Contact Dermatitis, 1996, 34, 27–30
Printed in Denmark *All rights reserved*

Copyright © Munksgaard 1996
CONTACT DERMATITIS
ISSN 0105-1873

Prognosis of occupational hand dermatitis in metalworkers*

MANU SHAH, FIONA M. LEWIS AND DAVID J. GAWKRODGER
Section of Dermatology, University Department of Medicine, Royal Hallamshire Hospital, Sheffield S10 2JF, UK

Hand dermatitis is common in workers employed in the cutting and grinding of metals. Previous studies have given conflicting results on the prognosis of this common occupational disease. This study was designed to determine the prognosis of hand dermatitis in metalworkers and the responsible allergens. A questionnaire survey was conducted on 64 patients seen between 1 and 5 years previously in the contact dermatitis clinic. Of the 51 patients responding, 82% still had hand dermatitis. There was no difference in outcome between those who continued to work with metals and oils, and those who had changed their occupation. Hand dermatitis in metalworkers carries a poor prognosis, with most workers remaining symptomatic even if they no longer had occupational exposure to metals or oils. This study also demonstrates that biocides are the most important allergen group in the aetiology of hand dermatitis in metalworkers.

Key words: occupational; allergic contact dermatitis; hand dermatitis; cutting oil dermatitis; prognosis; questionnaire; metalworkers; engineering industry. © Munksgaard, 1996.

Accepted for publication 26 April 1995

Hand dermatitis is common in workers employed in the cutting and grinding of metal components ('metalworkers'). In these industrial processes, cutting oils are used to cool the cutting edge of the tool, to remove chips of metals and to improve the surface of the finished product. There has been an increase in the prevalence of hand dermatitis in these workers since modern water-based soluble oils were introduced in the early 1940 s (1, 2). Soluble oils are complex substances that contain a wide variety of ingredients, including mineral, fatty and synthetic oils, emulsifiers, corrosion inhibitors, coupling agents, anti-foaming agents, perfumes, dyes and biocides. In addition, they may contain contaminants such as metals and infective agents.

The aim of this study was to establish the causative factors, in particular allergens, implicated in hand dermatitis in metalworkers, and to determine the prognosis of occupational hand dermatitis in this group.

*Part of this study was presented at the 74th Annual Meeting of the British Association of Dermatologists, London, UK, July 1994.

Materials and Methods

Between 1988 and 1993, 64 metalworkers with hand dermatitis were identified as referred for patch testing to the Contact Dermatitis Clinic. 64 metalworkers (58 male, 6 female) were patch tested. Their mean age was 45.7 years (range 21–67 years). All patients were tested to the European standard series, a preservative and vehicle series, and an oil/coolant series. Wherever possible, they were tested to the oils with which they worked, in appropriate dilutions. The patch test chemicals were supplied by Trolab (Biodiagnostics Ltd, Upton upon Severn, Worcs, UK) and were applied under Finn Chambers on Scanpor tape for 2 days. Patches were removed after 2 days and readings made at 2 and 4 days, according to standard practice.

Patients were followed up by postal questionnaire, between 1 and 5 years after patch testing, to assess the current state of their hand dermatitis. Questions were asked about symptoms, occupational history, time off work and assessment for industrial dermatitis.

Results

Results of patch testing

37 patients (33 male, 4 female) had 1 or more allergic positive reactions on patch testing. The commonest allergens thought to be relevant to the hand dermatitis are recorded in Table 1. Relevance of allergens was made on an individual basis, taking into account such factors as whether the allergen was a metal or oil constituent, the degree of exposure, any history of atopy and the use of medicaments. The commonest reactions were to the metals chromium, nickel and cobalt.

The commonest allergens thought not to be relevant to occupational hand dermatitis are recorded in Table 2. Although fragrance mix and balsam of Peru overlap with constituents of some soluble oils, and hence may be relevant, the reactions here were considered to be due to non-occupational sensitization. Thiuram mix allergy, due to rubber glove exposure, was considered to be of secondary importance in the aetiology of the hand dermatitis. The reactions to quinoline mix were thought to result from sensitization by topical medicaments.

When the relevant patch test reactions were grouped according to type of oil constituent, biocides were found to be the most common set of allergens. The number of individual reactions to each group were: biocides 29, metals 20, other oil constituents 19, and medicament/cosmetic constituents 10. Many patients reacted to combinations of allergen groups (Table 3).

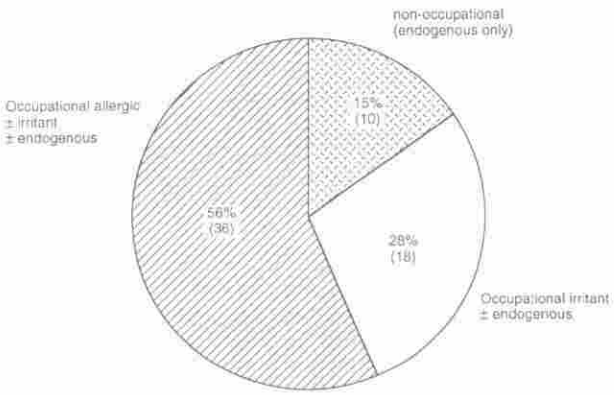

Fig. 1. Pie chart of aetiological sub-groups.

