

How well is the outcome of patch testing remembered by the patients? A 10-year follow-up of testing with the Swedish baseline series at the Department of Dermatology in Örebro, Sweden

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Summary

Background. Patch testing is beneficial for patients with contact dermatitis. However, it is not known how well the outcome of patch testing is remembered after a prolonged period.

Objectives. To study how well patients remember the outcome of their tests after 1–10 years.

Patients/materials/methods. In 2010, a questionnaire was sent to all patients tested with the Swedish baseline series in 2009, 2005, and 2000.

Results. The response rate was 53.3% (252/473), and 96% (241/252) of patients reported that they had been submitted for allergy testing. Among those with positive patch test results, 79% (111/141) remembered a positive result and 29% (41/141) reported the correct name of the allergen. We found a wide variation (0–80%) in how well the patients remembered positive test results for different allergens. The ability to recall allergens had no relationship with the localization or extension of eczema lesions, but was negatively correlated with the number of diagnosed allergies, the number of years after patch testing, and being male.

Conclusions. Our results indicate that improved information for patients following patch testing is required, in order to improve the prognosis of contact dermatitis.

Key words: allergen; contact allergy; outcome of testing; patch testing; recall.

The prevalence of skin diseases exceeds the prevalence of obesity, hypertension and cancer combined. One of three people has some type of skin disorder (1). Skin diseases are often chronic (2), visible, and difficult to treat, and generally have a negative impact on the patient's quality of life (1). Contact dermatitis, for example hand eczema, is common, and hand eczema is the most prevalent form of occupational skin disease. It is often chronic and relapsing,

and has a poor prognosis (3). Hand eczema seems to be more common in females than in males (4). In the general population, hand eczema prevalence is estimated to be between 2% and 10% (5).

The burden of hand eczema for patients and society is attributable to both economic and non-economic losses. Hand eczema often causes permanent disability (6). Prospective studies have shown that the prevalence of persistent or intermittent hand eczema, for diagnosed and treated patients, is reported as 81% after 1 year (7), 65% after 5 years (7), and 23% after 10 years (8).

During the investigation of contact dermatitis, patch testing provides an effective tool with which to diagnose contact allergy, thus providing the information about allergen exposure that is needed to reduce eczema

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duration and improve quality of life (9–15). There are many factors that affect the accuracy of patch testing: the severity of the subject's symptoms before the test (14), the dermatologist's selection in patch testing patients (12, 14), whether the subjects have developed chronicity before patch testing (12, 15), the expertise of the tester (16), and the use of appropriate test substances and concentrations (17). Furthermore, the type of information given regarding avoidance of allergens (11, 18) and the patient's ability to recall the results of patch testing and to adopt suitable avoidance behaviours will influence the final benefits of the patch testing.

To our knowledge, three studies have examined patients' knowledge regarding allergen avoidance after 2, 3 and 13 months (18–20). The aim of the present study was to investigate patients' abilities to recall their diagnosed allergens 1, 5 and 10 years after patch testing. Knowing how well diagnosed contact allergies are recalled over prolonged periods is likely to contribute to a better understanding of how information about allergen avoidance should be directed to patients.

Materials and Methods

During the first half of 2010, a questionnaire was sent to all patients, aged 16–85 years, patch tested with the Swedish baseline series for the indication of contact dermatitis in 2009, 2005 and 2000 at the dermatology clinic of the Örebro University Hospital in Sweden. The questionnaire consisted of 29 questions from the Nordic Occupational Skin Questionnaire (NOSQ) (21) and the quality of life instrument Dermatology Life Quality Index (22). In the present study, the answers to four questions from the NOSQ 2000 (Table 1) are included. The patients were asked whether they had been submitted for allergy testing (Table 1, Question 1) and, if so, what the result was (Table 1, Question 2). The data regarding positive patch test allergens were compared with the patients' medical records. The patients were also asked to describe the extent of eczema after age 15 years and in the last 12 months on the following areas: arms, legs, face, and other (Table 1, Questions 3 and 4). For those patients who were patch-tested in 2009, the data on subjectively reported localization and extent of eczema lesions were compared with the medical records. In the analysis of Question 2, an allergen was considered to be recalled if the patient reported the correct name of the diagnosed allergy (the allergen). The correct name means the correct chemical name, for example formaldehyde.

