BJD
British Journal of Dermatology

The relevance of patch testing in peristomal dermatitis

F. Al-Niaimi,[1] M. Beck,[1] N. Almaani,[2] V. Samarasinghe,[1] J. Williams[1] and C. Lyon[3]

[1]Department of Dermatology, Salford Royal Foundation Trust, Manchester, U.K.
[2]Department of Dermatology, St John's Institute of Dermatology, London, U.K.
[3]Department of Dermatology, York Hospital, York, U.K.

Correspondence
Firas Al-Niaimi.
E-mail: firas55@hotmail.com

Accepted for publication
26 February 2012

Funding sources
None.

Conflicts of interest
None declared.

DOI 10.1111/j.1365-2133.2012.10925.x

Summary

Background Skin disorders are a common problem for ostomates, resulting in more than a third of visits to a stoma nurse. Irritant reactions, particularly irritant contact dermatitis, are the most frequently seen, accounting for > 50% of problems in some studies.

Objectives To report our experience in patch testing for peristomal dermatitis.

Methods All patients were identified from our database of the skin-stoma clinic. Patch testing to various chemicals was performed and results analysed.

Results From a total of 850 stoma patients in the combined clinic, 149 patients were patch tested. Only seven patients (4·7%) had positive reactions of current, proven relevance, none of which was related to constituents of the stoma appliances themselves. Most of the relevant allergens were preservatives and fragrances.

Conclusions The symptoms and clinical appearances of allergic contact dermatitis and irritant contact dermatitis are similar in the occluded peristomal environment and are therefore difficult to distinguish on clinical grounds alone. Allergy is a relatively infrequent cause of peristomal dermatitis despite the continual exposure of skin to the components of cleansers, medicaments, other accessories and the stoma bag systems themselves.

Skin disorders are a common problem for ostomates, resulting in more than a third of visits to a stoma nurse.[1] Irritant reactions, particularly irritant contact dermatitis (ICD), are the most frequently seen, accounting for > 50% of problems in some studies.[2] This is not surprising when one considers that stoma formation results in the unnatural apposition of bowel with abdominal skin which, unlike urogenital or anal epithelium, is not adapted to the occlusion or repeated contamination with urine or faeces. Stripping of the skin on removal and application of appliances also contributes to disturbance of barrier function.[3] These features of the occluded peristomal skin environment intuitively would also enhance the possibility of allergic contact dermatitis (ACD). Appliance manufacturers endeavour to minimize these risks by employing materials with a low potential for irritation or allergy in systems designed to avoid trauma, undue wetness and to maintain skin pH between 4 and 5·5.

Modern stoma appliances consist of a plastic pouch, typically laminated thermoplastic (vinyl and polyethylene) and attached to an adhesive skin barrier by means of a firm thermoplastic ring. Colostomy bags are often one-piece, closed pouches that are removed and disposed of when full. For ileostomies and colostomies of the ascending colon bags may be either drainable by means of a resealable flap or a two-piece system where the barrier remains on the skin for 1–3 days and the pouches are changed when full, which can be several times per day. Urostomy bags are mostly one-piece appliances with a nylon tap for drainage purposes. Most stoma bags have an additional, skin-coloured, fabric cover and may also incorporate a carbon filter system for any gases passed. There is a range of skin barriers, the commonest being a hydrocolloid composed of food-grade materials. These are polyisobutylene (PIB) which provides 'dry tack' adhesion to the skin and a mixture of carboxymethylcellulose and fruit pectins which serve to preserve the acidic pH of the skin and to absorb water thereby maintaining the dry-skin adhesion. The polymer's adhesion is not optimal until warmed so most barriers incorporate an immediate adhesive tackifier on the surface, traditionally rosin based (pentaerythritol ester of rosin) but increasingly entirely synthetic hydrocarbon materials are used. To increase flexibility fibres such as cotton may be added to the hydrocolloid to provide a cross-linking effect. Newer polymer systems such as styrene-isoprene-styrene in place of PIB also provide flexibility by cross-linking. Some recently introduced products employ alginate-based barriers while the older karaya systems are used relatively infrequently nowadays. Many barriers employ an adhesive tape border for added security against detachment of the bag. These adhesive

tapes are similar to other medical dressings and contain acrylate adhesive systems. A range of accessory products such as additional adhesive lotions (containing acrylates), wipes, deodorizers, adhesive removers, skin cleansers and antiperspirants is available, increasing the potential for exposure of the peristomal skin to irritants or allergens.

