

REVIEW

The wear and tear of 26.2: dermatological injuries reported on marathon day

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Br J Sports Med 2004;**38**:498–501. doi: 10.1136/bjism.2004.011874

Whether it is to take on the challenge, to get in shape and lose weight, to relieve stress, or to enjoy the outdoors, people have increasingly turned to the marathon as their sporting event of choice. Although there are many health benefits, beginners should be aware that injuries are quite common in marathon runners. Among these are the wear and tear injuries to the skin. This is a review of the most commonly reported dermatological injuries on marathon day.

Dermatological injuries reported in the marathon literature include frictional skin injuries, jogger's nipples, chafing and other abrasions, tinea pedis, and jogger's toe.

BLISTERS AND OTHER INJURIES ON THE FOOT FROM REPETITIVE FRICTION

Blisters were the most common complaint of marathon runners, with an incidence of 0.2–39% (table 1). Acute friction on the soles of the feet results in horizontal shear forces which cause epidermal splits, with the separated layers then filling with blood or tissue transudate.^{1–4} The most commonly affected sites include the tips of the toes, the balls of the feet, and the posterior heel.⁵ Factors that contribute to the formation of blisters include heat, moisture, poorly fitting shoes, and excessive or unusual exercises early in training.^{1 2 6–11} Painful blisters can be lanced with a sharp sterile instrument, taking care to stay near the periphery and maintain the blister roof.^{1 11–14} Usual suggestions for preventing blisters include wearing dry socks, applying drying powder or other topical antiperspirants, wearing two pairs of socks that are different materials, applying petroleum jelly, wearing appropriately fitting footwear and moisture wicking synthetic socks, and promoting the hardening of the skin with 10% tannic acid soaks.^{1 3 9–11 14–16}

Calluses and corns are hypertrophic areas which develop on the feet of runners as a protective response to chronic and repetitive friction.^{4 12 13} Corns can be differentiated from calluses by their hyperkeratotic core.^{4 6 14} They should both be differentiated from warts which have "black seeds" indicating pericapillary haemorrhages.^{6 8} Calluses and corns both commonly occur over bony prominences, especially the metatarsal heads at the ball of the foot, and along the inner aspect of the large toe, or over areas of structurally or functionally defective areas of the foot.^{7 8} Those who desire to remove

their calluses or corns can soak their feet for several minutes and pare down the lesions to reduce the thickness of the callus, or apply an abrasive, topical salicylic acid or urea preparation.^{4 6 7 13 14}

JOGGER'S NIPPLES

Jogger's nipples are a common occurrence in long distance runners, especially in women who run without bras and in men who wear shirts made of coarse fibre such as cotton. Jogger's nipples were reported by 2–16.3% of runners on marathon day (table 2). Repetitive friction between a runner's shirt and their nipples can result in painful, erythematous, and crusted erosions of the areola and nipples.^{2 6 12 14 15 17} With prolonged irritation, lesions may crack or fissure with subsequent bleeding which may result in dramatic marks on the runner's shirt.^{6 12 15 18}

Treatment includes applying petroleum jelly or antibiotic ointment such as erythromycin after the lesions occur.^{6 12 15 18} To prevent trauma, a runner can apply petroleum jelly, commercially available patches, or adhesive tape over the nipples before long runs.^{2 4 6 12 15 18} Semisynthetic, silk, or other soft fibre bras are also available to female runners to reduce friction, and men can decrease the incidence of jogger's nipples by wearing a synthetic shirt that wicks moisture.^{2 4 6 12 15 18}

CHAFING AND ABRASIONS

Chafing is a superficial inflammatory dermatitis of skin surfaces that rub together and are subjected to increased moisture, friction, and maceration.¹³ This friction, combined with a warm, moist environment, causes a separation of the keratin from the granular sublayer in the epidermis, resulting in an inflamed, oozing lesion.¹³ In the marathon literature, chafing was reported by 0.4–16% of runners who reported to medical tents (table 3). Treatment consists of cleaning with soap and water, drying the areas thoroughly, applying a drying powder, and topical steroid ointments to alleviate inflammation.¹³ The runner can prevent chafing by wearing dry, well fitting clothes.¹³ Talcum and alum powders are mildly helpful for drying, and petroleum jelly is effective for reducing friction, especially in runners who are overweight.¹³

