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Stuides on Dermographometry in Atopic Eczzema

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The usual method of investigating dermatographism (D), which is typically white in atopic eczema (AE), allows only a qualitative rating. To allow reproducible quantification of D we have developed an easily usable device termed Dermography. This can be fitted with one to three blunt tapered metal bars of different weight applying a constant stretching pressure over the whole skin area to be examined with different pressures at isolated lines. We used this device to study D in 27 patients with AE and in 20 healthy controls. Of the 27 patients, 21 had white D, 2 had red D, and 4 none at each pressure applied. In 18 of the 20 controls D was red. Both groups differed significantly with regard to the time until the onset of D and its duration, the former being prolonged and the latter shortened in patients with AE. Simultaneous and constant application of distinct grades of pressure for quantitative dermographometry is a method than can reliably be used for the study of inter- and intraindividual variations in vascular reactivity. ***Key words: Dermographism (white, red, indifferent); Latency time; Duration.***

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The usual method of examining dermographism (D), which is typically white in patients with atopic eczema (AE), allows only a qualitative rating (4, 5, 6, 7, 10, 11). To study this vascular phenomenon more closely it is necessary to use methods which can be standardized and used for quantitative measurements. Thirty years ago Reed et al. (8) constructed a wheelbarrow-like device loadable with sets of different weights, which generates a dermographic line when drawn over the skin. Although this tool allows the application of defined forces on the skin by the rotating wheel, it can not apply different weights simultaneously. Moreover, the device generates only pressure and not additional rubbing to the skin unlike the usual elicitation of D by stretching the skin with a spatula or a blunt pin head.

The imperfection of Reed's method motivated us to develop, together with the German firm Lasco Umformtechnik Inc. (Coburg), a device which allows a standardized and quantitative examination of D by simultaneous application of 1, 2 or 3 definite weights (9). The device is made of aluminium (own weight 440 g) and looks like a sledge with two parallel skids (distance 9.5 cm) for carrying up to three steel pounders with conical and blunt pointed ends (contact area 2.55 mm^2 each) (Fig. 1). When this tool called "Dermograph" is drawn over the skin of an individual with a speed of about 4 cm/sec (Fig. 2), the different pounders (weight 157 g, 285 g, 425 g) produce a stretching pressure of 62, 112, or 167 g/mm^2, respectively. The 25 mm distance between the stretching points can be extended to 50 mm by taking off the mid-pounder. The virtually frictionless mounting of the pounders on the sledgebow guarantees the simultaneous elicitation of D by quantitatively different forces thus enabling the exact evaluation of the dermographic skin reaction to defined stretching.

DERMOGRAPHOMETRIC STUDY

This report deals with the results of a preliminaty study using dermographometry in 27 inpatients suffering from severe atopic eczema (16 females, 11 males, age 17 to 47 years, mean age 21.6 years) and 20 non-atopic healthy control subjects (8 females, 12 males, age 22 to 42 years, mean age 25 years). The patients had not used corticoid treatment for at least 3 months prior to inclusion in the study. All examinations took place on the fourth or fifth day of the patients' hospitalization, between 1 p.m. and 3 p.m., at a constant room temperature of 22–23°C. The study was performed between January and May.

We performed the dermographometric procedure on the back of the laying subject, below the right scapula. The onset and ending of the dermographic reaction were time-recorded and the type of colour change (pink or red; no change, white) was evaluated during the whole period of examination.

There were two groups of patients, group A with lichenification of the tested area, and group B with only dry skin in the tested area. 15 patients belonged to group A, the remaining 12 to group B.

RESULTS

Table I demonstrates the colour type of D elicited in the different test groups. 21 out of the 27 patients showed white D, while none of the controls did. Red

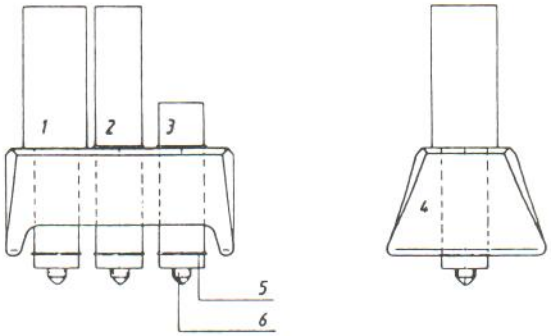

Fig. 1. Dermograph for manual use (schematic drawing). Sledge-shaped device carrying frictionlessly up to 3 pounders of different weight. Upper and lower holding rings prevent the pounders from slipping out the sledgebow. 1, 2, 3 = pounders; 4 = sledge; 5 = lower holding ring; 6 = blunt pencil-shaped end of pounder.