We have previously reported the results of patch testing in stoma patients with suspected ACD to stoma materials as part of a cohort study[2] where only one of 65 cases had proven contact allergy (to a stoma deodorizer). We herein report our findings from all stoma patients patch tested from 1998 to 2011.

Materials and methods

The first 65 patients patch tested represented all patients with otherwise unexplained dermatitis, identified from a cohort study of 525 cases. Preliminary findings on these cases have been reported before as part of that study.[2] In the subsequent 11 years we have run monthly stoma dermatology clinics that receive referrals nationwide from dermatologists, general practitioners, stoma nurses and surgeons as well as providing open access to old patients.

The approach to skin disease around stomas is similar to that at other special sites, e.g. vulval dermatoses. A general medical history and examination is undertaken and all those presenting with rashes are screened for infection with swabs for microbiological examination. Dermatophyte infection is occasionally seen and scrapings are taken from any flaking rashes to look for fungal elements. The patient is also observed changing their appliance. The appliance type, and all accessories or medicaments coming into contact with the skin are recorded and any potentially harmful techniques such as excessive scrubbing of the skin can be identified. Irritant dermatitis caused by repeated leakage of urine or faeces on to the skin is usually obvious and responds rapidly to appliance adjustments to prevent leaks. Pre-existing or coincidental skin disease, e.g. psoriasis and dermatitis elsewhere that might represent secondary generalization are noted. In some cases dermatitis is clearly located in an area of skin continually in contact with a distinct portion of the appliance, e.g. a tape border, suggesting a contact reaction. In these cases the patient is referred directly for patch testing and undergoes a use test. Patch testing and use testing are also considered in any cases not responding to interventions including appliance adjustments to prevent leaks or where an inflammatory rash remains unexplained despite other investigations or a primary dermatosis such as suspected psoriasis persists despite appropriate therapy. Effectively all patients with persistent or recurrent dermatitis, where leakage causing irritant dermatitis was excluded, were invited for further investigation by patch testing. Patch testing was performed using our own extended Manchester standard battery, the patient's own products and our own stoma series (Table 1). This series of stoma appliance, accessories and medicament components was constructed using information kindly disclosed by the major

Table 1 Our own stoma series

No.	Chemical
1	Cinnamyl alcohol
2	Cinnamaldehyde
3	Eugenol
4	α-Amyl-cinnamaldehyde
5	Hydroxycitronellal
6	Geraniol
7	Isoeugenol
8	Oak moss absolute
9	Sorbitan sesquioleate
10	Methyl methacrylate
11	n-Butyl methacrylate
12	2-Hydroxypropyl methacrylate
13	2-Hydroxyethyl methacrylate
14	Ethyleneglycol dimethacrylate
15	Triethyleneglycol dimethacrylate
16	1,4-Butanediol dimethacrylate
17	Urethane dimethacrylate
18	Bisphenol A dimethacrylate
19	Bisphenol A glycerolate dimethacrylate
20	1,6-Hexanediol diacrylate
21	Tetrahydrofurfuryl methacrylate
22	Tetraethyleneglycol dimethacrylate
23	N,N-Dimethylaminoethyl methacrylate
24	Ethyl cyanoacrylate
25	Diazolidinyl urea
26	Propylene glycol 20% aqueous
27	Chlorhexidine digluconate 0·5% aqueous
28	2-Ethylhexyl acrylate 0·1% in petrolatum
29	Isopropyl 10% aqueous
30	Cetrimide 0·1% aqueous
31	Polyvinyl pyrrolidone 1% aqueous
32	Gantrez® ES225/ES425
33	Cavilon™ foam applicator
34	Karaya 10% aqueous
35	Benzoyl peroxide
36	1H-Benzotriazole 1% in petrolatum
37	D-Limonene 10% in petrolatum
38	Propyl gallate 1% in petrolatum

