

“Deep Freeze” for Muscular Strain Causing a Deep Burn

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Abstract

Cryogenic burns are rare. They are therapeutic challenge to physicians in the absence any clear accepted management guidelines. We present a patient who was referred to our National Burns Unit having sustained a full thickness burn after the application of a brand name sub-zero producing aerosol spray. These are advocated as a method of rapid analgesia for muscular strain. To our knowledge this is the first reported case in the English literature.

Keywords: Deep; Freeze; Muscular; Strain; Cryogenic; Burn; Spray

Introduction

The direct exposure of skin to a liquid hydrocarbon gas may cause a severe freezing injury. However, burns secondary to the application of these extremely low temperature mediums are very rare [1]. These injuries are predominantly associated with an occupational exposure to agents which are known to represent a hazard, such as, liquid nitrogen or pressurized ammonia [2,3].

The cutaneous appearance of the burn is usually similar to that of a partial-thickness thermal injury. However these are dynamic injuries and deeper tissue damage may well far exceed that which is first apparent. This dynamism makes this type of injury challenging to manage especially with no agreed published protocol in the literature. While the pathophysiological mechanism suggests a freezing injury, the treatment of full thickness cold burns should be analogous to that of full thickness thermal burns.

Case History

A 65 year old male patient was referred from a peripheral institution to our National Burns outpatients for evaluation of a cryogenic burn.

He had sustained a musculoskeletal injury several days previously, following a mechanical fall at home sustaining blunt soft tissue trauma to his left lower limb. His partner attempted to provide an effective rapid method of analgesia for his persistent muscular strain by applying the “Deep Freeze” spray to the affected area.

She reported applying the spray at a thirteen centimeter distance for approximately two seconds only. After its application the patient reported no discomfort and no discoloration or blistering of the skin. However, the following day he noticed a patch of discoloration on his lower limb at the site of application and presented to his local hospital for medical attention. The injury was consistent with a burn.

On examination he had a well demarcated linear area on the posterior aspect of his left thigh of white brown discolored skin, this did not blanch to touch, was insensate and leathery in texture. It was classically an eschar, indicative of a full thickness burn. The total burn

surface area was estimated at 1 percent. He was admitted to our tertiary centres burns unit for definitive management of his injury.

The patient underwent surgical debridement and resurfacing of his wound with split thickness skin grafting. He required a seven day admission, with multiple dressings, physiotherapy and occupational therapy. He was discharged well and followed up in our burns outpatient clinic where he has been progressing well.

Discussion

There are sparse reports in the literature of liquid hydrocarbon burns. The majority have included only superficial and deep partial thickness burns all of which were managed conservatively.

The application of these “freezing” sprays desensitize the skin. The peripheral nerve fibers are stimulated and exhibit a reduction in the transmission of nociceptive stimuli producing an analgesic effect. This correlates with the manufacturers marketing of these products as an effective rapid method to “freeze” the pain of such muscular injuries. This is to facilitate a faster return to normal physical activities.

This mechanism however, permits a greater exposure time to these sprays and as they contain gases that have sub-zero evaporation temperatures, the rapid expansion and evaporation of the propellant during spraying may cause a cold thermal injury, as injury [4,5].

While the manufactures of these products advise to test the spray on a small area first to assess response, the potential risk to the user is not made explicit. This presents a possible public health hazard to users, especially in the sports arena where they are frequently used.

It is postulated that cold thermal burns are less susceptible to significant scarring due to a lack of protein denaturation. This implies conservative management is acceptable in the hope that preserved dermal integrity may yield a better cosmetic result than early excision and grafting. However there is no clear guideline advocating the advantage of a non-surgical versus a surgical approach to this patient cohort [6].

This is a novel case as it is the second only reported case of a full thickness liquid hydrocarbon burn and the first with pentane in the literature. It highlights a potential public health risk to an adult,

pediatric and sporting population who commonly use these "freeze sprays" as a method of rapid analgesia.

Full thickness cryogenic burns require early surgical debridement and grafting and published guidelines for their management should be established.

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