

The Allergy Pricker

Qualitative Aspects of Skin Prick Testing Using a Precision Needle

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Skin prick test has advantages over other diagnostic tests in allergy, and attempts to increase the reproducibility are warranted. A standardised disposable precision needle with a needle point of 1.0 mm has recently become available. Based on 960 tests with histamine and grass pollen (*Phleum pratense*) the reproducibility of the skin prick weal area was calculated. Using histamine 10 mg/ml and grass pollen (1000 and 5000 PNU) a significantly lower coefficient of variation was found compared with a standard blood lancet with a point of 4 mm. The mean weal reaction is reduced to about 80 % of the size obtained with the blood lancet. Testing with the precision needle resulted in a significantly reduced incidence of bleedings. The precision needle simplifies the skin test and does not require as much skill as other needles, and is recommended for both routine tests and the biological standardization of allergen extracts.

Key words: grass pollen extract; histamine; precision needle; reproducibility; skin prick test.

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The immediate skin test reaction due to the interaction between antigen and mast cell-bound IgE is one of the corner stones in clinical diagnostic work. The sensitivity as well as the variability, especially of the histamine reactions, are crucial in the evaluation of the results.

Skin testing involves one of the following techniques: intracutaneous, scratch or prick test. The latter is preferred by many allergologists due to the fact that it is an inexpensive, easy, and rapidly performed test. In an attempt to reduce the variability of the prick test Morrow Brown (5) and Østerballe (6) recommended a lancet with a point length of 1.0 mm. Dome/Hollister-Stier has introduced a disposable needle especially designed for prick test and the results of testing with histamine and grass pollen extract are compared to the normally used standard blood lancet (Sydeco®).

MATERIAL AND METHODS

Lancets

The "Allergy-pricker" (D/H-S) (Dome/Hollister-Stier®) is a disposable lancet with a point length of 1.0 mm and an inclusive angle of 25° as proposed by Morrow Brown (5). The standard blood lancet (Syd) (Sydeco) has a point length of 4.0 mm and a base width of 1.8 mm (Fig. 1).

Patients

Tests with histamine were performed on 10 adult patients (five allergics defined as persons with a history of atopic disease and positive skin test to several allergens and five normal persons without allergic symptoms, and a negative prick test to a standard panel of allergens).

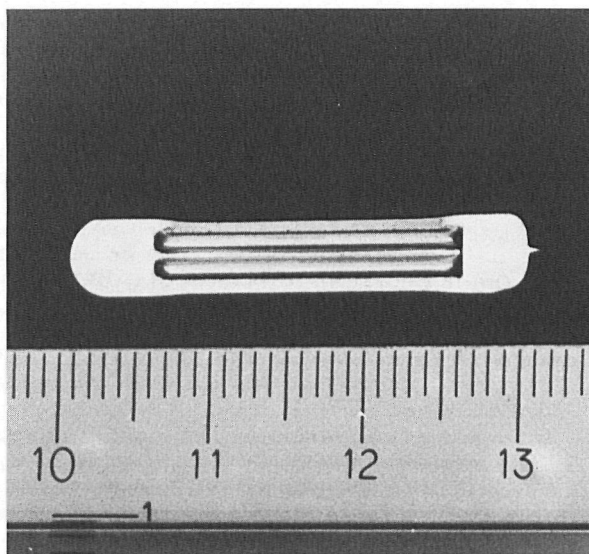


Fig. 1. The "Allergy Pricker" (Dome/Hollister-Stier) is a disposable lancet with a length of 3 cm and a width of 5 mm. The point length is 1.0 mm with an inclusive angle of 25°.

Prick tests with grass pollen were carried out on 10 grass pollen allergics with clinical symptoms in the grass pollen season and a well-known positive skin reaction to grass pollen, and positive RAST. Prick test was not performed on patients with eczema in the test area, nor on patients receiving antihistaminica and topical or systemical steroids.

Experimental design

Prick test was performed on the volar side of both forearms, in two straight rows from approximately 5 cm below the elbow flexure to 5 cm above the wrist at intervals of 1.5 cm. Six tests with two concentrations of either histamine or grass pollen were performed with the two examined lancets on corresponding anatomical localization. Two nurses, well-trained in the use of the standard lancet (Syd), tested on the same arm throughout the study. Nine hundred and sixty pricks were distributed equally between the two lancets and the two histamine concentrations respectively, amounting to 240 pricks for each.

Extracts

Histamine chloride 1 mg/ml (5.43 mmol/l) (Allergologisk Laboratorium A/S, Copenhagen) and histamine phosphate 10 mg/ml (30.75 mmol/l) (Dome/Hollister-Stier) were chosen for histamine tests. Commercially obtained grass pollen extract (*Phleum pratense*) in a concentration of 1000 and 5000 PNU (protein nitrogen units) was supplied by Dome/Hollister-Stier. Preliminary comparative testing with an HEP-standardized (3) timothy extract has shown this to be approximately 1 and 5 HEP respectively. Both histamine and allergen extract were dispensed in 50% glycerol.

Skin prick test

Prick test with Syd was performed by directing the lancet through the drop at an angle of 60–70° to the skin, the lancet point only "catching" the skin and lifting it, thus making a minute canal through which the extract penetrated intracutaneously. The lancet was pulled

Table 1

Reproducibility and level of significance for skin prick test with histamine and grass pollen (*Phleum pratense*) using the precision needle (Dome/Hollister-Stier) and a standard blood lancet (Sydeco)

Phase	Concentration	Lancet	Mean coefficient of variation	SD	Significance
Histamine	1 mg/ml	D/H-S	20.9	10.0	N.S.
		Syd	23.0	11.9	
	10 mg/ml	D/H-S	16.4	5.9	$P < 0.03$
		Syd	20.5	6.5	
	1000 PNU	D/H-S	14.2	6.7	$P < 0.001$
		Syd	33.9	14.8	
<i>Phleum pratense</i>	5000 PNU	D/H-S	18.4	7.3	$P < 0.001$
		Syd	31.2	7.8	

N.S. = not significant.

out in an inversely directed movement and the drop was wiped off.

