

Dermographism: Its definition, demonstration, and prevalence

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Dermographism has always been defined in general terms. Quite often it has been difficult, in practice, to determine whether a response to a scratch was abnormal. The authors describe a device which produces a known pressure on the skin and present the results of their experience with this instrument in different groups. Dermographism is then defined in quantitative terms as the occurrence of a wheal of 3 mm. or more in diameter with the use of a force of 400 Gm. or less. With this definition 1.5 per cent of a normal group exhibited dermographism, as compared to 7.4 per cent in patients with chronic urticaria and 2.7 per cent in those with seasonal allergic rhinitis.

Dermographism is defined in the literature as an *abnormal* whealing response of the skin to local trauma. Levine and Winkler¹ observed that in some patients complaining of hives dermographism is actually responsible for their symptoms. Therefore, as part of a long-term study of chronic urticaria,² patients were routinely checked for the presence of dermographism with a fingernail scratch on the arm. It soon became apparent, however, that with this method it was often difficult to decide when a response was abnormal. Thus a set of criteria was necessary to determine when dermographism was present. Since such information could not be found in the literature, this project was initiated in order to define dermographism quantitatively and to determine its prevalence in chronic urticaria.

In 1934, Nekam³ devised an instrument capable of producing a scratch of known force on the skin using weights varying from 100 to 500 Gm. Shpak⁴ de-

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scribed a similar instrument for the study of dermographism. However, neither presented the results of his experience. Lorincz⁵ mentioned the use of a ball-like metal point which could be weighted in order to standardize the mechanical stimulus. He found that a load of 200 Gm. or less produced whealing in patients with symptomatic dermographism but not in normal subjects. Using a force of 1,000 Gm., he observed minimal to mild whealing in 20 per cent of a normal group. Goldblum and Piper⁶ constructed a scratching machine to study mechanical trauma to the skin, but they did not investigate dermographism. Recently, Bettley⁷ used another device to measure the force needed to induce dermographism. His instrument could exert a pressure up to 85 Gm. He, too, presented no data or information regarding his results. In a recent report on the occurrence of dermographism in identical twins, Bart and Ackerman⁸ described the use of their "dermographometer" in 13 patients with dermographism. Whealing occurred in all these patients with 50 Gm. of pressure. In their patients with no dermographism, at least 100 Gm. of pressure was required to induce whealing. They found that 400 Gm. of pressure produced urtication in all young people. Ostrov⁹ has just reviewed the general subject of dermographism.

MATERIALS AND METHODS

A simple instrument was devised which could produce a scratch of known force on the skin (Figs. 1 and 2). The instrument is made of quarter-inch transparent plastic, polymethyl methacrylate (Lucite), and has three parts. The body is a flat bar with a curved tip which comes to a point perpendicular to

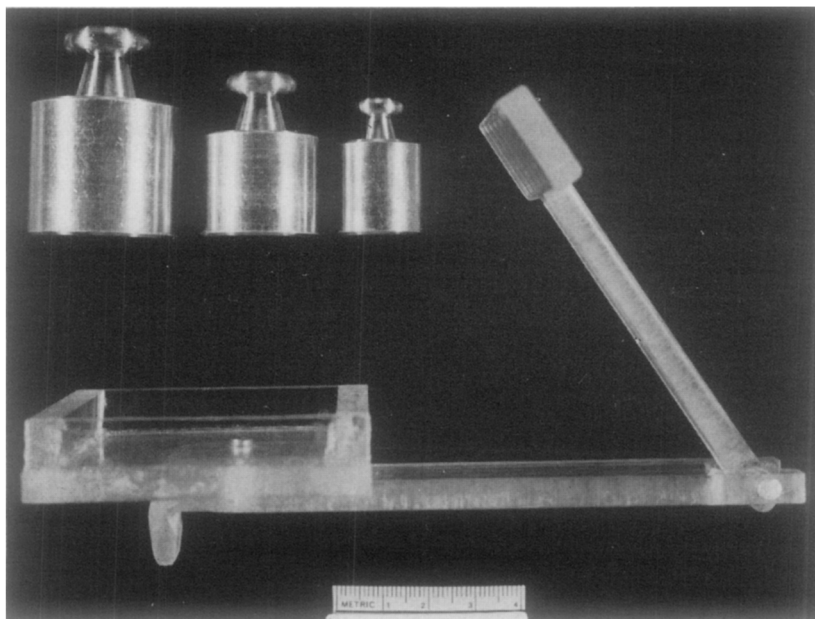


Fig. 1
Instrument for scratching the skin with a known force.