Cavilon™ (3M) barrier wipes contain siloxanes and acrylic terpolymer (vinyl chloride/ethyl acetate/hydroxylpropyl acrylate). Povidone iodine has been changed to polyvinyl pyrrolidone (K 30; Kollidon®; BASF) as false positive, irritant reactions are common to povidone iodine.[23] Our updated stoma series will include limonene, 1H-benzotriazole and propyl gallate. Pentaerythritol ester of hydrogenated rosin[24] is not readily available for patch testing but we are currently sourcing it and it will be included if reports from manufacturers confirm that it is still used as a tackifier. The first 65 patients were also tested to gelatin, cotton fibre, polyisobutylene (PIB), sodium carboxymethylcellulose, polyacrylamide, polysiloxane (adhesive remover spray as is), hydrocarbon tackifier resin and polyvinyl pyrrolidone/vinylacetate copolymer. These were dropped because no reactions were found and the materials were considered to be largely inert. None the less, if the patient has a positive use test or reacts to pieces of their appliance systems we endeavour to obtain samples of these chemical components from the relevant manufacturers for further testing. There may, for example, be contaminated batches of otherwise innocuous materials such as PIB.[19]

stoma products manufacturers and with materials supplied free from ISP Europe (Tadworth, U.K.), BASF UK (Cheadle, U.K.), Dansac UK (St Ives, U.K.), Hollister Incorporated (Libertyville, IL, U.S.A.), ConvaTec (Uxbridge, U.K.), A.H. Shaw Ltd (Ossett, U.K.), Medlogic Global (Plymouth, U.K.) and Salts UK (Aston, U.K.). Where separate ingredients could not be sourced the product was applied 'as is'. Patients also undertook a use test. This involved applying a stoma bag together with accessories such as additional hydrocolloid washers to the nonstoma side of the abdomen. The appliances were changed at the same time as that on their stoma. The test was continued for 5–7 days. The initial 65 patients from the cohort study all underwent prick testing to cotton, pectin, latex, gelatin, carboxymethylcellulose, polyacrylamide and polyisosorbate. This was subsequently abandoned as there were no positive results.

Results

The proportions of patients in the original cohort study presenting with each of a variety of dermatoses have been reported elsewhere.[2] We have since seen more than 850 new ostomy patients in our clinics. During this subsequent 11 years the proportions of the disorders seen in the clinic have changed a little as a result of more complex tertiary referrals: infections (11%), primary dermatoses, e.g. psoriasis or eczema (19%), defined irritant papular reactions, e.g. chronic papillomatous dermatitis (12%), pyoderma gangrenosum (17%), nicorandil-associated ulcers (2%), other rare dermatoses, e.g. lichen sclerosus (2%), nonstoma related, e.g. extraintestinal Crohn disease (5%), irritant dermatitis related to faecal, urine or physical irritation (18%), unexplained dermatitis (13%) (results presented at the European Council of Enterostomal Therapists conference in Bologna, 14 June 2011).

In total, 149 patients have been patch tested. There were 53 positive reactions. Only seven patients had positive reactions of current, proven relevance (Table 2), none of which was related to constituents of the stoma appliances themselves (one patient had two reactions). All seven patients also reacted to the relevant products (wipes and lotions tested 'as is'; deodorizers diluted to 1% in petrolatum). In each case the peristomal dermatitis settled on avoidance of materials containing the allergen. The first 65 patients tested were drawn from the cohort study population of 142 subjects and only one had a relevant positive reaction representing a prevalence of ACD of 0·7%. This patient was sensitive to oak moss absolute (*Evernia prunastri*) and the deodorizing product he was using that contained it. The other patient who was sensitive to a fragranced deodorizer specifically reacted to cinnamal. Both patients were using their deodorizing preparation inappropriately, allowing significant skin contact instead of placing a few drops in the bag itself as per the package instructions.