The standard procedure when performing patch testing at the clinic has been to give patients both

Table 1. The content of the four questions from the Nordic Occupational Skin Questionnaire 2002 questionnaire included in the present article

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- | | |
|----|---|
| 1. | Have you ever been submitted for allergy testing? Yes, No, Don't know. If yes, was the result positive or negative? |
| 2. | What allergies have you been diagnosed with?
Specify allergies and when or Don't know |
| 3. | Have you, after the age of 15 years, developed eczema on:
Arms, legs, face, other body site (Yes or No for each alternative) |
| 4. | Have you, in last the 12 months, had eczema on:
Arms, legs, face, other body site (Yes or No for each alternative) |
-

written and verbal information about the test results. The written information included the name of each diagnosed allergen, where to find it, and how to avoid it. During the period covered by this study, more than 10 dermatologists performed patch testing at the clinic.

Statistics

All analyses were performed with STATISTICA, version 9.0. Fisher's exact test was used for non-parametric analysis, and Student's *t*-test was used for parametric data. All *p*-values are given in the tables. *p*-Values of <0.05 were considered to be significant in the analysis. The Ethics Committee of Uppsala, Sweden approved the study.

Results

The questionnaire was sent to 473 patients. After one reminder, a total of 253 (53.5% of 473) subjects returned the questionnaire. Of these, 1 person answered only one question, yielding a study population of 252 subjects (53.3% of 473) available for analysis of all four questions. The proportion of responders in relation to the total study population as regards sex, age and patch test results are shown in Table 2. There were no differences in sex, age and contact sensitization to allergens between responders and non-responders.

In total, 96% (241/252) of the patch-tested patients reported that they had been submitted for allergy testing. In the group of patients with positive results, it was found that 79% (111/141) remembered that they had positive results in their patch test, and 29% (41/141) reported the correct name of the diagnosed allergen(s).

In Table 3, the proportion of patients remembering the correct names of all the diagnosed allergens is shown, for each year of testing. There was a statistically significant difference between subjects patch tested in 2009 and 2000. On comparison of 2009 and 2005, there was

Table 2. Comparison of drop-outs and responders

		Drop-outs	Responders	Total
Sex, % (no.)	Females	64.5 (142/220)	65.6 (166/253)	308
	Males	35.4 (78/220)	34.4 (87/253)	165
Median age (years)		48.0	48.7	
Patch testing, % (no.)	Positive	50.0 (110/220)	55.7 (141/253)	251
	Negative	50.0 (110/220)	44.3 (112/253)	222
	Total	220	253	473

There were no statistically significant differences concerning sex, age, or outcome of patch testing.

Table 3. The proportion of responders remembering all of the diagnosed allergens in relation to years after testing

Years after testing	Responders (n)	Remembers all allergens, % (no.)	<i>p</i>
1	64	39 (25/64)	—
5	35	26 (9/35)	0.0791 ^a
10	42	17 (7/42)	0.0045^a
			0.4028 ^b
Total	141	29 (41/141)	—

Statistical analysis with Fisher's test.

^aCompared with 1 year.

^bCompared with 5 years.

Bold figures, *p* < 0.05.

a trend (*p* = 0.079) towards a difference in remembering all diagnosed allergens. The proportions of patients remembering all of the diagnosed allergens in relation to the number of diagnosed allergens are shown in Table 4. The number of patients remembering all of their allergens decreased with an increasing number of diagnosed allergens. This can be seen on comparison of those with one diagnosed allergen with those with two (*p* = 0.0511), three (*p* = 0.0032) and more than three (*p* = 0.0014) diagnosed allergens. Subjects with two diagnosed allergens were not better at remembering their allergens than subjects with three (*p* = 0.2427) or more than three (*p* = 0.1066) allergens. There was a statistical significance, in that more women than men remembered all diagnosed allergens (*p* = 0.0168); see Table 5. There was, however, no relationship between recalling the correct names of diagnosed allergens and the self-reported location of eczema in patients patch-tested in 2009, 2005, and 2000. This was confirmed for the patients tested in 2009, for whom information about the distribution of eczema lesions was also obtained from medical records. No relationship between recalling the diagnosed allergens and the location of eczema was found.

