

Exposure-pattern dermatitis due to CS gas

S. SOMMER AND S. M. WILKINSON

Dermatology Department, Leeds General Infirmary, Great George Street, Leeds LS1 3EX, UK

Key words: allergic contact dermatitis; airborne; CS gas; ortho-chlorobenzylidene malononitrile; incapacitants; police use. © Munksgaard, 1999.

Case report

A 24-year-old patient presented via the accident and emergency department with a bullous exposure-pattern dermatitis (Fig 1). 7 days previously, he had been detained by the police and CS gas was used, to which he had been exposed 1× before. An immediate irritant reaction was noticed on both occasions by the patient, followed by a more severe reaction 6 days after the 2nd exposure. There was no past medical history of skin disease or atopy.

Histology showed a spongiotic dermatitis with many eosinophils, consistent with an acute contact dermatitis. Immunofluorescence was negative. A diagnosis of contact allergy to CS gas was made. The patient was prescribed oral prednisolone 30 mg 1× a day for 1 week. Topically, 0.05% clobetasol propionate ointment (Dermovate®) was applied under a non-adherent dressing to the affected areas. Unfortunately, the patient defaulted from follow-up. In addition, we were unable to obtain either the CS gas or its constituents for patch testing.

Discussion

According to information from the police, the so-called CS incapacitant contains a 5% solution of ortho-chlorobenzylidene malononitrile (CS) in methylisobutylketone, with a nitrogen propellant. This results in a vapour of minute droplets or particles. A report on the safety of CS gas was published after its use to control the rioting in Ulster in 1969 (1, 2). Its use as a chemical restraint in a mentally ill person has been criticized (3, 4).

Ortho-chlorobenzylidene malononitrile has replaced

chloroacetophenone (CN; 'tear gas') for controlling riots (5). CS is 10× as irritant as CN gas, but significantly less toxic (2). Concentrations as small as 4 mg/m³ of air can make even determined subjects move away from a contaminated area, because of lacrimation, salivation, rhinorrhoea, blepharospasm, burning sensations in the eye, mouth, nose, throat and lungs, as well as constricting sensations in the chest (2). Disabling symptoms were caused at atmospheric concentrations as low as 0.73 µmol/l², and a dose-response relationship for its effect on the eye and tongue was demonstrated (6). When the skin is exposed to CS gas, a burning sensation is commonly described, followed by redness and possibly the appearance of small vesicles at places of friction. Experimentally, burns can be induced by CS, although this is thought to be highly improbable under conditions of civil disturbance (2). However, 1 report describes 11 civilians who were hospitalized with severe blistering irritant contact dermatitis after being sprayed with CS gas (7).

We believe that our patient developed contact allergy to CS spray, although we were unable to patch test him. After the initial irritant reaction had improved, which he had recognized from his previous exposure, he developed a delayed 2nd reaction, which was very severe, with extensive oedema and blistering in an air-borne distribution. There are few reports of contact allergy to ortho-chlorobenzylidene malononitrile outside the industrial setting. This may be because few individuals are repeatedly exposed; additionally, under-reporting by affected subjects may occur. In a series of patch tests of 56 occasional participants in demonstrations, there was only 1 ?+ reaction to CS (8). However, there is 1 report of primary sensitization following a single exposure to CS spray. The patient was subsequently patch tested and reacted to a 1:1,000,000 dilution (9). Occupational contact dermatitis from CS has also been well-recognized, with 2 of 28 workers in a chemical plant having a positive patch test to a 1:1000 dilution of CS, a further 23 having developed an irritant contact dermatitis (10).

In recent years, doubts about the safety in use of CS incapacitants have been voiced (11, 12). In addition to the cutaneous effects previously reported, we describe a further patient with an allergic exposure-pattern dermatitis following contact with CS spray. Development of contact allergy following a single exposure suggests that it is a potent sensitizer (9).

References

1. Himsworth H. *Report of the enquiry into the medical and toxicological aspects of CS (orthochlorobenzylidene malononitrile)*. Part 1. London: HMSO 1969. (Cmnd 4173).



Fig. 1. Bullous dermatitis on forearms 10 days after exposure to CS spray.