Three patients had positive reactions to components of cleansing wipes that are intended to remove the adhesive debris that is left when removing a bag. These included propylene glycol (two cases) and isopropyl alcohol (propan-2-ol). All three patients reported a definite improvement in the peristomal dermatitis following discontinuation and substitution of the wipes with ones which did not contain either allergen.

Two patients were sensitive to methylchloroisothiazolinone/methylisothiazolinone found as a biocide in wet wipes and wet toilet tissue (Fig. 1). One of these patients was also sensitive to formaldehyde and the formaldehyde-releasing biocide bronopol (2-bromo-2-nitropropane-1,3-diol) which was a declared ingredient of a deodorizing spray she used intermittently. Avoidance of these materials resulted in complete resolution of the peristomal dermatitis in each case.

We found two patients with positive results of past relevance to chlorocresol which is present in a proprietary skin gel that both patients had stopped using already as they had suspected it to be the cause of their peristomal dermatitis.

Table 2 Relevant allergens found in our cohort with breakdown of their relevance

Relevant allergen	Allergen past relevance	Source	Number of patients
Propylene glycol		Skin wipes	2
Isopropyl alcohol		Skin wipes	1
Cinnamal		Stoma deodorizer	1
Oak moss absolute, *Evernia prunastri*		Stoma deodorizer	1
MCI/MI		Skin wipes	2
Bronopol		Deodorizers	1
	Chlorocresol	Stoma skin gel	2

MCI/MI, methylchloroisothiazolinone/methylisothiazolinone.

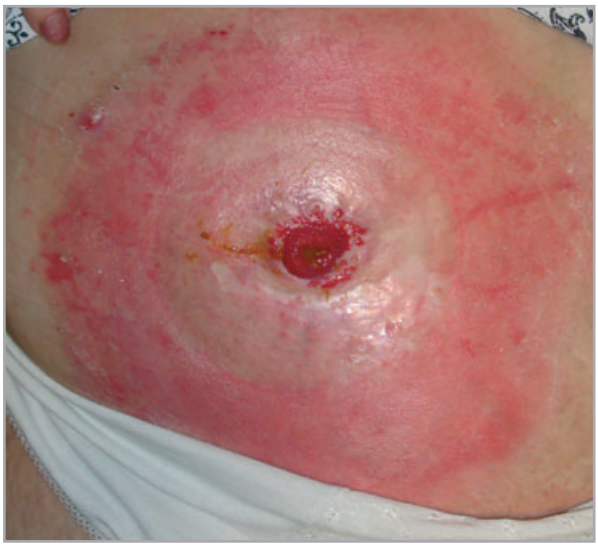

Fig 1. A 57-year-old woman sensitive to methylchloroisothiazolinone/methylisothiazolinone present in moist cleansing wipes.

Twenty of the 43 other reactions were considered to be not relevant because there was no evidence of any exposure of the peristomal skin to these materials (see Table 3). It is possible, however, that they were of past relevance not recalled by the patient, particularly Gantrez® (ISP Europe) which is the second most frequently reported stoma allergen to date and polyvinyl pyrrolidone (PVP)/vinylacetate copolymers (present in some adhesive dressings or pastes), the skin barrier wipe Cavilon™ (3M, Bracknell, U.K.) and 2-ethylhexyl acrylate which is a declared ingredient of some adhesive retention strips used to secure stoma bag wafers.

The epoxy resin reactions may also have been of previous relevance but no epoxy material was demonstrable on chemical analysis of the stoma appliances used in each case (analysis by Magnus Bruze, Malmö University Hospital, Sweden).

Similarly, diaminodiphenylmethane was not demonstrable by high-performance liquid chromatography (HPLC) in any of the three relevant appliances tested (Michael Taylor, Hollister Incorporated). Butanediol dimethacrylate was tested for by Bert Bjorkner (Department of Occupational and Environmental Dermatology, University of Malmö, Sweden) and was not demonstrable in the suspected appliance.

