

The strip patch test – indication in occupational dermatology demonstrated with a case history

Heinrich Dickel, Nina Scola, Peter Altmeyer

Department of Dermatology and Allergology, Division of Allergology, Occupational and Environmental Dermatology, St. Josef-Hospital, Ruhr-University, Bochum, Germany

JDDG; 2009 · 7

Submitted: 10. 2. 2009 | Accepted: 7. 4. 2009

Summary

In occupational dermatology, repeat patch testing is a frequent occurrence when an expert opinion is required. As a result, discrepancies in test results may affect the legal position in respect of insurance and a reduction in the level of disability. The strip patch test (SPT) supports the diagnosis of allergic contact dermatitis when a weak sensitization is present or when a weak sensitizer with poor epidermal penetration is involved leading to a false-negative patch test result. We report on a 30-year-old man working as an industrial mechanic from 1995 to 2006. After approval of an occupational disease no. 5101 of the German ordinance on industrial disease in 2007, he went to court claiming compensation. The sensitization with clinical and occupational relevance to potassium dichromate that was decisive for the evaluation for insurance purposes was first confirmed in a patch test in 2005. Succeeding tests in 2006 in the context of an expert opinion and in 2008 in the context of our decisive expert opinion remained negative. We could reconfirm the potassium dichromate sensitization only by the SPT performed in the proposed standardized manner. The potassium dichromate allergy was the determining factor in the assessment for insurance purposes. This resulted in an adjustment in

the severity of disability and a pension entitlement. From this case it is obvious that the detection of a SPT-positive and patch test-negative sensitization may have a significant impact on the situation with respect to the legal and insurance position.

Keywords

strip patch test – SPT – test sensitivity – potassium dichromate – occupational skin disease – occupational disease no. 5101

Introduction

The strip patch test (SPT), first reported by Spier and Natzel [1], has been referenced in standard dermatology texts (see [2]) as a modified version of the patch test which can enhance the penetration of test substances and increase the sensitivity of the skin in patients in whom only minimal sensitization is suspected.

Testing procedure

A standardized method has been presented for the first time on behalf of the German Contact Dermatitis Research Group [3]. To perform the SPT a non-inflamed area of skin is chosen on the upper back (Figure 1). Any body hair is removed beforehand with a clipper (Figure 2; 3M™ Clipper; 3M Deutschland GmbH). One 3M™ Blenderm™-strip (width: 25 mm; 3M Deutschland GmbH) is used for each application. The adhesive strip is applied without tension, parallel to the spine, using the fingers to lightly smooth it onto the skin under gentle pressure for about 2 seconds (Figure 3 a, b). Afterward the tape is removed in one smooth motion in the direction of application at an angle of 45° (Figure 3 c). After each stripping, a new tape is applied to the same area. On one half of the lateral, upper half of the back, tape strips are applied an area measuring 50 × 25 mm (Figure 1 a) and stripped again until the endpoint (≥ 3 glistening points) becomes visible. Afterward the

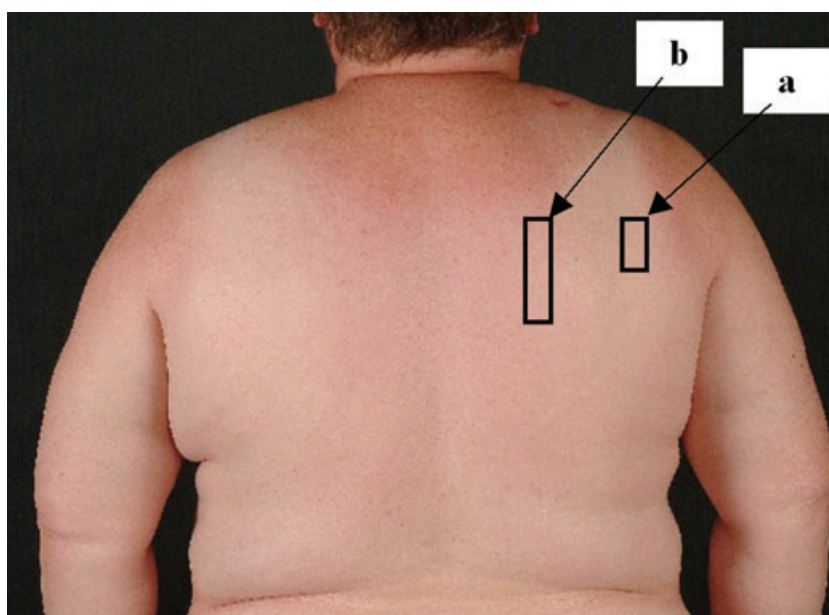


Figure 1: Exemplary assembly of the test sites in the strip patch test; test site for the tape strips down to the stratum lucidum (a) and test site for the calculated tape strips (b) before applying the test substances there.