Table 1. Results of patch testing: the commonest relevant allergic reactions

Allergen	Male (no. tested: 58)	Female (no. tested: 6)
chromate	8	–
nickel	3	4
cobalt	4	1
formaldehyde	5	–
chloroacetamide	5	–
Bioban CS 1246	5	–
Bioban CS 1135	5	–
colophony	3	–
Bioban P1487	3	–

Table 2. Results of patch testing: the commonest non-relevant allergic reactions ($n=64$)

Allergen	*n*
quinoline	5
fragrance mix	5
thiuram mix	3
balsam of Peru	3

Table 3. Allergic reaction patterns (no. patients)

1. metal(s) only	12
2. biocide(s) and other oil constituent(s)	7
3. other oil constituent(s) only	6
4. biocide(s) only	5
5. biocide(s) and other oil constituent(s) and metal(s)	4
6. other combinations	3

Table 4. Mean ages (in years) of occupational groups

Diagnostic group	Mean age for group (years)	Atopics (years) (*n*)	Non-atopics (years) (*n*)
occupational allergic ($n=36$)	46.2	35.7 (7)	48.7 (29)
occupational irritant ($n=18$)	47.5	45.6 (6)	48.5 (12)
endogenous only ($n=10$)	42.0	41.2 (4)	42.5 (6)

Diagnostic categories

Patients were divided into 1 of 3 diagnostic categories: occupational allergic, occupational irritant or endogenous (Fig. 1). If there was a positive reaction to a relevant allergen, the patient was placed in the occupational allergic group, even though irritant and endogenous factors may have played an important role in the aetiology of the hand dermatitis. In the occupational irritant group, irritant factors were thought to be of prime importance, although patients may also have had positive patch test reactions to non-relevant allergens. The hand dermatitis was thought to be due mainly to endogenous factors if there were no relevant allergic positive reactions on patch testing and if there was a strong personal history of atopy. There was no statistical difference between the mean ages of the subjects in the 3 diagnostic groups (Table 4).

Table 5. Results of postal survey: the prognosis of hand dermatitis according to occupational group ($n=51$)

Occupational group	Frequency of symptoms		
	all the time	from time to time	not at all
occupational allergic ($n=36$)	7	14	6
occupational irritant ($n=18$)	3	11	2
endogenous only ($n=10$)	2	5	1

Postal survey of prognosis

The questionnaire relating to symptoms was returned by 51 of the 64 patients (response rate 80%). All those returned were suitable for full analysis. 13 (25%) of those replying had been assessed as having industrial dermatitis by the Department of Social Security. 22 patients (43%) were still working with oils. Of these, 19 (86%) were still symptomatic, with 15 of these having experienced symptoms of a hand dermatitis within the previous 3 months. Only 6 patients still working with oils had taken steps to reduce their oil contact. 29 (57%) patients were no longer working with oils. Of these, 16 had retired or were unemployed, and 13 had found new work, not involving contact with metals or oils. The majority of these patients had had no oil or metal contact for at least 2 years. 23 (79%) of these were still symptomatic, and 19 of them had experienced a hand dermatitis within the previous 3 months.

13 subjects had taken time off work due to their hand dermatitis. 6 had taken less than 3 months off work, and 7 had taken off longer than 3 months. Of those who had lost time from work, the symptoms cleared temporarily in 5, improved in a further 5, and remained the same in 3.

The postal survey (Table 5) showed that most patients in all 3 diagnostic groups continued to have symptoms. In most this was intermittent and there was no clear difference between the 3 diagnostic categories.

Discussion

A high prevalence of contact sensitivity was found in our group of metalworkers. However, irritant and endogenous factors are also important in the aetiology of occupational hand dermatitis. The patch test results show that metalworkers reacted to a wide range of allergens, underlining the importance of testing to a full complement of oil constituents.

Biocides were the most common group of oil constituents causing positive allergic reactions, and are important in causing hand dermatitis in metalworkers. Many reactions to biocides have been reported (2–5). Mackey & Marks (6) showed several allergic reactions to biocides in 20 machinists, but failed to demonstrate allergic reactions to metals. The rôle of nickel in causing hand dermatitis in metalworkers is debatable in the 4 nickel-sensitive women in this group, as they could have been sensitized by ear piercing and wearing jewellery. However, allergy to nickel, and to chromium and cobalt, in the men in our series, cannot be explained on any basis other than occupational exposure. Metals have been detected in significant quantities in some samples of cutting oil fluid (7, 8), although the amount of metal in the oil may depend on industrial practices, including the frequency with which the oil is changed.

