ALLERGY TO BENZALKONIUM CHLORIDE IN PLASTER OF PARIS
AFTER SENSITISATION TO CETRIMIDE

A CASE REPORT

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A patient developed specific sensitisation of the skin beneath a Gypsona plaster cast. This proved to be due to the inclusion of benzalkonium chloride in the product. The historical and practical relevance of this finding is reviewed.

CASE REPORT

A five-year-old boy presented with a simple undisplaced fracture of the lower end of the left radius. An above-elbow plaster was applied and he was sent home. Twenty-four hours later a "plaster check" revealed a swollen hand and the patient complained of intense pain. There was a rash on the left anterior abdominal wall and he was mildly febrile (38.3 degrees Celsius). The plaster was removed and marked erythema and oedema were noted on the lower arm, forearm and hand. A forearm plaster back-slab was applied and the opinion of a paediatrician was sought to exclude a coincidental viral illness.

A few hours later the boy returned with a more swollen hand and blistering of the skin in the erythematous area (Fig. 1). He was admitted to hospital, the limb was elevated, the blisters were cleaned and dressed and two weeks later both bone and skin were completely healed. The abnormalities in the skin were restricted to those parts of the left arm which had been covered by the plaster of Paris. The lesions on his left anterior abdominal wall were compatible with contact of the cast with the skin during the night after the injury and treatment. The possibility of a contact dermatitis was investigated as follows.

which comprises lignocaine, cetrimide, chlorhexidine and aminacrine, all of which are potential sensitising agents on the skin. Consultation with the manufacturers of Gypsona revealed that an antiseptic called benzalkonium chloride was included in their plaster of Paris.

Patch tests were then performed by impregnating a series of Band-Aids, each with a suitably dilute solution of one of these substances, and applying them to the boy’s back. After 24 hours patch tests were positive at the site of application of 0.5 per cent cetrimide, 0.25 per cent benzalkonium chloride and again to Gypsona. Lignocaine, chlorhexidine and aminacrine patch tests were negative. Finally, pure gypsum (base plaster) and a preparation of elasticated plaster-of-Paris bandage were also applied to the boy’s skin without adverse reaction. It was concluded that the patient was sensitive to cetrimide and benzalkonium chloride and therefore to the Gypsona.

DISCUSSION

The history of the use of gypsum, or plaster of Paris, is long and well documented (Bacon 1923; Monro 1935; Rang 1968). The plaster bandage was introduced by Antonius Mathijsen in 1852 by impregnating cloth with plaster of Paris paste (Van Assen and Meyerding 1948). He laid the foundation for present techniques, and though the original setting qualities of the bandages were poor, he regarded them as being simple and easy to apply. They provided complete fixation, were easy to remove, adequately porous, cheap and cosmetically acceptable.

The problems and complications of plaster bandages have been well described in Smith and Nephew's monograph on Gypsona Technique (1973). The calcium salts which constitute gypsum are inert and do not cause contact dermatitis. In recent years the manufacturers of gypsum products have improved the handling characteristics and behaviour of plaster bandages by the use of various additives. In addition to substances which aid adhesion, Gypsona also contains benzalkonium chloride, an antiseptic quaternary ammonium compound, related to cetrimide (Martindale 1977). Aque-

Fig. 1

Photograph showing the swollen hand and blistering skin a few hours after the removal of the plaster cast.

A primitive patch test was performed by securing a small piece of moist Gypsona and a similar piece of orthopaedic padding to the boy’s back. Within 12 hours an erythematous area appeared beneath the Gypsona, but not beneath the padding. The lesions were identical with those seen on the arm and abdomen. The boy’s father then revealed that his son was sensitive to a local skin application called Mediecream

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ous solutions of quaternary ammonium compounds are unstable if exposed to light and lose most of their antibacterial properties when brought into contact with cotton, cellulose fibre, protein or gauze. The function of benzalkonium chloride in Gypsona is “to promote the soaking properties of the plaster mass”. There have been no other cases of contact dermatitis reported in the four years or so since the agent was introduced (Smith and Nephew, personal communication).

The incidence of sensitisation to benzalkonium chloride is not established, though Morgan in 1968 described 46 cases of cetrimide sensitivity and concluded that the problem was rare. It is essential to perform properly controlled patch testing before ascribing local complications of Gypsona to this substance.

This unusual complication from the use of a Gypsona plaster cast illustrates the need to know the exact constituents of splinting products and their properties. It is also important to determine the sensitising agent in order to avoid the recurrence of such complications in affected individuals.

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REFERENCES


Editor’s Note. In the knowledge that this article was to be published Smith and Nephew have requested me to state that they have sold many million Gypsona bandages in the five years since benzalkonium chloride was introduced into their formulation. In this time they have recorded only one other case on their files. Smith and Nephew also point out that in the study reported above the benzalkonium chloride did not initiate the patient’s allergy.