Treating cement burns in the emergency department

Anthony Summers outlines how nurse practitioners can diagnose alkaline burns in people who have had prolonged contact with cement

Abstract

Use of cement is widespread in the UK and warnings about burns caused by contact with the material are usually printed on bags and delivery dockets. Nevertheless, about 2 per cent of people admitted to burns units have injuries, many serious, caused by prolonged contact with wet cement. This article explores the pathophysiology of cement burns, and outlines the best forms of treatment and prevention.

Keywords
Cement, alkaline burns, dermatitis, nurse practitioner

IN THE first six months of 2012, almost 4 million tonnes of cement were produced in the UK for a wide variety of uses (Mineral Products Association 2012). However, despite this high level of consumption of cement, its propensity to cause burns is rarely reported in the literature. About 2 per cent of people admitted to burns units in the UK have injuries caused by cement (Alam et al 2007), yet up to 51 per cent of people who work with the material are unaware of its propensity to cause burns and take no precautions while using it (Levis et al 2004).

Most cement includes calcium oxide, which reacts with water to form calcium hydroxide, an alkali that can have a pH greater than 12 (Lewis et al 2004). When such alkaline substances come into contact with the skin they can dissolve its protein and collagen, which dehydrates cells and turns fat into soap fat (Chung et al 2007).

Cement burn injuries are not confined to construction workers, however. Occasionally, sports players receive superficial burns following contact with the calcium oxide used to mark out touchlines on football or rugby fields (Fisher 1998).

Cement burns have an insidious onset and many patients report an initial minor irritation, which increases in severity over several hours (Feldberg et al 1992). Wilson and Davidson (1985) suggest this occurs because the alkali in cement can remain in the skin despite cleansing. Consequently, people with cement burns often present to emergency departments (EDs) a day or more after they have been in contact with cement.

Pathophysiology

Wet cement can damage the skin in three ways:

- Allergic dermatitis in the skin caused by hexavalent chromate ions in the cement (Jaeger and Pelloni 1950).
- Alkali burns, which become more severe the longer that wet cement is in contact with the skin. Such burns are defined as prolonged when contact lasts for between one and six hours (Poupon et al 2005).
- Prolonged chafing caused by clothing impregnated by concrete (Poupon et al 2005). Burns can occur on any part of the body that has prolonged contact with wet cement, while brief contact can cause allergic dermatitis.

Burns to the feet and ankles occur when wet cement makes contact with the skin in these areas, usually because it has entered the boots over the top of the uppers or because inappropriate footwear has been worn, and rubs the skin for long periods of time (Spoo and Elsner 2001). An example of a cement burn to the foot is shown in Figure 1.
Cement burns to the knees usually occur after kneeling in wet cement while spreading it (Alam et al 2007). Because the hands are usually washed before they have been in prolonged contact with cement, burns to the hands are rare.

Like most burns, those caused by cement start with localised erythema, oedema, and blistering and heat in the areas of contact (Sherman and Larkin 2005). Partial burns can reach full thickness if the alkali is not fully washed away.

The initial sequela of cement burns is raised, purple scarring, which can remain discoloured, tender and pruritic for many months (Kelsey and Alvey 1995). Longer term complications include hypertrophic scarring, contractile adhesions, skin fragility, pruritus, nerve entrapment in scars, chronic ulcerations, skin pigment changes and squamous cell carcinoma (Poupon et al 2005, Sherman and Larkin 2005). These complications are more common in burns that last longer than three weeks and in full thickness burns, particularly those that fail to heal by secondary intention (Alam et al 2007).

### Management

Patients with cement burns may require significant treatment after they have been examined and so should be seen quickly. Immediate first aid for cement burns, which involves the removal of all contaminated clothing and footwear (Sherman and Larkin 2005) to halt contact between cement and skin, can be undertaken by nurse practitioners. Cool compresses, rest and elevation should be initiated to decrease pain and oedema, just as they would be for any type of burn (Kelsey and Alvey 1995).

Affected areas of skin should then be irrigated with water or saline to help remove cement particles. Mackey and Dheansa (2005) suggest that, after patients have received analgesia, which can include paracetamol and ibuprofen or, if necessary, morphine, a pre-operative scrubbing brush and chlorhexidine solution can be used to remove cement particles. However, Rao and Menezes (2009) say this method is appropriate only as a first aid measure. Once affected areas have been cleaned thoroughly, they should be covered with non-adhesive dressings. All patients with cement burns should be referred to burns specialists.

Between two thirds and three quarters can require surgical debridement, and surgery is often indicated for full-thickness burns (Sherman and Larkin 2005).

Staff in burns units should assess and monitor the progression of the healing process until the patients concerned can be discharged. Patients should be given standard discharge wound-care information, about for example the importance of keeping wounds clean and dry, and how to monitor for signs of infection. Patients should attend burns units for follow-up care during the next six months.

Although warnings about cement burns are printed on cement bags and on delivery dockets (Wilson and Davidson 1985), they still occur in professionals and non-professionals who use the material. Such people should be advised to wear watertight boots and gloves, for example, and to use knee pads or dry boards when kneeling in cement.

### Conclusion

Although cement burns are not common presentations in EDs, they can have significant consequences for patients. It is therefore important that nurse practitioners are aware of the insidious nature of cement burns so that they can assess and treat patients appropriately before referring them for definitive management by burns specialists.

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**References**


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**Conflict of interest**

None declared