Two patients had strong reactions to colophony (rosin). Rosin-based tackifiers have been used to increase the initial adhesion of hydrocolloid skin barriers. Five potentially relevant stoma appliances were tested for the presence of the rosin materials abietic acid, dehydroabietic acid and the stable oxidation product 7-oxodehydroabietic acid using HPLC (Ann-Therese Karlberg, Department of Chemistry, University of Gothenburg, Sweden) and no rosin materials were detected. However, one of the rosin-sensitive patients was patch tested because of a severe reaction to a batch of stoma bag skin barriers; she also had a positive use test. Unfortunately she discarded the bags after we told her of our suspicion that they were the cause of her dermatitis so we were not able to test them for allergenic rosin materials.

Table 3 Positive allergens of unproven relevance

Allergen	Possible relevance	Unlikely to be relevant	Number of patients
Epoxy resins	Possibly of relevance to older appliance systems		3
Formaldehyde[a]		No source identified	3
Rosin derivatives[a]	Tackifiers possibly relevant to older appliance systems		2
Fragrance		No source identified	3
Oak moss absolute, *Evernia prunastri*		No source identified	1
Cinnamal		No source identified	1
Wool alcohols		No source identified	1
Gelatin		No source identified	1
Lyral (hydroxyisohexyl 3-cyclohexene carboxaldehyde)		No source identified	1
Cinnamaldehyde		No source identified	1
PVP/VA copolymer	Medical adhesive and dressing systems		1
Nickel		No source identified	3
Cobalt chloride		No source identified	1
Cavilon™ foam applicator	Patient did not recall using this barrier preparation		1
Gantrez® ES425		Possibly sensitized from nonstoma products	1
Diaminodiphenylmethane[a]		No source identified	1
Balsam of Peru		No source identified	1
Quinoline mix		No source identified	1
Diazolidinyl urea	Possible exposure from cleansing materials		2
Ethyl hydroxyacrylate[b]			1
Bisphenol A glycerolate dimethacrylate[b]			2
Methyl methacrylate[b]			1
Butanediol dimethacrylate[a,b]			3
1,6-Hexanediol diacrylate[b]			2
2-Hydroxyethyl methacrylate[b]			2
Triethyleneglycol diacrylate[b]			1
2-Ethylhexyl acrylate	Used in some adhesive 'retention' strips		2

[a]Chemical not found following analysis of the appliances. [b]The acrylates are all of potential relevance as they may be components of adhesive systems. Research into this is ongoing. PVP/VA, polyvinyl pyrrolidone/vinylacetate.

Gelatin was not considered a true reaction as the patient's reaction cleared spontaneously prior to patch testing and had no further problems despite continuing to use the same appliance. Furthermore, we were unable to provoke the dermatitis with the use test on the uninvolved skin of the abdomen.

Most manufacturers were happy to share information about ingredients; however, we were unable to get any information about the acrylic monomers used in the 'medical grade' adhesive or 'multipolymer' used for tape borders and adhesive strips. Many appliance manufacturers use ready-made material from an international supplier of medical acrylic adhesive systems who refused to divulge the information but did say that monomer levels fell to undetectable (< 40 p.p.m.) before the product was finished. This meant that for the other five acrylates (Table 3) we have been unable to ascertain the relevance reliably so far, although in two cases (bisphenol A glycerolate dimethacrylate and methyl methacrylate) changing to a different appliance without adhesive fabric borders did not improve the dermatitis which was then presumed to be irritant. In the other cases use tests were positive, suggesting that further investigation is warranted.

Apart from the use test results detailed above the only other significantly positive one was an elderly woman who was negative on patch testing but who reacted to a new batch of hydrocolloid washers. She did not, however, react to other batches of the same product. The ultimate cause was never identified as she had discarded the box of washers and the manufacturers found no problems with any other patients using them.