TINEA PEDIS

Organisms causing tinea pedis in runners include *Trichophyton rubrum* and *Trichophyton mentagrophytes*.^{5 6 12 19–23} These organisms live in keratin and thrive in the warm and moist

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Accepted 2 March 2004

Table 1 Blisters, calluses, and corns reported in the marathon literature

Event	Method of study	Number of race entrants	Number of study participants	Number of people affected
Classical Marathon Race of Athens (1973) ⁴⁴	Survey sent to runners 1 month after race	139	94	During race: 24 (26%)* After race: 13 (14%)* (blisters, chafing, loss of toenails)
New York City Marathon (1979) ³⁸	Review of medical records from medicine and podiatry tents	14153	635	96 (16%)*
Midnight Sun Marathon (1980) ⁴⁵	Survey sent 3 weeks after race	252	84	11 (19%)*
Big M Melbourne Marathon (1980) ⁴⁶	Survey of those who sought treatment during the race	5423	97	13 (13%)*
London Marathon (1982) ⁴⁷⁻⁴⁸	Report of runners treated at first aid stations during race	1700 (1982)	Unknown	12 (0.7%)†
Sheffield Marathon (1982) ⁴⁹⁻⁵¹	Report of runners treated at first aid stations	2289	409	94 (4.2%)‡ (skin lesions, including blisters)
Twin Cities Marathon (1982-94) ⁵²	Review of medical records from first aid tents	81277 (total for all years)	1534	289 (19.9%)*
Glasgow Marathon (1982-85, 1987) ⁵³	Review of medical records from first aid tents	8256 (1982)	Unknown	152 (1.8%)†
		14271 (1983)		81 (0.6%)‡
		15353 (1984)		54 (0.4%)‡
		20052 (1985)		33 (0.2%)‡
		8600 (1987)		48 (0.3%)‡
Boston Marathon (1985, 1987) ⁵⁴	Review of medical records from first aid tents	5122 (1985)	536	102 (19%)*
Wonderful Copenhagen Marathon and Danish National Marathon Championship (1986) ⁵⁵⁻⁵⁷	Review of medical records from medical tent	6364 (1987)	93	9 (10%)*
		2520 (total in race)	40	During run: 10 (16%)*
Arhus Marathon (1986) ⁵⁸	Two questionnaires given to championship participants; one for injuries during race and one for injuries after race	60 (championship participants)	60	After run: 16 (26%)*
Grandma's Marathon (1989-91, 1993-95) ⁵⁹	Questionnaire about training injuries	Unknown	161	40 (25%)*
	Review of medical records from first aid tent	3742 (1989)‡	385	89 (23%)*
		5334 (1990)‡	405	89 (22%)*
		5150 (1991)‡	242	61 (25%)*
		5640 (1993)‡	141	31 (22%)*
		5193 (1994)‡	343	72 (21%)*
		6528 (1995)‡	261	60 (23%)*
Auckland Citibank Marathon (1993) ⁶⁰⁻⁶¹	Review of medical records from first aid tent	1219	75	11 (14.5%)*
New York City Marathon (1994) ⁶²	Survey for people who presented to first aid stations for podiatry care	29735	265	109 (41%)* (corns/blisters/calluses)
Great North Run (Unknown) ⁶³	Review of medical records from first aid tents	9330 (marathon)	445	62 (0.7%)‡ (blisters, chafing, strains, stings, exhaustion)

If not otherwise stated, the percentage in "Number of people affected" refers to blisters.

*Percentage based on number of entrants in study.

†Percentage based on number of entrants in race.

‡Number of finishers.

environment of the feet.^{5 6 12 19-23} Tinea pedis presents in three forms: interdigital type with scaling plaques; inflammatory type with vesicles typically on the instep; moccasin distribution scaling type with or without erythema along the lateral aspect of the sole.^{4 5 7 12 13 24 25} Two studies have specifically looked at the presence of tinea pedis in marathon runners on race day. In 1988, Auger *et al*²⁶ took interdigital skin scrapings from 405 runners participating in the International Marathon of Montreal four days before the race and found a culture

positive incidence of 22%. Only 48% of this group had occult athlete's foot.²⁶ Lacroix *et al*²⁷ found a slightly higher incidence of 31% after taking scrapings from 147 runners after the 1998 Médoc Marathon.

