoloration on the posterior or posterolateral aspects of the heel. It is caused by hemorrhage in a location where blood vessels are minimally protected by fatty tissue.⁴² The development of 'black heel' is associated with frequent quick starts and stops, which is typical in tennis or basketball, but can occur in football and other sports.⁴³⁻⁴⁵

Black palm (tache noir) presents as grouped punctate hemorrhages, occurring in athletes who apply pressure to

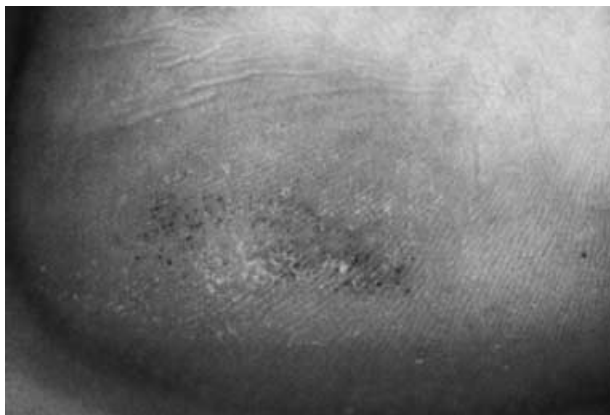


Figure 3 Black heel on the lateral surface of the foot (reproduced with permission from Pharis *et al.*,²⁷ fig. 1)

their hands. It is occasionally found in tennis players, as well as in weightlifters, racquetball and baseball players, gymnasts and golfers.^{12,27}

Stringer's fingers are the development of asymptomatic hypertrophic papules over the fingertips in tennis players who hit with a heavy spin and use tight strings.⁴⁵

Football and soccer

Turf toe is common in athletes who play football or soccer on artificial turf. It affects the great toe as a result of quick stops and turns. Acute tendonitis of the flexor or extensor of the great toe can lead to painful erythema and edema, which sometimes resembles the clinical presentation of acute gouty arthritis or acute paronychia.^{12,39}

Turf burns represent a superficial abrasion of skin (usually elbows and knees) affecting cheerleaders, as well as soccer and football players as a result of contact of uncovered areas with artificially surfaced fields.^{32,37}

Athlete's nodules are asymptomatic, well-defined, flesh-colored nodules located on the dorsal aspects of the feet. They are caused by chronic pressure, friction or recurrent trauma by tight-fitting boots and sneakers.^{12,27}

Outbreaks of *Staphylococcus aureus* **furunculosis** have been noted among high school athletes, including football players.^{46,47}

Traumatic injury of the toenails is also observed in soccer players,¹² resulting in subungual hemorrhage similar to tennis toe (affecting the first and second toes) or jogger's toe (affecting the third, fourth and fifth toes). These conditions are discussed in greater detail under their respective headings in this article.

Sports with frequent direct skin-to-skin contact

Several infectious diseases can occur as outbreaks in sports with frequent skin-to-skin contact. **Tinea corporis gladiatorum** refers to superficial tinea infections among wrestlers.^{48,49} In one outbreak among members of a high school wrestling team, lesions occurred most commonly on the arms, trunk, head, and neck, corresponding to areas of greatest contact between wrestlers.⁵⁰ Also, extensive cleaning and disinfection of the mats failed to control the outbreak. These observations were interpreted to support the likelihood that transmission occurred by skin-to-skin contact, rather than by fomites.⁵⁰

Herpes gladiatorum refers to occurrence of herpes simplex I infection among wrestlers.⁵¹ In one outbreak, 60 of 175 high school wrestlers attending a training camp were affected.⁵² As a result of the "lock up" position in which opponents' right cheeks are repeatedly pressed together, these lesions are typically on the right side of the face and head.⁵³

Infestations such as **scabies** and **pediculosis** have also been described in athletes who participate in sports with frequent frictional skin-to-skin contact.⁵⁴

Impetigo is a bacterial infection caused by *Streptococci* and *Staphylococci* species, and occurs in wrestlers, and football and rugby players.⁷ Lesions present as superficial blisters that break open, often with golden yellow crusting. Impetigo can be a secondary infection of herpes gladiatorum, atopic dermatitis, and tinea corporis gladiatorum.