Figure 2: Hair removal with a clipper.

necessary number of tape strips is multiplied with the strip-specific correction factor $cf = 11/26 \approx 0.42$. The calculated number of tape strips is then applied for the SPT contralateral and/or lateral to spine (Figure 1 b). Next the patch test with the test substance is applied and left in place for 24 hours under occlusion. The results are read in the same manner as in conventional patch testing.

Case report

A 30-year-old man worked from 1995 until September 2006 as an industrial mechanic. His work initially involved contact with pesticides, but in 2003 he began working as a cutting mechanic where he had contact with coolants, cutting and grinding oils, anticorrosive agents, metal cleansers, industrial lubricants, and various residues. The patient wore protective clothing when it was permitted. This included quickly soaked-through leather gloves, protective rubber gloves against corrosive materials, and leather or rubber boots.

In January 2005 he noticed redness and swelling of the hands which was followed by blistering and excoriations spreading out on the forearms. A patch test done at another institution in April 2005 revealed sensitization to potassium dichromate and N-Isopropyl-N'-phenyl-4-phenylenediamine (IPPD). A diagnosis of "cumulative-toxic, dyshidrosiform eczema of the hands with spread" was made.

In June 2005 additional patch tests were performed with occupation-relevant test

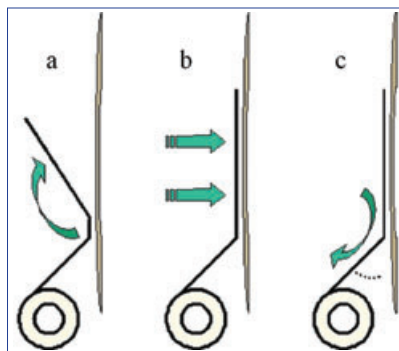


Figure 3: Handling of the tape (a–c) (abstracted from [3]).

series as well as substances from the patient's workplace. The results revealed sensitization to coconut diethanolamide; the patient was also positive for machine oil and a heavy duty cleaner. A diagnosis was made of "dyshidrosiform hand eczema with atopy and contact sensitization to coconut diethanolamide and machine oil."

According to a notice of the workers' compensation board, the patient was unable to change his position within the company. In November 2005, under the assumption that the patient could not continue working in his present capacity, measures were approved to assist the patient in continuing to work. Patch testing done at another institution in March 2006 to establish a causal relationship failed to detect any sensitization to potassium dichromate, IPPD, or coconut diethanolamide. The skin symptoms persisted and diagnosis was made of "irritant atopic hand eczema" and "healed allergic contact dermatitis of the hands, forearms, and face."

In a decision by the workers' compensation board dated July 2007, as a result of occupational disease as described in section number 5101 of the German ordinance on industrial disease, there was "occupationally-related exacerbation of atopic dermatitis of the hands arising from a predisposition to disease." The patient was not granted compensation and proceeded to file a claim with the social court.

As part of the legal proceedings, we prepared an assessment in January 2008. A patch test confirmed sensitization to coconut diethanolamide; there was no positive reaction to potassium dichromate or IPPD. SPT was performed according to our proposed method [3], and revealed sensitization to nickel sulfate and

potassium dichromate. We judged it likely that the sensitizations to potassium dichromate and coconut diethanolamide were occupationally related, given the patient's handling of anticorrosive agents and the wearing of chrome-tanned leather gloves and protective shoes as well as contact with coolants. After the skin symptoms resolved we diagnosed "partly irritant-provoked, partly hyperkeratotic-rhagadiform hand eczema in atopic diathesis with secondary allergic contact eczema in occupationally-related sensitization to potassium dichromate and coconut diethanolamide." The sensitization to nickel sulfate was judged to be non-occupationally related and latent, given that it was first detected on SPT and was not clinically relevant. In the evaluation on lost earning capacity, we found the main sensitization to potassium dichromate to be the *effect of an allergy* and to be "moderate" [4] rather than "severe" given the higher threshold and lack of detection on conventional patch tests, but only on SPT. Sensitization to coconut diethanolamide was considered "minimal" with no major effects. In accordance with the recommendations for preparing an evaluation based on severity of skin disease as per the "Bamberger Merkblatt" [5], we determined an initial entitlement to compensation of 20 % ("moderate" or "mild" skin symptoms) and 10 % ("no" skin symptoms) beginning as of the date of our evaluation examination.

