

## Interesting Case Series

### *Blistered Hands*

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#### **DESCRIPTION**

This is a picture of a 12-year-old girl who had been waiting at a bus stop on a cold winter morning for several hours. She presented with swollen and painful fingers to the emergency room. Most noticeable are the multiple tense noncircumferential blisters seen on the dorsum of her fingers. The remainder of her hands, including her fingertips, appears to be pink and viable.

NEXT

## **QUESTIONS**

- 1. Describe what you see in the picture.**
- 2. What is the differential diagnosis?**
- 3. How is this injury classified?**
- 4. What is the pathophysiology of this injury?**
- 5. How should this injury be treated; what is the role of thrombolysis in this injury?**

[BACK](#)

[NEXT](#)

## DISCUSSION

The differential diagnosis for hand blisters is broad but includes autoimmune diseases (eg, bullous pemphigoid and pemphigus vulgaris), drug reaction (eg, toxic epidermal necrolysis), infections (eg, boil, herpes simplex, hand foot and mouth disease, and orf), metabolic disorders (eg, porphyria cutanea tarda), and environmental causes (eg, contact dermatitis, burn injury, and cold injury). A thorough history is important in determining the true underlying cause.

In the above case, the hand blisters are due to frostbite, which is the most severe form of localized injury caused by low temperatures. This process typically occurs with prolonged (>1 hour) exposure to subzero temperatures. Other milder forms include frost nip, pernio, and trench foot. Extremities are more prone to this injury. Oftentimes, these patients cannot escape from the cold environment because of alcohol use, drug intoxication, homelessness, mental illnesses, or other trauma.

The mechanism of tissue injury occurs at a cellular level by the formation of both intra- and extracellular ice crystals. Later, tissue injury is mediated by thromboxane A<sub>2</sub>, prostaglandin F<sub>2</sub>-alpha, bradykinins, and histamine, which lead to vasoconstriction, vascular thrombosis, leaky capillaries, and fluid extravasation.

Frostbite can be classified into 4 categories, which can be useful in determining the appropriate treatment and prognosis. First-degree injury is superficial and is characterized by tissue erythema, edema, and hyperemia. It has the best prognosis. Blisters are seen with second-degree injury, but without deep tissue necrosis. It typically occurs within 24 hours of exposure to cold. Third-degree injury is full thickness and also involves subcutaneous tissue. Full-thickness skin involvement can cause hemorrhagic blisters, which often progress to form an eschar if not excised. Fourth-degree injury involves the underlying muscles and bones and has the worst prognosis.

The acute management of frostbite has not changed significantly since originally outlined by Mills in 1966. This treatment regimen includes restoring body heat, rewarming the affected area with water at 40°C to 44°C, analgesia, and tetanus prophylaxis. Factors leading to the presentation such as acute mental illness, intoxication, and trauma involvement should also be thoroughly evaluated. The affected limb must be elevated to reduce swelling, which can worsen the depth of injury and lead to a compartment syndrome. The wound site should be cleaned and covered with topical antimicrobial dressings. Nonsteroidal anti-inflammatory drugs and topical aloe can be used to limit the inflammatory response from thromboxane A<sub>2</sub> and prostaglandins. Hegggers et al were able to show improved tissue preservation and decreased amputation rates with this protocol. Bruen et al performed a retrospective review in 2007 and found a reduction in the

[BACK](#)

[NEXT](#)

rate of extremity amputations when these patients were treated with intra-arterial thrombolytics within 24 hours of injury followed by a heparin infusion. The affected area can take up to 6 weeks to fully demarcate. Technetium-99 scintigraphy performed at around day 2 of the injury can be used to predict long-term viability of affected tissue. The burn or plastic surgery team needs to be consulted early, as these wounds often require long-term wound care, repeated debridements, possible amputations, and fasciotomies if signs of compartment syndrome arise. These patients require extensive physical and occupational therapy during and after their hospitalization.

[BACK](#)

[NEXT](#)

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BACK