The "Allergy-pricker" (D/H-S) was jabbed through the drops at an angle of 90° to the skin and lifted, and the drops wiped off. In preliminary experiments it was found that the force used in order to penetrate the skin was crucial. Gently pricking with the lancet point resulted in very small reactions and violent jabbing in splash of extract and a high frequency of bleeding.

Consequently, a moderate jab was used throughout the study.

The weal reactions were recorded at maximal size i.e., for histamine after approximately 10 min and for grass pollen about 15 min after the prick. The contours of the weal were outlined with a fine fibre-tip pen and transferred to paper by means of tape. The weal area was calculated by multiplying the greatest diameter with the diameter at right angles to its mid-point. Patients with weal diameters of less than 2 mm or with large weal reactions, including pseudopodia, were excluded from the study.

Statistics

Difference in reproducibility between the two lancets examined was tested with a two-tailed paired t test. A chi-square test was applied to the frequency of bleeding.

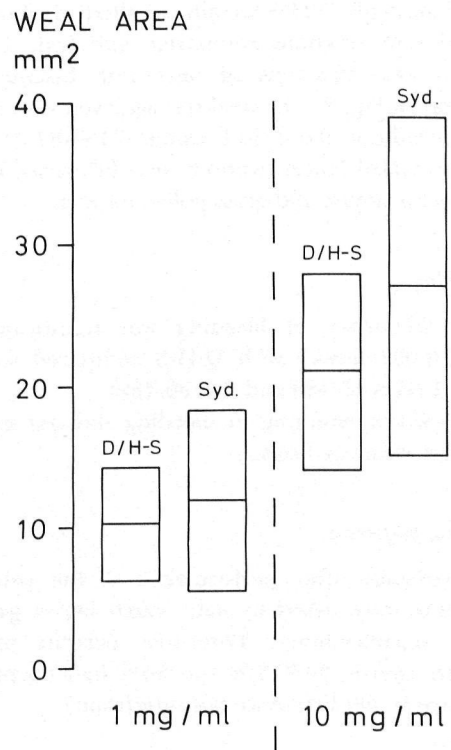


Fig. 2. Mean wheal area and standard deviations of prick tests with histamine 1 mg/ml and 10 mg/ml with the Dome/Hollister-Stier (D/H-S) and the Sydeco (Syd.) lancets. (480 pricks distributed on 10 patients).

RESULTS

Reproducibility

The reproducibility of the two examined lancets was stated as coefficients of variation ($SD\% = SD/\text{mean weal} \times 100$). No significant difference was found between the two investigators, right or left arm, or the location in the test area, consequently all results are indicated in one.

In relation to histamine as well as grass pollen the "Allergy-pricker" (D/H-S) resulted in more reproducible prick reactions compared with a lancet with a longer point. As is evident from Table 1 the D/H-S lancet has a highly significantly (except histamine 1 mg/ml) superior reproducibility.

Prick test weal size

Pricking with D/H-S usually resulted in diminished skin reactions compared with Syd. The mean weal reactions of tests with histamine appear in Fig. 2. The weal size achieved with a 1 mm needle is about 80% (range 74%–87%) of the standard lancet, without any difference between histamine and grass pollen extract.

Bleeding

The frequency of bleeding was significantly ($P < 0.002$) lower with D/H-S compared with Syd (D/H-S 46/480 and Syd 80/480).

Prick test resulting in bleeding did not give greater weal reactions.

Patient preference

Immediately after performance of the prick, patients were asked to state which lancet gave least inconvenience. Forty-five percent preferred D/H-S, 30% Syd and 25% had no preference at all (difference not significant).

DISCUSSION

Standardization of test procedures in allergology is extremely crucial. Without doubt the

prick test is the screening test to be preferred, and consequently, attempts to increase the validity of the results are important. Furthermore, in connection with the biological standardization of allergen extracts a highly reproducible skin test is needed (2,3). The requirements of the Scandinavian Society of Allergology (1) for a standard deviation of less than 20% is indeed difficult to obtain without very accurate methods which eliminate differences in skin injury and operator skill. Several publications refer to this problem (4, 6).

Morrow-Brown (5) has shown that a precision needle is superior in reproducibility to both hypodermic needles and blood lancets, and the present data confirm his findings. Compared with the conventional prick test method we found significantly lower variation in the weal reaction using histamine 10 mg/ml and grass pollen extract with the "Allergy-pricker". The reproducibility of test with allergen extracts is 2–3 times better than that described by Østerballe (6), who also used a needle with a 1 mm point.

To a high degree, using the Dome/Hollister-Stier skin prick lancet will make the result of the prick test less dependent on the experience of the investigator and increase its accuracy. A problem with the D/H-S lancet is the diminished weal area compared with the standard lancet (80%) but even with the latter it is difficult to obtain a mean weal diameter > 4 mm with the recommended histamine concentration of 1 mg/ml (3).

The variability in the histamine and allergen reactions in the same individual indicates that at least duplicate tests should be performed when histamine reaction is used to grade the skin reaction of allergen extracts (3).

The Dome/Hollister-Stier precision needle does not require the same high degree of technical skill as other skin prick devices, and has a better reproducibility. The "Allergy-pricker" will simplify the prick test and is recommended for both routine test and for titration in the standardization of allergen extracts.

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