Physical friction is under-recognized as an irritant that can cause or contribute to contact dermatitis

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Summary

Background The role of physical friction as an irritant in the causation of contact dermatitis is under-recognized. Frictional dermatitis is defined as an eczematous process in which physical frictional trauma contributes to the induction of a dermatitis process.

Objectives To examine the clinical background of patients in whom friction was contributing to dermatitis.

Methods Over a 30-month period during which 2700 new patients were seen, frictional irritancy was identified as playing a role in the dermatosis in 31 cases: in 27 of these, case notes were evaluated for a range of parameters.

Results Physical friction was identified as causing or contributing to the dermatitis in 18 men and nine women, mean age at onset 42 years. The hands, usually the fingers of the dominant hand, were affected in all but two cases. Occupational frictional activities were found in 25 cases: commonly handling small metal components, paper, cardboard or fabric, and driving. Potential frictional activities in hobbies were noted in 12 cases. Wet work irritancy contributed in four cases (15%). Patch testing showed relevant contact allergies as cofactors in seven of 25 subjects tested (26%). Psoriasis was a cofactor in four (15%), and atopic dermatitis in 11. The study was selective, being based in a teaching hospital clinic with a special interest in contact dermatitis. Frictional irritancy is often one of several factors contributing to dermatitis.

Conclusions The contribution of friction to contact dermatitis is under-recognized probably because dermatologists do not think about the potential for physical forces to induce eczematous changes in the skin.

Frictional dermatitis can be defined as an eczematous process in which physical frictional trauma on the skin primarily causes or secondarily contributes to the induction of a dermatitis process. It is an under-recognized aspect of irritant contact dermatitis. Repetitive frictional trauma to the skin can produce dermatitis, characterized by erythema, scaling, vesicles and hyperkeratosis, that particularly involves the palms and fingertips. The repeated minor frictional trauma may cause enhanced percutaneous penetration of allergens and elicit microvesicles, with the development of secondary eczematous changes. The histopathology of these lesions has not been studied.

In the small number of published reports frictional irritant contact dermatitis has been associated with the handling of pressure-sensitive carbonless paper, the repetitive use of paper tissues, rubbing from clothing, repeated handling of plastic bags and, in baseball players, at the medial right ankle and lower right knee as a consequence of their pitching action.

We describe a small series of patients in whom friction was an important contributor to their dermatitis.

Materials and methods

A case note audit was performed of patients attending contact dermatitis and general clinics in which frictional factors were identified clinically as a possible contributory cause of their dermatitis. Over the 30-month period studied (January 2002–July 2004), about 2700 new patients were seen. Frictional irritancy was identified as a possible cause or contributory element in 31 patients (approximately 1% of all patients seen). Cases notes were available in 27 of these and were reviewed with regard to the following parameters: ethnicity, age at onset, personal atopic history, occupational history, hobbies, site of skin affected, patch testing result, concurrent skin conditions, treatment given and outcome.
Results

Of the 27 subjects evaluable, 18 were male (67%) and nine female (33%). All patients were of white British ethnic background. The mean age at onset was 42 years (range 22–64, not stated in two). In four patients, a diagnosis of frictional psoriasis was made, although none had a previous diagnosis of psoriasis. Eleven (41%) had a history of atopic eczema as a child. A personal history of other atopic disorders was found in eight (29%; atopic history not stated in three (11%)).

The occupational history was recorded in all cases. Activities that caused friction and that were occupational in nature were identified in 25 patients (Table 1). In two patients, non-occupational activities caused friction. The activities included: handling small metal components (nine: 33%), handling paper (five: 19%), handling cardboard (three: 11%), handling fabric (two: 7%), driving (three: 11%), handling cables (one: 4%), working at a meat counter (one: 4%), gardening (one: 4%), foot surgery (the resulting deformity causing friction with footwear) (one: 4%) and a community nurse who developed eczema secondary to friction under the waistband of her uniform (one: 4%).

Most of the patients had ‘dry’ jobs; four (15%) had some exposure to wet work and these were employed as a plumber, a grinder, at a meat counter and in an engineering works, respectively. In these instances, some contribution to the dermatitis from wet work exposure may be anticipated, but frictional factors were regarded as the predominant cause of the skin problem.

Hobbies were stated in 17 of cases, and in 12, hobbies were identified to have the potential to induce friction on the skin, including: gardening (n = 3), horse riding (n = 2) (one of these patients had lesions in the palms where she held the reins), fishing (n = 2), golf (n = 1) (in this patient only his right ungloved hand was affected), embroidery (n = 1) (in this woman the fingertips were the most affected), walking (n = 1), dog walking (n = 1) and mountaineering (n = 1). In five cases no hobby-related frictional activities were identified.

