

Photopatch testing – a retrospective review using the 1 day and 2 day irradiation protocols

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Photopatch testing is indicated in the investigation of patients with eczematous eruptions, affecting mainly light-exposed sites and in those who give a history of worsening of their condition with sun exposure. 3 different protocols are described by the British Photodermatology Group (*Br J Dermatol* 1997;136:371–376), 1 of which includes irradiation of allergens 1 day after application and 2 using irradiation of allergens 2 days after application. There is no evidence for superiority of any of these protocols. We reviewed the records of all patients who underwent photopatch testing in Leeds over a 50-month period, who had had the allergens applied in triplicate with 1 set irradiated after 1 day occlusion and another after 2 days. The control was occluded for 2 days. Readings were performed at 2 days and 4 days. 15 of 74 patients photopatch tested during this period had 49 positive results between them. 43 of these were felt to be of current relevance to their clinical problem. 34 of the positive results were indicative of photoallergy. Additional photoallergic reactions were detected following 2 days occlusion and irradiation compared with 1 day occlusion (16 versus 5). In conclusion, our case series suggests that 2 days occlusion before irradiation of allergens is more sensitive at detecting photoallergy.

Key words: 1 day irradiation; 2 days irradiation; photoallergy; photopatch test. © 2006 The Authors. Journal compilation © 2006 Blackwell Munksgaard.

Accepted for publication 9 October 2005

Photopatch testing is indicated in the investigation of patients with eczematous eruptions affecting mainly light-exposed sites and in those who give a history of worsening of their condition with sun exposure. 5 J/cm² of UVA is administered to 1 set of allergens on the back, while a control set of allergens is not irradiated. Photoallergy is indicated by a positive reaction on the irradiated side only (Fig. 1). 3 different protocols are described by the British Photodermatology Group (BPG) (1), 2 of which include irradiation of allergens 2 days after application and 1 using irradiation of allergens 1 day after application. There is no evidence that any 1 protocol is superior to the others. Traditionally, contact dermatitis specialists tend to irradiate allergens after 2 days occlusion, as patients would be due for review of their patch tests at that time; photobiologists generally irradiate allergens after occlusion for 1 day at the time of phototesting. We wished to determine whether there was any difference in results, indicating photoallergy, detected after 1 day and 2 days occlusion and irradiation of allergens.

Patients and Methods

We reviewed the records of all patients who underwent photopatch testing at the Leeds Centre for Dermatology over a 50-month period between December 1999 and February 2004. All the patients were being investigated for a photodermatosis or photoallergy and so were booked to come for patch testing and phototesting on a Monday, Tuesday, Wednesday and Friday. Patch tests were performed and read according to the guidelines of the ICDRG (2) in the patch test clinic, supervised by 1 individual. Patients were patch tested to the BCDS standard series and the photopatch test series used in Leeds (Table 1). Allergens in the photopatch series were applied in triplicate with 1 set irradiated with 5 J/cm² of UVA after 1 day of occlusion and another after 2 days occlusion. The control was occluded for 2 days and not irradiated. Readings were taken at 2 days and 4 days.

Results

74 patients were photopatch tested during the 50-month period (3357 patients had patch testing

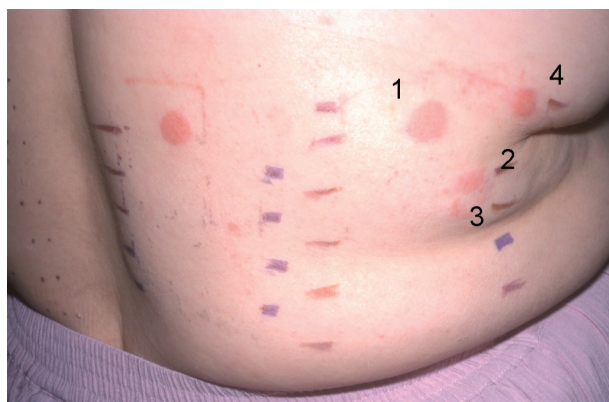


Fig. 1. Patient 8: results at day 2. Left side, after 1 day of occlusion and irradiation; right side, 2 additional positive results after 2 days occlusion and irradiation. Control negative. 1 = butylmethoxydibenzoylmethane; 2 = octyltriazone; 3 = Vichy SPF60; 4 = patient's own product.

in the same period) and 15 had a total of 49 positive results, between them (Table 2). 12 of these 15 patients were female, and the mean age was 49 years. 43 of the positive results were felt by the dermatologist to be of current relevance to their clinical problem. 15 of all 49 positive results were indicative of allergic contact dermatitis; Vichy SPF 60 and butyl methoxydibenzoylmethane had 4 positive reactions each, benzophenone-3 had 3, octyl methoxycinnamate had 2 and octyl dimethyl PABA and methylbenzylidenecamphor had 1 positive reaction each.