2. Himsworth H. *Report of the enquiry into the medical and toxicological aspects of CS (orthochlorobenzylidene malononitrile)*. Part 2. *Enquiry into toxicological aspects of CS and its use for civil purposes*. London: HMSO 1971. (Cmnd 4775).
3. Trigwell P. CS gas has been used as a chemical restraint in mentally ill person. *BMJ* 1997; 314: 444.
4. Gray P J. CS gas is not a chemical means of restraining a person. *BMJ* 1997; 314: 1353.
5. Finn D H, Hogg M A P, Crichton D. Improvement in apparatus for controlling riots. 1960; CS Patent No 967660.
6. Ballantyne B, Swanston D W. The irritant potential of dilute solutions of ortho-chlorobenzylidene malononitrile (CS) on the eye and tongue. *Acta Pharmacol Toxicol* 1973; 32: 266–277.
7. Parneix-Spake A, Theissen A, Roujeau J C, Revuz J. Severe cutaneous reactions to self-defence sprays. *Arch Dermatol* 1993; 129: 913.
8. Fuchs T, in der Wiesche M. Zur Frage der Kontaktallergien auf CN und CS ('Tränengas') bei Demonstrationsteilnehmern. *Z Hautkr* 1990; 65: 288–292, 295.
9. Kanerva L, Tarvainen K, Pinola A, Leino T, Granlund H, Estlander T, Jolanki R, Förström L. A single accidental exposure may result in a chemical burn, primary sensitization and allergic contact dermatitis. *Contact Dermatitis* 1994; 31: 229–235.
10. Shmunes E, Taylor J S. Industrial contact dermatitis. Effect of the riot control agent ortho-chlorobenzylidene malononitrile. *Arch Dermatol* 1973; 107: 212–216.
11. Jones G R N. Are CS sprays safe? *Lancet* 1997; 350: 605–606.
12. Lancet Editorial. 'Safety' of chemical batons. *Lancet* 1998; 352: 159.

Contact dermatitis from clotrimazole with positive patch-test reactions also to croconazole and itraconazole

S. ERDMANN, M. HERTL AND H. F. MERK

Department of Dermatology, University Hospitals RWTH Aachen, Pauwelsstrasse 30, D-52074 Aachen, Germany

Key words: allergic contact dermatitis; antimycotics; azoles; clotrimazole; cross-sensitivity; medicaments. © Munksgaard, 1999.

Case Report

A 52-year-old man presented with contact dermatitis in the genital area spreading to the lower abdomen and upper thighs. He had applied a cream containing clotrimazole 1% and dexamethasone acetate 0.1% (Baycuten® N). This antimycotic had been prescribed to him 1 year before and at that time successfully cured a tinea. After withdrawing the topical medication, and with additional oral treatment with prednisone 0.5 mg/kg, the skin rapidly recovered completely.

2 months later, he was patch tested with a standard series, a drugs series including clotrimazole 5% pet., all

the constituents of Baycuten® N cream, and a series of azole antimycotics (1% and 5% pet., 1% eth.). He reacted to clotrimazole and Baycuten® N, clotrimazole being the only constituent of Baycuten® N to react. Furthermore, patch tests to itraconazole (triazole) and to croconazole (imidazole) were also positive (Table 1).

Discussion

Contact allergies to modern imidazole antimycotics are comparatively rare, considering their high prescription rates. They may be caused by either vehicle components or the active ingredient. The most common sensitizers in the vehicle are cetearyl alcohol and propylene glycol (18); of the active ingredients, miconazole, econazole, tioconazole, and isoconazole have most frequently been reported (3–9, 12, 16, 22), but these are also the most frequently prescribed. Contact allergies to clotrimazole are relatively rare (1, 10, 15, 17, 20, 23).

Imidazoles can be divided into phenethyl (ketoconazole, miconazole, tioconazole, isoconazole, enilconazole, econazole, sulconazole, sertaconazole, oxiconazole) and phenmethyl (clotrimazole, croconazole, bifonazole). Itraconazole was the only triazole antimycotic in our test series, and is used exclusively for oral treatment. Cross-sensitivity was first proposed between the 2,4-dichlorophenylethyl imidazoles (13). Baes (2) then introduced the concept of ortho-chloro cross-sensitivity. Cross-sensitivity has been suggested between the phenethyl imidazoles miconazole, econazole, and isoconazole, between sulconazole, miconazole, and econazole.

Table 1. Patch test results

		D2	D3	D7
itraconazole	1% eth.*	—	+	+
croconazole	1% eth.*	—	+	+
bifonazole	1% eth.*	—	—	—
sertaconazole	1% eth.*	—	—	—
miconazole	1% eth.*	—	—	—
oxiconazole	1% eth.*	—	—	—
tioconazole	1% eth.*	—	—	—
ketoconazole	1% eth.*	—	—	—
Baycuten® N	as is	++	++	++
clotrimazole	1% eth.*	++	++	++
dexamethasone	1% pet.	—	—	—
other constituents of Baycuten® N		—	—	—

* Also tested at 1% and 5% pet.