Several factors are believed to put runners at risk of tinea pedis, including occlusion, trauma, sharing showers, and sweating with subsequent maceration of the epidermis.^{1 2 4 12 13 20-22 24 28-30} An astringent soak and 30% aluminium chloride applied to the web spaces may help to keep the

Table 2 Jogger's nipples reported in the marathon literature

Event	Method of study	Number of race entrants	Number of study participants	Number of people affected
Classical Marathon Race of Athens (1973) ⁴⁴	Survey sent to runners 1 month after race	139	94	2 (2%)
Mayor Daley Marathon (1977) ⁶⁴	Injuries reported at first aid station	4300	372	20 (5.4%)*
Women's National Marathon (1977) ⁶⁴	Informal survey at marathon	98	98	16 (16.3%)*

*Percentage based on number of entrants in study.

Table 3 Chafing and abrasions reported in the marathon literature

Event	Method of study	Number of race entrants	Number of study participants	Number of people affected
New York City Marathon (1979) ³⁸	Review of medical records from medicine and podiatry tents	14153	635	3 (0.4%)*
London Marathon (1982) ^{47, 48}	Report of runners treated at first aid stations during race	1700	Unknown	10 (0.5%)†
Twin Cities Marathon (1982–94) ⁵²	Review of medical records from first aid tents	81277 (total for all years)	1534	27 (1.9%)*
Auckland Citibank Marathon (1993) ^{60, 61}	Cohort study; questionnaire 2 days before marathon to assess risk factors, post-race questionnaire 1 week after race	1219	875	140 (16%)* (chafing)
				13 (2%)* (abrasions)

*Percentage based on number of entrants in study.

†Percentage based on number of entrants in race.

skin dry, remove crusts and macerated tissue, and kill bacteria responsible for superinfection.^{4, 7, 28} Topical antifungals, including the azoles, allylamines, and tolnaftate, may be used several times a day for mild disease, although reinfection is common, and oral antifungal treatment may be necessary for more moderate to severe cases.^{2, 4, 20–22, 31–34} Runners can prevent tinea pedis by frequently changing their socks, wearing ventilated shoes and moisture wicking synthetic socks, and applying powder to keep their feet dry.^{6, 7, 12, 13, 15, 21, 22, 28, 35} They should also be advised to wear sandals in the locker room and showers.^{6, 12, 15, 21, 22, 35}

JOGGER'S TOE

A repetitive thrusting of the longest toe into the toebox, especially with downhill running, results in subungual haematoma, or jogger's toe.^{4, 8, 12, 18, 36, 37} Only one study of marathon runners has reported on subungual haematoma. Bird *et al*³⁸ found an incidence of 2.5% after reviewing the medical records of 635 runners in the 1979 New York City Marathon. Clinically, jogger's toe presents on the hallux, second toenail, or the lateral aspects of the third, fourth, and fifth toes with black discoloration, onycholysis, periungual haemorrhage, oedema, and erythema.^{21, 37, 39, 40} Clinicians can also confuse jogger's toe with onychomycosis and subungual malignant melanoma.^{6, 12, 37, 39, 41} Potassium hydroxide can differentiate onychomycosis from jogger's toe.^{6, 12, 37, 39, 41} If melanoma is suspected, a biopsy should be performed.^{6, 14, 37, 39}

Treatment of subungual haematomas is not necessary, as they may resolve on their own; however, the toenail may remain black for several months.^{6, 12, 36, 37, 39, 42} Properly fitted footwear with a snug midfoot and adequate toebox can help prevent jogger's toe.^{4, 6, 12, 37, 39, 42, 43} In addition, nails should be cut straight and close to the skin to ensure equal distribution of forces and to prevent damage to surrounding nail structures.^{4, 6, 8, 9, 12, 37, 39, 42}

SUMMARY

Dermatological injuries are commonly reported by the runner on marathon day. By keeping in mind the skin diseases that plague the long distance runner, clinicians can make quick diagnoses and provide prompt and appropriate treatment.

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