34 of all 49 positive results were indicative of photoallergy with 13 congruent positive results (positive after 1 day and 2 days occlusion and irradiation). There were 5 additional positive results after 1 day occlusion and irradiation as compared to 16 additional positives after 2 days occlusion and irradiation (Fig. 2). The commonest allergens causing photoallergy were isoamyl *p*-methoxycinnamate (6 positives), butyl methoxydibenzoylmethane (5 positive results) and Vichy

SPF 60 causing 4 positive results (butyl methoxydibenzoylmethane is an ingredient in Vichy SPF 60).

Discussion

There is no consensus of opinion as to whether photopatch test allergens should be irradiated after 1 day or 2 days of occlusion; our results suggest that the latter is more sensitive. If occlusion and irradiation had only been performed after 1 day, 47% (16/34) of the positive results indicating photoallergy would have been missed; conversely, if occlusion and irradiation had only been done after 2 days, 14.7% (5/34) of positive results would have been missed. To irradiate the allergens after 1 day and 2 days occlusion would require a patient to attend on 4 days of a week, which may be unacceptable and too labour intensive; this study indicates that if a choice has to be made, then occlusion and irradiation after 2 days may be more sensitive. The reasons behind more photoallergic results after 2 days occlusion and irradiation can only be hypothesized upon. It is well reported that allergens left on longer in conventional patch testing lead to more positive results. Hextall et al. (3) found that there was a direct relationship between exposure time and elicitation of allergic response to *p*-phenylenediamine. It would seem possible that the longer application and occlusion time may allow more time for allergen formation.

The BPG recommends UVA as the radiation source during photopatch testing, as it is felt that the dose of UVB required to produce photoallergy would be higher than that for a sunburn response (4). Most allergens are active in the UVA range (315–400 nm), but there are some exceptions to this which are active in the UVB range, raising the possibility that some photoallergic reactions may be missed if only UVA was used during photopatch testing. Pollock and Wilkinson found, however, that there were no positive reactions to UVB irradiation which did not react to UVA irradiation in a study involving 118 patients (5).

In the past, there was little standardization in the dose of UVA used in photopatch testing; doses between 1 J/cm² and 15 J/cm² were used at various centres. This has been standardized in recent years to 5 J/cm² after studies showed that significant positive responses occurred at this dose and lower. No further benefit was gained at higher doses, and in fact, phototoxic reactions were more likely to result (6).

In standard patch testing, up to 30% of positive reactions can become apparent between

Table 1. The photopatch test series in Leeds

Octocrylene	10% pet.
Octyl methoxycinnamate	10% pet.
Benzophenone-3	10% pet.
Octyl dimethyl PABA	10% pet.
PABA (<i>p</i> -aminobenzoic acid)	10% pet.
Butyl methoxydibenzoylmethane	10% pet.
Methylbenzylidenecamphor	10% pet.
Octylsalicylate	10% pet.
Isoamyl <i>p</i> -methoxycinnamate	10% pet.
Phenylbenzimidazolsulphonic acid	10% pet.
Octyl triazone	10% pet.
Vichy SPF 60	as is
Benzophenone-10	2% pet.
Homosalate	5% pet.
Benzophenone-4	10% pet.

pet. = petrolatum.