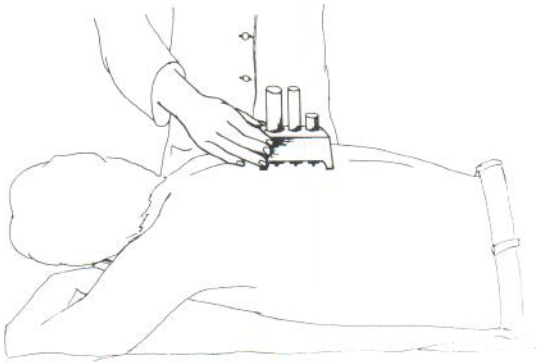

Fig. 2. Performance of dermographometry on the back of a laying subject.

D was observed in 2 patients of group B and in 18 of the 20 control subjects. Dermographic non-reactivity was found in two subjects of each group (group A, B and controls).

Table II shows the mean time values for the beginning and the disappearance of the dermographic reaction for the groups A, B, and the controls.

In comparison with the controls showing red D, the white D in the atopic subjects started later and faded away much earlier.

With increasing weight of the dermographic pounders both the latency time as well as the duration of white D was prolonged in the atopics. The red D in the control group lasted two to three times longer than the white D in the atopics. The white dermographic reaction of the atopics started earlier and lasted longer in lichenified skin than in the less severely affected dry skin. Two atopics in group B with short-lived red D demonstrated a very long latency time (60 or 105 sec, respectively) and a very short duration of D (only 3 min).

Table I. *Colour type of dermographism*

Dermographism[a]	Patients ($n=27$) Group A ($n=15$)	Group B ($n=12$)	Controls ($n=20$)
Pink or red	–	2	18
Unchanged	2	2	2
White	13	8	–

[a] Elicited with 3 different weights. Test area infrascapular, right side. Group A = lichenified skin, Group B = dry skin.

DISCUSSION

In the present study we compared the following items of dermographism (D) in atopic and non-atopic subjects:

1. Colour type of dermographic reactivity using simultaneous application of different dermographic weights. The results was that the colour type remained the same for the different weights simultaneously applied.
2. The comparison of the latency periods for normal and atopic dermographic reactivity demonstrated a remarkable starting delay of white as well as pink D in atopic subjects.
3. The comparison of the duration of dermographic reactivity in non-atopic and atopic subjects

Table II. *Dermographometry*

Onset (s) and Ending (m), mean values

		73 g/mm² O/E (s/m)	112 g/mm² O/E (s/m)	167 g/mm² O/E (s/m)
White	L ($n=13$)	15/15	22/16	38/19
	D ($n=8$)	35/16	50/16	50/19
Red	L ($n=0$)	–	–	–
	D ($n=2$)	60/3	105/3	105/3
Red	C ($n=18$)	6/29	7/47	7/60

L = lichenified skin; D = dry xerotic skin; C = controls; O = onset; E = ending; s = seconds, m = minutes.

showed a remarkable shortening of the dermographic time span in the atopics.

4. There was a positive correlation of latency time and duration of D to the stretching pressure applied in the atopics, but in the non-atopics only the duration of the dermographic reactivity was positively correlated to the strength of the stretching pressure. The latency time was shorter in lichenified skin than in non-lichenified skin of the atopics.
5. If the D was red, there was a longer latency and a much shorter total duration of the dermographic reactivity in the atopic subjects.

The explanation for the "paradoxical" white dermographism in patients with AE are a matter of controversy. Several authors regard the white type as the consequence of a superficial edema over dilated cutaneous vessels (2, 4, 10), whereas others assume an enhanced angiospastic reactivity of the cutaneous vessels (1, 3, 6, 7, 11). The results of current dermographiometric studies on another group of patients with AE are in favour of a moderate vasodilatation, since the infrared radiation emitted from the dermographed lines tends to increase slightly. However, additional microcirculatory measurements, such as cutaneous pO_2 pressure or microflowmetry in the dermographed area are required to clarify the overlapping conditions which are presumably operating in white dermographism.

By use of dermographometry we could demonstrate that the abnormal cutaneous reactivity in atopics tends to diminish parallell with the improvement of the eczematous skin condition. The quantification of D is a simple, reliable, easily repeatable and non-invasive method to study skin conditions in atopics. Moreover, the quantitative measurement of D provides a well reproducible method to examine the cutaneous microcirculatory reactivity in the course of many other inflammatory skin disorders.

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