Discussion

It is not surprising, given the nature of the peristomal environment, that when skin problems occur many patients and health professionals consider that allergy has played the most important role. This assumption possibly also stems from the number of individual case reports in the medical literature describing contact allergy to components of stoma appliances or their accessories. When one considers that over 1·5 million people in the U.K. and U.S.A. alone use stoma appliances on a daily basis, the number of allergic reactions reported over the last 30 years could be regarded as reassuringly small. All but two of these 25 cases[4,5] have been comprehensively reviewed by Martin *et al.*[6]

The most frequently reported allergen group are epoxy resins,[7–10] representing over one-third of all reports of ACD associated with ostomies, although to our knowledge they are now no longer used in any stoma appliances marketed in Europe, America or Australasia (personal communication, all major appliance manufacturers). Gantrez® copolymers are the next most frequently reported allergens (four cases).[5,6,11,12] These are used as adhesive components in a range of pastes employed to fill irregularities in the skin before applying a stoma bag, thereby enhancing the wet adhesion of the appliance to the skin (Gantrez® ES425 or ES225 depending on the manufacturer). This range of polymethylvinyl ether/maleic anhydride copolymers is widely used in other applications such as hair styling foams, toothpastes and denture fixatives so that sensitization may also in some cases have occurred via exposure at sites other than the stoma. Patients sensitive to Gantrez®, however they may have been sensitized, are advised to avoid the relevant adhesive pastes in future.

Limonene (two cases)[13] and the racemate dipentene continue to be used in some stoma adhesive remover wipes, the other principal ingredients being polydimethylsiloxanes, although we have not had any patients react to adhesive remover wipes or releasing sprays. The remaining 10 cases of ACD in the literature are individual reports of reactions to rubber materials (three cases),[14,15] fragrance materials in deodorizers (two cases),[2,16] lanolin in a cream,[15] benzotriazole (ultraviolet absorber) in a laminated vinyl bag,[4] karaya sealing ring,[17] Abitol in adhesive paste[18] and the food grade hydrocolloid component PIB.[19]

We have herein presented our own findings which bring the number of reported cases to 32 since 1978. In our series of patients the relevant positive reactions are to common sensitizers such as fragrances and preservatives in deodorizers (five cases) rather than to components of the appliance systems themselves. One patient was sensitive to isopropyl alcohol used in a barrier wipe as a solvent. This lower aliphatic alcohol has recently been shown to be a more common sensitizer than previously thought.[20] Two patients were sensitive to propylene glycol which is present in several types of wet cleansing wipes as a humectant.

We were able to discount many of the remaining reactions as not responsible for the dermatitis observed either because there was no evidence of relevant exposure or because chemical analysis failed to demonstrate the material. Although not proven, these other allergies are all of potential relevance to materials used peristomally and some, such as the reactions to Gantrez® or epoxy resin systems, may well have developed from exposure in the past. Furthermore, the information obtained is useful so that future exposure is avoided. The acrylate monomers remain the group where there is still some doubt as to possible relevance. This warrants further investigation not least because the details of the composition of the adhesive tapes are not revealed by the suppliers. This is one reason why we have kept a wide range of acrylic adhesive components on our stoma patch test series to date. The acrylates represent 14 of the 54 positive reactions and we are currently re-analysing products for possible sources. Diaminodiphenylmethane is probably of historical significance in relation to epoxy systems previously employed by some stoma appliance manufacturers; however, it may also be employed in the synthesis of some medical grade thermoplastic polymers such as PEEK (polyether ether ketone) although we have not found a relevance to stoma appliances and have dropped it from our series.

Regularly reviewing our results as well as communicating with appliance manufacturers has, however, allowed us to modify our stoma series over the years for most allergen groups (Table 1). For example, although we screen for latex

sensitivity we no longer undertake prick tests to natural rubber unless indicated because it is no longer present in appliances, to our knowledge. Our aim is clearly to produce a patch test series that picks up as many relevant positive reactions as possible and without testing to unnecessary materials. This exercise indicates that we should continue to test for the common allergens, particularly fragrance materials, preservatives and other excipients of cleansers and wet wipes, as well as the co-polymers (Gantrez®, PVP). From reviewing the literature and communication with the manufacturers we aim to add to the series limonene, 1*H*-benzotriazole and propyl gallate an antioxidant in some newer peristomal skin moisturizing lotions. The continued use of modified-rosin tackifiers indicates that we should also include pentaerythritol ester of hydrogenated rosin.[21,22]