Mat burns are an example of superficial abrasions often observed in athletes.³⁷

Weightlifting

Hooking thumb occurs exclusively in weightlifters as a result of a special method of gripping the weight bar (hooking). It presents as abrasions, hematomas, bullae, denudation, and subungual hematomas of the distal third of the thumb.²⁷

Black palm (pigmented palmar petechiae) is a form of palmar petechiae on the pressure points of the fingers.^{38,42}

Hand warts can be transmitted through weightlifting equipment.¹²

Striae distensae (stretch marks) occurring usually over the anterior shoulders, lower back and thighs are often observed in adolescents who lift weights regularly.

Atrophic striae that occur in combination with acne, a receding hair line or hypertrichosis are common features of athletes using anabolic steroids.^{27,55}

Exercise training

Rower's rump (lichen simplex chronicus) occurs as scaling plaques on the buttocks. It presents as ecchymoses in the gluteal cleft caused by chronic rubbing of the buttocks on the hard metallic seat of a rowing machine.^{26,56} Rower's rump should not be confused with runner's rump, which is hyperpigmentation of the superior gluteal cleft in long-distance runners.²⁶

Torso telangiectasias are small "sun bursts" of superficial vessels of the upper back and shoulders. They represent a benign condition described as a manifestation of aggressive weight training programs occurring predominantly in women.³⁷

Exercise-induced anaphylaxis is a potentially life-threatening condition with suddenly developing generalized pruritus, urticaria, angioedema, respiratory difficulties, gastrointestinal symptoms and vascular collapse. Such anaphylaxis most commonly occurs in individuals predisposed to allergic reactions.^{7,27,57} Pruritus is the most common symptom, but the other features listed above occur with varying frequencies.⁷

Golf

Golfer's nails have been described as splinter hemorrhages or linear dark streaks in the fingernails. This condition can be seen in golfers who grip the club tightly and produce an



Figure 4 Ping-pong patches on a thigh (reproduced with permission from Scott and Scott,⁵⁸ fig. 1. Copyright 1989, Quadrant HealthCom Inc.)

excessive pressure on the nail plate and underlying vascular bed.^{27,37}

Black palm, which has been described as a common pathology for weightlifters and tennis players, can also be seen in golfers.²⁶

Miscellaneous sports and dermatoses

Ping-pong patches (Fig. 4) present as 12–15-mm circular lesions with erythematous or purpuric border and clear center. They are caused by high-velocity ping-pong balls striking the exposed or protected skin.⁵⁸ A similar condition is paintball purpura, in which a large purpuric patch occurs at the site of impact between the skin and paintballs fired from an air-powered gun (personal observations).

Pulling boat hands represent subcutaneous vascular injuries and blisters in crew team members that are a combined result of mechanical injury and cold exposure.⁵⁹ Calluses later replace the acute lesions.

Creeping eruption (cutaneous larva migrans) is caused by *Ancylostoma brasiliense*, and may be identified in the athlete who plays beach volleyball in tropical areas. It presents as pruritic papules and erythema in a serpiginous arrangement.⁶⁰

Balance beam alopecia presents with hair loss from frontal to occipital scalp in a linear distribution, along either side of the vertex. It is believed to represent traction alopecia caused by head stands and rollovers performed on the balance beam.⁶¹

Poison ivy/oak dermatitis (rhus dermatitis) represents an allergic contact dermatitis that can be found in outdoor athletes, including hikers and golfers.⁶² **Hiker's and climber's toe** represents a similar condition where there are subungual hemorrhages sometimes associated with nail dystrophy and subungual hyperkeratosis.^{39,63}

Acne mechanica refers to the occurrence of papulopustular lesions in parts of the body subject to repeated friction and

pressure. The likelihood of precipitating new lesions is proportional to the severity of existing acne.⁶⁴ In hockey and football players, this occurs on the shoulders and occipital scalp, caused by friction with shoulder pads and helmets.²⁷ In weightlifters who perform bench presses by lying on plastic covered weight benches, this is seen in the central portion of the back.^{12,37} Similarly, it can occur on the backs of women who wear occlusive synthetic clothings during aerobic exercises.^{27,37} In golfers, this can occur on the lateral back due to friction with the golf bag.^{12,37} In tennis players who wear heavy garments in cold weather, acne mechanica can occur on the upper back, chest, and lower neck.^{12,45}

Calluses are common on the hands of oarsmen, racket sports players, and serious golfers.²⁶ Gymnasts consider hyperkeratotic palms to be a competitive advantage.²⁶

Sunburn is often seen in baseball players, rowers, golfers, beach volleyball players, and tennis players, as well as in sailors, water and snow skiers, snowboarders, ice skaters, hikers and mountain climbers.^{12,65} Drug-induced photosensitivity can be a significant problem in outdoor sports.³⁸

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