Table 4. The proportion of responders remembering the diagnosed allergens in relation to the number of positive patch test results

Number of positive patch test results	Responders (n)	Remembering all positive allergens, % (no.)	<i>p</i>
1	52	45 (25/52)	—
2	37	27 (10/37)	0.0511 ^a
3	28	14 (4/28)	0.0032^a
			0.2427 ^b
>3	23	9 (2/23)	0.0014^a
			0.1066 ^b
			0.6778 ^c
Total	141	29 (41/141)	—

Statistical analysis with Fisher's test.

^aCompared with one positive test result.

^bCompared with two positive test results.

^cCompared with three positive test results.

Bold figures, *p* < 0.05.

Table 5. Proportion of responders remembering all diagnosed allergies in relation to sex

Sex	Remembering all allergies, % (no.)	<i>p</i>
Females, <i>n</i> = 95	35.8 (34/95)	0.0168
Males, <i>n</i> = 46	15.0 (7/46)	—
Total, <i>n</i> = 141	29.1 (41/141)	—

Statistical analysis with Fisher's test.

Bold figures, *p* < 0.05, comparing sex.

Twenty-eight patients, 20% of the 141 that tested positive, reported a substance group instead of the name of the allergen. Four patients reported perfume instead of *Myroxylon pereirae*; 7 reported preservatives instead of imidazolidinyl urea, diazolidinyl urea, paraben mix, formaldehyde, methylchloroisothiazolinone/methylisothiazolinone, methyltribromo glutaronitrile, or quaternium-15; 5 reported cortisone instead of tixocortol pivalate; and 3 reported metals instead of chromium or cobalt.

The outcome of patch testing with allergens in the Swedish baseline series and the frequency of recalling diagnosed allergies in 2009, 2005 and 2000 are shown in Table 6.

Discussion

We found that in a 10-year, 5-year and 1-year follow-up of patch-tested subjects, 96% of the patients patch-tested on indication of contact dermatitis reported that they had been submitted for allergy testing. In a group of patients with positive results, who were given both verbal and written information about allergen avoidance, it

Table 6. The outcome of patch testing with allergens in the Swedish baseline series in 2000, 2005, and 2009, and the proportion of responders reporting positive patch test results

Allergens	Positive test results for all tested [%] (n/total)	Persons reporting positive tests [%] (n/persons with positive test results)
Nickel sulfate	22.5 (60/267)	75.0 (45/60)
<i>Myroxylon pereirae</i>	10.5 (28/267)	17.9 (5/28)
Potassium dichromate	10.1 (27/267)	37.0 (10/27)
Perfume mix I	8.2 (22/267)	31.8 (7/22)
Colophonium	7.5 (20/267)	45.0 (9/20)
Cobalt chloride	7.5 (20/267)	40.0 (8/20)
Formaldehyde	4.1 (11/267)	63.6 (7/11)
Methyldibromo glutaronitrile	3.7 (10/267)	20.0 (2/10)
Quaternium-15	3.4 (9/267)	33.3 (3/9)
<i>p</i> -Phenylenediamine	3.4 (9/267)	22.2 (2/9)
Tixocortol pivalate	3.4 (9/267)	22.2 (2/9)
Budesonide	2.6 (7/267)	28.6 (2/7)
Epoxy resin	1.9 (5/267)	80.0 (4/5)
Neomycin	1.9 (5/267)	20.0 (1/5)
Ethylenediamine dihydrochloride	1.5 (4/267)	50.0 (2/4)
Perfume mix II	1.5 (4/267)	25.0 (1/4)
<i>p</i> -Tert-butylphenol formaldehyde resin (PTBP resin)	1.1 (3/267)	33.3 (1/3)
Caine mix	1.1 (3/267)	0.0
Hydroxyisohexyl 3-cyclohexene carboxaldehyde	1.1 (3/267)	0.0
Thiuram mix	1.1 (3/267)	0.0
Paraben mix	0.7 (2/267)	0.0
Sesquiterpenelactone mix	0.7 (2/267)	0.0
Mercapto mix	0.4 (1/267)	0.0

was found that 79% remembered that they had positive results in their patch tests, and only 29% reported the correct name of the allergen. The ability to recall allergens had no relationship with the localization or extension of eczema lesions, but was negatively correlated with the number of allergens, the number of years after patch testing, and being male.