The skin sites affected were as follows (Table 2): hands alone in 12 (44%), fingers alone in nine (33%), hands and fingers both mentioned in two (7%; see Fig. 1), hands and feet in two (7%), foot in one (4%), and under waistband in one (4%). Eleven patients had previously been diagnosed as having some form of eczema, 12 had no prior history of skin disease, and four had another concurrent skin diagnosis including seborrhoeic warts (n = 1), psoriasis (n = 1; this patient was not in the frictional psoriasis group mentioned above), vulval lichen sclerosus (n = 1) and urticaria (n = 1).

With regards to treatment given, patients were often tried on more than one modality depending on response. Potent topical steroids alone were used in 10, emollients alone in five, topical steroids combined with an emollient in six, advice on avoidance of friction alone in five, and topical tacrolimus in five. Topical calcipotriol, dithranol and steroid tape were all tried on one occasion each. The outcomes in these patients were as follows: 18 either improved or cleared, two developed a persistent dermatitis, three are still being followed up and four did not attend follow up.

Twenty-five of 27 patients were patch tested. Twelve were negative to all tested substances. Of those who were positive on patch testing, results thought potentially to be of some contributory relevance (and secondary to frictional irritation) were found in seven cases as follows: fragrance mix in two,

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**Table 1** Occupational sources of frictional irritancy

<table>
<thead>
<tr>
<th>Type of friction</th>
<th>Patients (n = 27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetitive handling of paper/cardboard</td>
<td>8</td>
</tr>
<tr>
<td>Repetitive manipulation of small metal parts</td>
<td>9</td>
</tr>
<tr>
<td>Driving</td>
<td>3</td>
</tr>
<tr>
<td>Handling fabrics</td>
<td>2</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>5</td>
</tr>
</tbody>
</table>

*Includes an accountant, a magistrate, a photographic shop worker and a printer among others. †Includes manual engineers, a washing machine repair man, a plumber and a gynaecologist.

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**Table 2** Sites affected by frictional dermatitis

<table>
<thead>
<tr>
<th>Area affected</th>
<th>Patients (n = 27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hands †</td>
<td>12</td>
</tr>
<tr>
<td>Fingers</td>
<td>9</td>
</tr>
<tr>
<td>Hands and fingers</td>
<td>2</td>
</tr>
<tr>
<td>Hands and feet</td>
<td>2</td>
</tr>
<tr>
<td>Feet</td>
<td>1</td>
</tr>
<tr>
<td>Waistband</td>
<td>1</td>
</tr>
</tbody>
</table>

†In eight of these only the dominant hand was affected or was more severely affected.

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Fig 1. Hyperkeratotic changes on the palms and fingers of a warehouse man (only the right hand is shown). The handling of cardboard boxes was believed to be the source of frictional irritancy. Psoriasis was suspected.
Kathon CG in two, bronopol in one, nickel/cobalt in one and wool alcohols in one. Three others were positive to nickel and two others to cobalt but these were not considered to be relevant.

Discussion

The diagnosis of irritant dermatitis in which frictional activities are thought to play a major or contributory part relies on the taking of a detailed medical history, an understanding of occupational practices (and activities related to hobbies), the recognition of a pattern of dermatitis often affecting the fingers of the dominant hand, a knowledge of coexisting endogenous dermatoses and the investigation for allergic contact factors by patch testing.1,2 In this series of patients in whom frictional irritancy played a role in the dermatitis, endogenous skin disease was a cofactor in four patients (15%) with psoriasis and 11 patients (41%) with a previous history of atopic eczema. In addition, contact allergies potentially made a contribution in seven cases (26%) and wet work irritancy seemed to contribute in four (15%). Hence, the diagnosis often is not a pure one.

The differential diagnosis of frictional irritant contact dermatitis includes a number of other causes of dermatitis and psoriasis. Repetitive frictional injury may initiate dermatitis or result in its localization to a particular site or its perpetuation in other forms of eczema, include juvenile plantar dermatosis, discoid eczema, hyperkeratotic palmar or plantar dermatitis and airbag dermatitis.7 In psoriasis, friction may induce a worsening of the condition locally through koebnerization.1,8,9 Studies of the mechanisms involved in the Koebner response to trauma in psoriasis skin, e.g. from friction, show keratinocyte hyperplasia associated with an increase in the expression of intercellular adhesion molecule-1 and an accumulation of immunocompetent cells at the injured site.10

Frictional irritancy is not an uncommon cause or exacerbating factor in contact dermatitis and was diagnosed in 1% of all general dermatology patients seen over a 30-month period. The fingers on the dominant hand are most commonly affected. It is underdiagnosed and deserves wider recognition. General dermatologists should be more aware of frictional factors, and should ask about frictional activities related to occupation or hobbies when taking a history. Patients in whom frictional irritancy is suspected to play a part in their dermatitis are educated to try to avoid the frictional activity thought to be culpable; however, further investigation into the problem and treatment of friction-related dermatitis is required.

Acknowledgments

We thank colleagues who referred patients and Dr Helen Ramsay for permission to reproduce the figure.

References