Table 2. Positive photo patch test results

Allergen	1 day irradiation		2 day irradiation		Unirradiated control		Relevance
	Day 2	Day 4	Day 2	Day 4	Day 2	Day 4	
Patient 1							
Octylmethoxycinnamate		+		+		+	PR
Octyl dimethyl PABA		+					PR
Butyl methoxydibenzoylmethane		+	?+	+	?+	+	PR
Patient 2							
Octocrylene	+						R
Octyl methoxycinnamate	++	+	++	+	++	+	R
Octyl dimethyl PABA	++	+	++	+	++	+	R
Butyl methoxydibenzoylmethane	++	++	++	++	++	+	R
Benzophenone-4				+			R
Isoamyl <i>p</i> -methoxycinnamate	++	++		++			R
Vichy SPF 60	++	++	++	++	++	+	R
Patient 3							
Butyl methoxydibenzoylmethane	+	+		++			R
Isoamyl <i>p</i> -methoxycinnamate				+			R
Vichy SPF 60	++	++	++	+	+	++	R
Methylbenzylidenecamphor				+			R
Octyl triazone				+			R
Patient 4							
Octylmethoxycinnamate	+	+	+	++			R
Butyl methoxydibenzoylmethane	++	+	+	++	++	+	R
Isoamyl <i>p</i> -methoxycinnamate		+	+	+			R
Vichy SPF 60	++	++	+	++	++	+	R
Benzophenone-3	+	+		?+	+		R
Patient 5							
Benzophenone-3	+	++	+	++	+		R
Patient 6							
Butyl methoxydibenzoylmethane	+	+					R
Patient 7							
Methylbenzylidenecamphor	+	+	+	+	+	+	NR
Patient 8							
Butyl methoxydibenzoylmethane	++	++		++			R
Octyl triazone				++			R
Vichy SPF 60		?+		+			XR
Patient 9							
Octylmethoxycinnamate				+		+	R
Benzophenone-3	+	++		+		+	R
Octyl dimethyl PABA				+			R
PABA				+			R
Butyl methoxydibenzoylmethane		+		+		+	R
Methylbenzylidenecamphor				+			R
Octylsalicylate		+		+			R
Benzophenone-4				+			R
Isoamyl <i>p</i> -methoxycinnamate				+			R
Phenylbenzimidazolsulphonic acid		+					R
Octyl triazone				+			R
Vichy SPF 60	?+	+		+			R
Benzophenone-10	++	++		++			R
Homosalate	?+	+		+			R
Patient 10							
Benzophenone-4				+			R
Patient 11							
Vichy SPF 60				+			NR
Patient 12							
Octyl dimethyl PABA		?+		?+			R
Patient 13							
Butyl methoxydibenzoylmethane	+	+	?+	+			R
Vichy SPF 60				+			XR
Patient 14							
Isoamyl <i>p</i> -methoxycinnamate			+				Not stated
Patient 15							
Butyl methoxydibenzoylmethane	+	+		?+			R
Isoamyl <i>p</i> -methoxycinnamate	+	++					R
Vichy SPF 60	+	+	+	+	+	+	R

R = relevant; PR = past relevance; XR = cross-reaction; NR = not relevant.

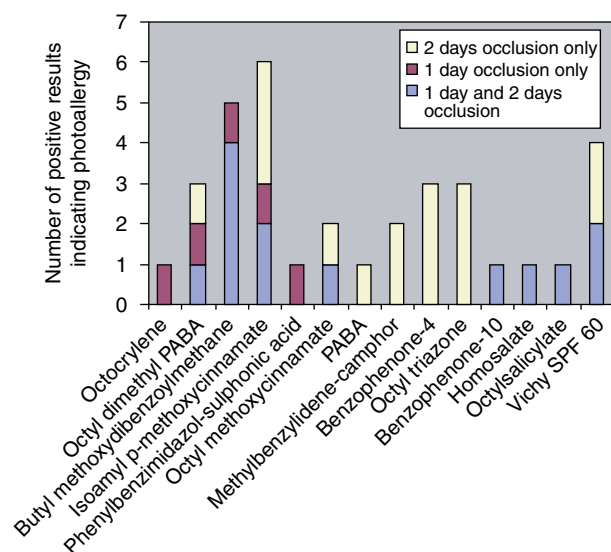


Fig. 2. Positive photopatch test results indicating photoallergy after 1 day of occlusion and irradiation only, 2 days of occlusion and irradiation only and after 1 day and 2 days of occlusion and irradiation.

2 days and 4 days (7). In photoallergy, the formation of the allergen occurs after exposure to the UV radiation, and so it would seem logical that readings should be taken up to 4 days after irradiation in order that late reaction are not missed; there appears to be no advantage in extending the reading time beyond 4 days (5).

From our study, it would seem that photopatch testing involving occlusion of allergens in

duplicate for 2 days rather than 1 day, followed by irradiation to 1 set of allergens is more sensitive. However, a prospective study would be advisable to look at any difference between the various protocols before a single method is adopted.

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