In conclusion, the symptoms and clinical appearances of ACD and ICD are similar in the occluded peristomal environment and are therefore difficult to distinguish on clinical grounds alone. Allergy compared with faecal or urine irritation is a relatively infrequent cause of peristomal dermatitis despite the continual exposure of skin to the components of cleansers, medicaments, other accessories and the stoma bag systems themselves. Nevertheless, patch testing is an essential investigation for those with persistent peristomal inflammation in order to identify the small cohort with a relevant allergy who will be helped by avoidance advice.

We make the following recommendations regarding patients who should undergo allergy testing. In addition to those stoma patients with a clear localization of dermatitis suggesting contact sensitivity, patch testing should also be considered for all cases with dermatitis which is not clearly related to faecal, urine or physical irritation, to infections or to primary skin disorders such as psoriasis. We also recommend patch testing for all patients with persistent rashes unresponsive to appropriate interventions, whatever the original diagnosis. In addition to the standard series and our stoma series (Table 1) we patch test to the patient's own materials, in particular the hydrocolloid or other barrier, any tape border separately, a piece of the bag itself including any cover fabric and any other material in contact with the skin, e.g. adhesive pastes, extra hydrocolloid rings or adhesive strips. We suggest that all patients where contact sensitivity is considered should also undertake a use test (Fig. 2), whereby a stoma bag together with all accessories such as any hydrocolloid washers, washing materials, barrier lotions, tapes or pastes are applied to the nonstoma side of the abdomen. The appliances etc. are changed at the same time and in exactly the same way as that on their stoma. The test should be continued for 7 days as late reactions may occur in our experience. Any significant reactions may indicate a sensitivity to a component of the patient's appliance regimen even in the presence of negative patch testing such that further investigation may be indicated including liaison with the product manufacturers and even analysis of the appliance materials.

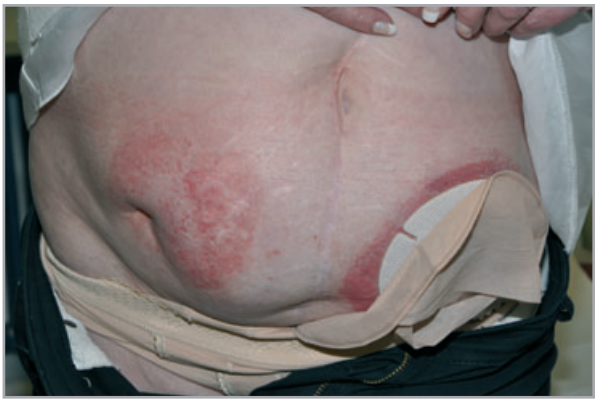

Fig 2. A 63-year-old woman with a positive use test suggesting sensitivity to a component of the tape border of her appliance. Investigation of potentially allergenic adhesive ingredients, in particular the acrylates, is ongoing.

What's already known about this topic?

- Positive patch test reactions have been the subject of 25 case reports over the last 30 years.
- No consistently relevant allergens, apart from Gantrez® resins in adhesive paste accessories, have been described.

What does this study add?

- A description of patch testing in the context of a population of stoma patients, including suggested patch test series.
- Common allergens usually from cleansers or deodorizers are the most frequently seen.
- Components of medical adhesive tape in stoma appliances appear to be an emerging source of skin reactions.