Patch testing is a cost-effective (14) method used to document sensitivity to suspected allergens (23). Patients who are diagnosed through patch testing show a significant improvement in quality of life (11, 12), thanks to adopting avoidance behaviours regarding the diagnosed allergens (18). It has been shown that contact allergy is associated with more severe hand eczema, an association not found 6 months after diagnosis (24). This can be interpreted as a positive effect of patch testing, as an identified allergy provides the possibility of allergen avoidance, thus improving the situation for the patient.

However, a positive patch test result was not found to affect the prognosis of hand eczema. This discrepancy can perhaps partly be explained by the fact that the accuracy of patch testing is multifactorial and depends, for instance, on the competence of the tester (16), use of the appropriate substances and concentrations (17), the type of information given regarding avoidance of allergens (11, 18), and the patient's ability to recall the results of patch testing, which was the central question in our study. One previously published study showed that, 2 months after patch testing, 97.4% were able to recall the information about avoidance of allergens (18), as compared with 56% in a study by Lewis et al. (19). Another study showed that, at a mean time of 13 months after patch testing, 34.1% remembered all of their identified allergens (20). To the best of our knowledge, no study has examined patients' abilities to remember for longer time periods. We found that the patients' knowledge of the outcome of patch testing is negatively correlated with the number of years after testing.

Possible limitations of this retrospective study are the response rate of 53.5% and the relatively small sample size, which might impair some of the subgroup analyses. However, we found no significant differences in age, sex or patch test results between responders and non-responders. Another limitation could be the severity of eczema, which could either enhance or impair the ability to recall diagnosed allergies. Severity of contact dermatitis can be influenced by seasonal variations (25–27), and therefore affect the recollection of contact allergies. This was taken into account in our study by sending the questionnaires during one season in 2010. It must be also considered that the questions included in this study have not been validated before. The strengths of our study were that the study population included all subjects patch-tested from 2009, 2005, and 2000, and that recalled allergens could be compared with the patients' medical records.

One might expect patients with more extensive and more obvious eczema lesions to be keener to implement avoidance strategies, and therefore show a higher prevalence of recalled allergens. In this study, we could not find any variation in recalling allergens in relation to the body site affected by eczema. In a previous study, no significant association was found between quality of life and body site affected by eczema (18). In another study, it was found that facial involvement was not correlated with baseline quality of life (28).

The wide variation in the proportion of patients recalling the different allergens (Table 6) is, perhaps, not so surprising. One could expect it to be more difficult to

remember complicated chemical names. It is also plausible that it is easier to remember identified allergies if they are related to daily occupational activity. The fact that 20% of patients with positive patch test results did not recall the correct names of the allergens, but did recall the substance group, indicates a possible problem for the patients when it comes to adapting a strategy of allergen avoidance. In some instances, it could, perhaps, even be better to remember the substance group, for example perfume, than a specific allergen such as *M. pereirae*, which is not on the label.

Several studies have shown that there is a female predominance among patients at patch test clinics (29), and that hand eczema is more prevalent among females (4). On measurement of quality of life, females are more affected by hand eczema than males (30). A sex difference was also seen in the present study, as females recalled diagnosed allergies better than males. The reason for this is not clear. However, it is tempting to speculate that this is because females are more strongly affected by hand eczema.

A delay between the appearance of eczema and patch testing could be one possible reason for not recalling the diagnosed allergens. When the disease has been established, more time is needed for healing (14, 15), and it can also be more difficult to identify the relationship

between a diagnosed allergy, the disease, and the actual living situation.

It can be argued that the results of the present study represent only the dermatology clinic in Örebro. However, patch testing and subsequently providing information to the patients has been performed in the same way at most Swedish clinics not specialized in patch testing. Thus, we believe that the overall findings can be generalized. It must be noted that, although the patients had visited the clinic, the questionnaire was presented as a follow-up to their visit; they did not recall being tested.

Information on and knowledge of established contact allergies are essential for the patients, in order for them to adopt an allergen avoidance strategy. Our results suggest that there is a need for further work focused on developing better information strategies when performing patch testing. During testing, the information about test results must be adapted to the specific allergen and the sex of the patient, and also take into consideration the number of diagnosed allergies.

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