Our postal survey demonstrated the poor prognosis of hand dermatitis in metalworkers. Most remain symptomatic whether or not they continued to work with oils and metals. Unemployment or a change of job has little effect on the outcome. Several other authors report similar findings. Pryce et al. (9) reported a poor prognosis in workers with soluble oil dermatitis, both in those who continued in this work and in those who had stopped. As in our study, there were no differences in outcome when patients were divided into aetiological subgroups. Similarly, Fregert (10) found that 50% of patients in a wide range of industries continued to have symptoms 2 years after a diagnosis of occupational dermatitis, and reported that the prognosis was similar for workers who stopped and changed jobs as in those who continued in the same work. Occupational contact dermatitis from metals such as nickel and chromium has been shown to carry a poor prognosis (11).

In contrast, others have found that occupational dermatitis may improve with time. Johnson & Wilson (12), who looked at subjects with oil dermatitis, concluded that those with a mild dermatitis have a better prognosis. In their follow-up study of 87 patients, the dermatitis of most patients (83%) had cleared or improved. Rosen & Freeman (13) were also optimistic. They noted an overall improvement in patients with occupational contact dermatitis, and suggested that a change of work improves the outcome of the dermatitis. However, they found no difference in outcome between irritant and allergic contact dermatitis. Like Fregert (10), Rosen & Freeman (13) did not restrict their study to a single occupational group.

The prognosis of occupational skin disease may be improved by better worker education. One study showed that workers with a greater knowledge of the causes of their dermatitis had a better prognosis (14).

Our study shows that the prognosis of occupational hand dermatitis is not influenced by the diagnostic category or by the worker's age. Hellier (15) suggested a worse prognosis in older patients but these data have been contradicted by recent studies (12). Investigating our patients by patch testing does not seem to have had a beneficial effect on their long-term prognosis. However, it has been suggested that patch testing results in information that is of use in improving or clearing dermatitis in certain cases, since the identifiable allergen or allergens can be avoided (6).

Although no difference in outcome between patients still working with oils and those no longer working with oils has been demonstrated, it may be that better occupational hygiene would improve the prognosis for some patients. Further studies are needed to evaluate this.

References

1. Alomar A, Condé-Salazar L, Romaguera C. Occupational dermatoses from cutting oils. *Contact Dermatitis* 1985: *12:* 129–138.
2. Grattan C E H, English J S C, Foulds I S, Rycroft R J G. Cutting fluid dermatitis. *Contact Dermatitis* 1989: *20:* 372–376.
3. Camarasa J G, Romaguera C, Serra-Baldrich E, Vilaplana J. Allergic contact dermatitis from Biobans in Spanish metal workers. *Contact Dermatitis* 1993: *29:* 98.
4. Wrangsjö K, Martensson A, Widström L, Sundberg K. Contact Dermatitis from Bioban P-1487. *Contact Dermatitis* 1986: *14:* 182–183.
5. Madden S D, Thiboutot D M, Marks J G. Occupationally induced allergic contact dermatitis to methylchlorosothiazolinone/methylisothiazolinone among machinists. *J Am Acad Dermatol* 1994: *30:* 272–274.
6. Mackey S A, Marks J G. Dermatitis in machinists: a retrospective study. *American Journal of Contact Dermatitis* 1983: *4:* 22–26.
7. Samitz M H, Katz S A. Skin hazards from nickel and chromium salts in association with cutting oil operations. *Contact Dermatitis* 1975: *1:* 158.
8. Einarsson O, Eriksson E, Lindstedt G, Wahlberg J E. Dissolution of cobalt from hard metal alloys by cutting fluids. *Contact Dermatitis* 1979: *5:* 129.
9. Pryce D W, Irvine D, English J S C, Rycroft R J G. Soluble oil dermatitis: a follow-up study. *Contact Dermatitis* 1989: *21:* 28–35.
10. Fregert S. Occupational dermatitis in a 10-year material. *Contact Dermatitis* 1975: *1:* 96–107.
11. Dooms-Goossens A, Ceuterick A, Vanmaele N, Degreef H. Follow-up study of patients with contact dermatitis caused by chromates, nickel and cobalt. *Dermatologica* 1980: *160:* 249–260.
12. Johnson M L, Wilson H T H. Oil dermatitis: an enquiry into its prognosis. *Br J Industr Med* 1971: *28:* 122–125.
13. Rosen R H, Freeman S. Prognosis of occupation contact dermatitis in New South Wales, Australia. *Contact Dermatitis* 1993: *29:* 88–93.
14. Holness D L, Nethercott J R. Is a worker's understanding of their diagnosis an important determinant of outcome in occupational contact dermatitis? *Contact Dermatitis* 1991: *25:* 296–301.
15. Hellier FF. The prognosis in industrial dermatitis. *Br Med J* 1958: *1:* 196–198.

Address:

M. Shah
Department of Dermatology
Royal Hallamshire Hospital
Sheffield S10 2JF
UK

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.