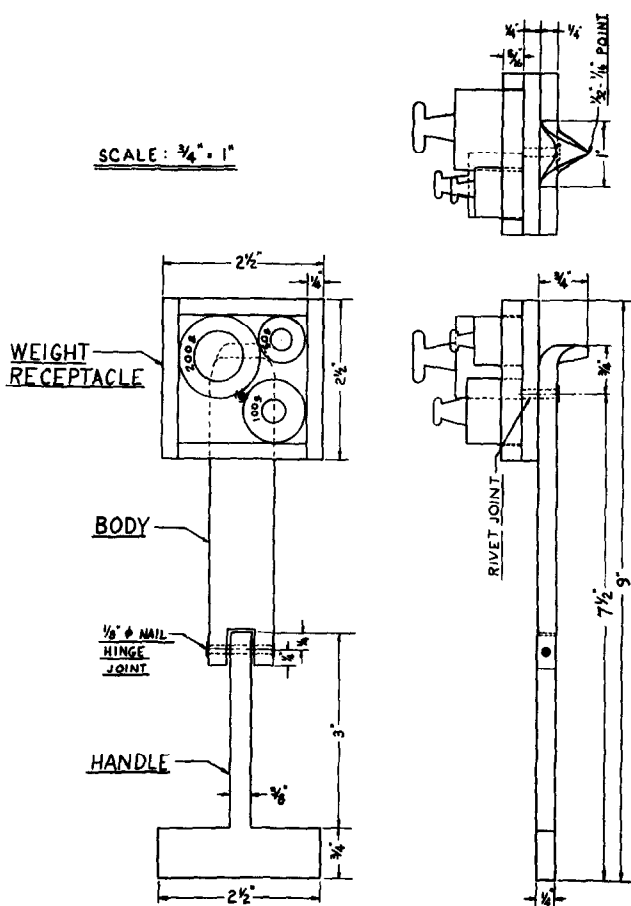


Fig. 2
Scale drawing of instrument for scratching the skin.

the main axis. Above the point is the weight receptacle which is mounted on the bar. The handle is attached to the proximal end of the body by a hinge joint which acts to prevent any significant weight from being added by the examiner. The weight of the instrument itself measured at the scratching point is 50 Gm. The total weight delivered to the scratching point is varied by placing the desired weights in the receptacle. Each subject was scratched by drawing the point of the instrument along the volar surface of the forearm with the use of total weights of 200, 300, and 400 Gm. The reaction was read at 15 minutes and the maximum width of wheal and erythema measured.

RESULTS

The normal response was determined in a control group which consisted of 200 working subjects, 100 men and 100 women, who considered themselves in good health. The whealing responses are shown in Fig. 3. The values for erythema showed no apparent pattern and are not included. The figure indicates

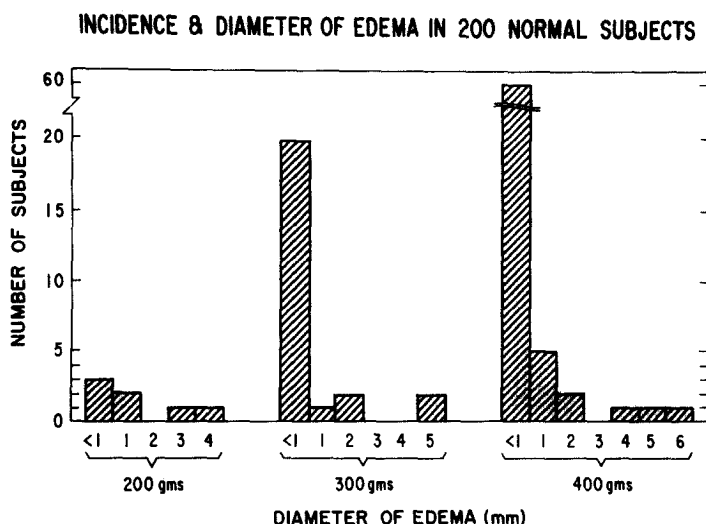


Fig. 3

Incidence and diameter of the wheals resulting from instrument scratches with 200, 300, and 400 Gm. weights in 200 control subjects.

the frequency of specific diameters of whealing response obtained with the respective weights. With 200 Gm., only 7 subjects developed wheals, 3 of less than 1 mm., 2 of 1 mm., and 1 each of 3 and 4 mm. With 300 Gm., 20 showed wheals of less than 1 mm., 1 of 1 mm., 2 of 2 mm., and 2 of 5 mm. With 400 grams, 70 of the 200 subjects showed a whealing response, 60 of less than 1 mm., 5 of 1 mm., 2 of 2 mm., and 1 each of 4, 5, and 6 mm. width. When these data were compared with the results of fingernail scratch tests, it was observed that dermatographism was diagnosed by the fingernail scratch only in those subjects who produced whealing of 3 mm. or more with the instrument. On the other hand, subjects responding to 400 Gm. of force with a wheal measuring 2 mm. or less were considered to have negative or equivocal dermatographic responses when tested with the fingernail scratch. On the basis of this evidence dermatographism was defined as the occurrence of a wheal of 3 mm. or more with a force of 400 Gm. or less.