Discussion

Although the risk of false positives is higher than in conventional patch testing [6], in correctly performed SPT the risk is generally low [7]. False negatives on conventional patch tests are more common than generally believed [8]. A positive result obtained from a patch test can later be negative on repeat testing. Potassium dichromate sensitization is usually detectable by patch testing for several years [8]. A negative result on a follow-up test is thus either a false negative or a sign of no longer detectable (too mild) sensitization on conventional testing. In our patient this was apparent with SPT for potassium dichromate as well as nickel sulfate. Our own current studies show that using our proposed strip patch test method [3] the threshold for nickel sulfate is lowered by a factor of 10 and for potassium dichromate by a

factor of 5 [9]. This case report demonstrates the usefulness and significance of this modified patch test method in clinical practice [3] when dealing with occupational diseases; use of the test should be (similar to repeat patch testing for evaluation follow-up examinations) targeted, well-founded, and conducted according to the recommendations of the "Bamberger Merkblatt" [5]. <<<

Conflict of interest

None.

Correspondence to

Dr. med. Heinrich Dickel
Klinik für Dermatologie und Allergologie
Abteilung für Allergologie, Berufs- und
Umweltdermatologie
St. Josef-Hospital, Ruhr-Universität
Bochum
Gudrunstraße 56
D-44791 Bochum
Tel.: +49-234-509-3448
Fax: +49-234-509-3451
E-mail: dickel@derma.de

References

- 1 Spier HW, Natzel R. Chromatalergie und Zementekzem. *Gewerbedermatologischer und analytischer Beitrag. Hautarzt* 1953; 4: 63–65.
- 2 Müller W. *Das Berufsekzem*, Berlin: Acron Verlag, 1980.
- 3 Dickel H, Bruckner TM, Erdmann SM, Fluhr JW, Frosch PJ, Grabbe J, Löffler H, Merk HF, Pirker C, Schwanitz HJ, Weisshaar E, Brasch J. The "strip" patch test: results of a multicentre study towards a standardization. *Arch Dermatol Res* 2004; 296: 212–219.
- 4 Diepgen TL, Dickel H, Becker D, Geier J, Mahler V, Schmidt A, Schwanitz HJ, Skudlik C, Wagner E, Wehrmann W, Weisshaar E, Werfel T, Blome O. Evidenzbasierte Beurteilung der Auswirkung von Typ-IV-Allergien bei der Minderung der Erwerbsfähigkeit – Begutachtung berufsbedingter Hautkrankheiten. *Hautarzt* 2005; 56: 207–223.
- 5 Diepgen TL, Bernhard-Klimt C, Blome O, Brandenburg S, Dienstbach D, Drexler H, Elsner P, Fartasch M, Frank KH, John SM, Kleesz P, Köllner A, Otten H, Pappai W, Römer W, Rogosky E, Sacher J, Skudlik C, Zagrodnik F. *Bamberger Merkblatt: Begutachtungsempfehlungen für die Begutachtung von Haut- und Hautkrebserkrankungen. Teil I: Hauterkrankungen. Dermatol Beruf Umwelt* 2008; 56: 132–150.
- 6 Frosch PJ, Weickel R, Schmitt T, Krastel H. Nebenwirkungen von ophthalmologischen Externa. *Z Hautkr* 1988; 63: 126–136.
- 7 Trautmann A. Schlusswort: Diskussion zu dem Beitrag „Was tun bei Heparinallergie?“ *Dtsch Arztebl* 2007; 104: B 916–917.
- 8 Kleinhans D. Interpretation negativer Ergebnisse beim Epikutantest. *Allergo J* 2006; 15: 582, 584.
- 9 Dickel H, Kamphowe J, Geier J, Altmeyer P, Kuss O. Strip patch test vs. conventional patch test: investigation of dose-dependent test sensitivities in nickel- and chromium-sensitive subjects. *J Eur Acad Dermatol Venereol* 2009; (Epub ahead of print): DOI: 10.1111/j.1468-3083.2009.03237.x.