References

1 Jemec GB, Nybaek H. Peristomal skin problems account for more than one in three visits to ostomy nurses. *Br J Dermatol* 2008; **159**:1211–12.
2 Lyon CC, Smith AJ, Griffiths CE, Beck MH. The spectrum of skin disorders in abdominal stoma patients. *Br J Dermatol* 2000; **143**:1248–60.
3 Omura Y, Yamabe M, Anazawa S. Peristomal skin disorders in patients with intestinal and urinary ostomies: influence of adhesive forces of various hydrocolloid wafer skin barriers. *J Wound Ostomy Continence Nurs* 2010; **37**:289–98.
4 van Hecke E, Vossaert K. Allergic contact dermatitis from an ostomy bag. *Contact Dermatitis* 1988; **18**:121–2.
5 Field S, O'Sullivan C, Murphy M, Bourke JF. Peristomal allergic contact dermatitis to stoma-adhesive paste containing monobutyl ester/maleic acid of polymethylvinylether (Gantrez 425) but not to isopropyl ester/maleic anhydride of polymethylvinylether (Gantrez 335). *Contact Dermatitis* 2011; **62**:120–1.
6 Martin JA, Hughes TM, Stone NM. Peristomal allergic contact dermatitis – case report and review of the literature. *Contact Dermatitis* 2005; **52**:273–5.

7 Beck MH, Burrows D, Fregert S, Mendelsohn S. Allergic contact dermatitis to epoxy resin in ostomy bags. *Br J Surg* 1985; **72**:202–3.
8 Fregert S, Meding B, Trulsson L. Demonstration of epoxy resin in stoma pouch plastic. *Contact Dermatitis* 1984; **10**:106.
9 Mann RJ, Stewart E, Peachey RD. Sensitivity to urostomy pouch plastic. *Contact Dermatitis* 1983; **9**:80–1.
10 van Ketel WG, van de Burg CK, de Haan P. Sensitization to epoxy resin from an ileostomy bag. *Contact Dermatitis* 1983; **9**:516.
11 Scalf LA, Fowler JF Jr. Peristomal allergic contact dermatitis due to Gantrez in Stomahesive paste. *J Am Acad Dermatol* 2000; **42**:355–6.
12 Heskel NS. Allergic contact dermatitis from Stomadhesive paste. *Contact Dermatitis* 1987; **16**:119–21.
13 Lazarov A, Trattner A. Allergic contact dermatitis from the adhesive remover wipe of stoma bags. *Contact Dermatitis* 1998; **39**:48–9.
14 de Pablo P, Ortiz J, Borrego L *et al.* Allergic contact dermatitis from diaminodiphenylmethane in an ostomy bag. *Contact Dermatitis* 1992; **27**:260–1.
15 Stevenson CJ. Skin problems with surgical stomata. *Contact Dermatitis* 1975; **1**:243.
16 Davids MG, Hodgson GA, Evans E. Contact dermatitis from an ostomy deodorant. *Contact Dermatitis* 1978; **4**:11–13.
17 Camarasa JM, Alomar A. Contact dermatitis from a karaya seal ring. *Contact Dermatitis* 1980; **6**:139–40.
18 Gallo R, Ciambellotti A, Cozzani E, Parodi A. Peristomal allergic contact dermatitis caused by Stomahesive paste: an additional case. *J Am Acad Dermatol* 2002; **47**:633.
19 Parslew R, Evans S, King CM. Allergic contact dermatitis from polyisobutylene in stoma bags. *Contact Dermatitis* 1996; **35**:178–9.
20 Garcia-Gavin J, Lissens R, Timmermans A, Goossens A. Allergic contact dermatitis caused by isopropyl alcohol: a missed allergen? *Contact Dermatitis* 2011; **65**:101–6.
21 Sasseville D, Tennstedt D, Lachapelle JM. Allergic contact dermatitis from hydrocolloid dressings. *Am J Contact Dermat* 1997; **8**:236–8.
22 Pereira TM, Flour M, Goossens A. Allergic contact dermatitis from modified colophonium in wound dressings. *Contact Dermatitis* 2007; **56**:5–9.
23 Lachapelle JM. Allergic contact dermatitis from povidone-iodine: a re-evaluation study. *Contact Dermatitis* 2005; **52**:9–10.
24 Korber A, Kohaus S, Geisheimer M *et al.* [Allergic contact dermatitis from a hydrocolloid dressing due to colophony sensitization]. *Hautarzt* 2006; **57**:242–5.