With this definition, 1.5 per cent of the normal working group exhibited dermatographism. In a group of 68 patients with chronic urticaria, defined as having complained chiefly of hives for one month or more, 7.4 per cent showed dermatographism, a statistically significant difference when compared to the control group with the chi-square procedure for goodness of fit at the 5 per cent level of significance. It should be pointed out that these groups are not matched in any manner and that the control group may not be a random sample of the general population.

In order to have an allergic population for comparison, a series of patients was selected who had seasonal allergic rhinitis due to ragweed or grass pollen sensitivity but did not have significant perennial nasal symptoms or a history of hives. In 146 patients in this category dermatographism was noted in 2.7 per

cent, which was not a statistically significant difference compared to the control group with the chi-square procedure for goodness of fit.

DISCUSSION

Our knowledge of the mechanism and significance of dermatographism is very limited. Actually, there has been little interest or investigation into this subject since the original work of Sir Thomas Lewis. Lewis¹⁰ believed that dermatographism represented "an exaggerated susceptibility of the skin to certain forms of stimulation." Although he found that 5 per cent of young men developed a full wheal with a single firm stroke, he stated that a more severe injury would raise a wheal in the majority of, if not all, young subjects. He felt that the difference was one of degree and that wheals resulted from purely physiological reactions. Although the forces used in our experiments were probably less than those used by Lewis, the results support his thesis that the difference in response is one of degree and is related to the force of the stroke. The site of the scratch may be an additional factor, but this has not been investigated.

Using the criteria established in this study, we have found dermatographism in 1.5 per cent of a control population and 7.4 per cent of patients with chronic urticaria. These data may be compared with those reported in the original work of Cotton, Slade, and Lewis,¹¹ who studied the response of the skin to a single firm stroke in soldiers with an "irritable heart." They reported that "in 25 per cent a visible urticaria develops; and in 5 per cent a fully developed wheal is seen." In further experience, Sir Thomas Lewis¹⁰ observed that "the above figures may be treated as approximately true for young and normal subjects generally." Lorincz⁵ observed minimal to mild whealing in 20 per cent of a normal population using 1,000 Gm. of force. Walzer¹² stroked the skin of 13 patients with urticaria, papular urticaria, or pruritus and produced whealing in 11, including all 5 who had urticaria. Graham and Wolf¹³ studied 30 patients with repeated attacks of urticaria and commented that every patient demonstrated dermatographism from moderately strong stroking of the skin. Fisher and Schwartz¹⁴ tested 100 patients with subacute or chronic urticaria by stroking the skin with a tongue depressor and noted dermatographism in 6 per cent. Thus an incidence of dermatographism of 5 to 20 per cent has been reported in normal subjects, and one of 6 to 100 per cent in patients with urticaria.

The possible significance of the increased prevalence of dermatographism in chronic urticaria is worthy of some speculation. This finding may indicate the presence of an increased dermal vascular reactivity following physical stimulation in these patients. This in turn may predispose the patient to the occurrence of hives under appropriate circumstances. The increased vascular reactivity could be a result of urticarial reactions, rather than a forerunner. That immunologic reactions per se are not responsible for this increased prevalence of dermatographism in chronic urticaria is suggested by the absence of an increased prevalence in allergic rhinitis. Possibly increased vascular reactivity is a local phenomenon in the organ expressing the allergic reaction and therefore would be absent in the skin of patients with allergic rhinitis.

It would be pertinent to know the incidence of dermatographism in acute

urticaria and its relationship to the duration of the symptoms. Unfortunately, we have not enough data in this type of urticaria to suggest an answer.

In view of the finding of Landerman¹⁵ that dermographism was present in a patient with hereditary angioneurotic edema during an attack of that disease, the possibility is suggested that dermographism results from a local deficiency of an enzyme or enzyme inhibitor involved in vascular permeability systems, possibly involving kinins, which are activated by local trauma or scratching. Winkelmann, Wilhelmj, and Horner¹⁶ demonstrated kinin activity in dermal perfusates in patients with clinical dermographism and in experimentally induced dermographism, lending additional support to the role of a kinin mechanism in dermographism.

The establishment of specific criteria for the diagnosis of dermographism, as defined in this study, provides an objective basis for comparison of data obtained by different investigators. In addition, the use of a quantitative scratching technique may be of value in the study of other cutaneous disorders.

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