

A New Lancet for Skin Prick Testing

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A new lancet with a point length of 1.0 mm suitable for skin prick testing is described. The weal reactions appearing after the use of histamine chloride 1 mg/ml and an extract of *Phleum pratense* in a 1 HEP concentration (1 histamine equivalent prick) prove suitable as regards size and reproducibility compared with the reactions produced by a more conventional prick test method. The new lancet simplifies the prick test procedure and does not require as much experience as do needles and longer lancets.

Key words: allergen-standardization; skin prick test; reproducibility

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The prick test is now the skin test method most often applied to demonstrate immediate sensitivity of the skin and also to evaluate the biological activity of the allergen extracts (1). To achieve reproducible results with the prick test a certain amount of experience with the method is necessary because, among other things, the size of the weal reaction depends very much on the prick depth.

Some years ago Morrow Brown presented a standardized needle for prick testing and recommended a 1.25 mm needle point (2). Unfortunately, the needle was not disposable but had to be "cleaned" between the different prick tests.

Nowadays, it is up to the individual investigator to select a suitable needle or lancet and learn a reproducible technique where the prick depth is of importance.

For several years we have been using a disposable blood lancet (Sjucor®), normally used for puncturing the ear lobe to obtain capillary blood for laboratory analyses. The lancet point being 4.0 mm makes it necessary to prick the skin from the side with the very point in order to avoid too deep a prick with consequent bleeding.

The aim of this work is to demonstrate that by slightly altering the old type of lancet we can produce a disposable lancet which makes it much easier to carry out the prick test with a suitable reproducibility.

MATERIAL AND METHODS

The old lancet (OL) has a point length of 4.0 mm and a base width of 1.8 mm as shown in Fig. 1. Based on this lancet a series of new lancets (NL) have been produced, all with different point lengths: 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3 mm, and base widths of 0.6 to 0.8 mm. All NL were labelled with a code number, instead of the mm length, in order to blind the investigation.

Skin prick test

The prick test was performed on the volar side of the forearms, in two straight rows from approximately three fingers' breadth under the elbow flexure to a hand's breadth above the wrist. The pricks were placed at intervals of 2 cm. A numbered strip of tape was stuck on the skin and the extracts were placed beside the respective numbers. The



Fig. 1. Three of the new lancets (NL) with point lengths 0.6, 1.0, 1.3 mm and, on the right, the old lancet (OL).

prick in the skin was made with the OL and NL through the drop in the following ways:

The OL was directed 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 canal through which the extract could penetrate intracutaneously. The OL was then pulled out carefully, and after 30 to 60 sec the drop was wiped off.

The NL was held at an angle of 90° to the skin, going directly through the drop. Owing to the special shape of the lancet the prick depth will only depend on the lancet point. The weal reactions were read when maximal. For histamine this took between 9 and 12 min and for grass pollen extract between 13 and 16 min. The contours of the weal were marked with a soft ballpoint pen and by means of tape were transferred to square millimeter paper. The results were stated as the weal diameter $\times$ the perpendicular diameter in mm². Double controls were made on one arm as well as on both arms.

Allergen extracts

Histamine chloride in 50% glycerol at a concentration of 1 mg/ml was used in the test. This particular histamine concentration is often recommended for HEP (histamine equivalent prick) standardization of allergen extracts. Furthermore, an extract of *Phleum pratense* (PP) in 50% glycerol was used in a 1 HEP concentration (using PP-extract of this

concentration the weal reaction was as large as histamine reference 1 mg/ml in at least 10 patients with moderate PP-allergy (1)). The extract was supplied by Allergologisk Laboratorium A/S, Copenhagen.

Statistics

Based on double controls the estimation of the standard deviation (s.d.) was carried out with the formula:

$$\text{s.d.} = \sqrt{\frac{\sum d^2}{2n-1}}$$

with d = differences between double controls and n = number of double controls. Furthermore, the results of each NL were classified and medians together with 10% and 90% percentiles were calculated.

Patients

Thirty-four adult patients admitted to allergological examinations at Rigshospitalet, Copenhagen, participated in the test. Among these were 12 patients with typical grass pollen allergy, as demonstrated with positive skin prick test, RAST, and nasal provocation with PP. None of the patients received any medication affecting the skin, including local- and systemic steroids for at least 48 h prior to the test.

Experimental design

The test was performed in two phases, A and B. Phase A was carried out with NL-0.6 to 1.3 mm. Then NL-1.0 mm was selected and used for phase B. In phase B 12 patients allergic to grass pollen were examined for PP-extract, using both the old and new methods. In phase A the new lancets were coded and used in randomized order. The weals being read, the code for the individual lancets was broken and the weal size was set in relation to the NL point length. In phase A one well-trained person made all the tests, whereas in phase B the 12 grass pollen allergies were tested parallelly by two investigators with different degrees of ex-

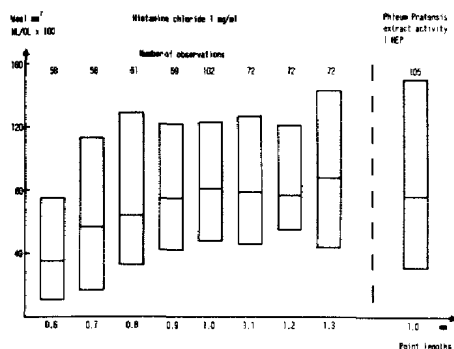


Fig. 2. The weal reactions of 564 pricks with histamine chloride 1 mg/ml on 22 patients and 105 pricks with *Phleum pratense* extract 1 HEP (see text) on 12 patients allergic to *Phleum pratense* with the new lancets (NL) in relation to the weals of the old lancet (OL) as the ordinate and NL point lengths as the abscissa. The median values and the 10% and 90% percentiles are graphed.

perience, together with the well-trained investigator from phase A.

RESULTS

Suitable prick depth

In phase A 22 patients were tested with 564 NL-pricks and 194 OL-pricks. The median value together with the 10% and 90% percentiles for the NL lancet type were

Table 1

Frequency of the bleeding side effect with the new (NL) and old (OL) lancets

Lancet point in mm	Bleeding frequency in %
NL 0.6	0
NL 0.7	0
NL 0.8	3
NL 0.9	3
NL 1.0	14
NL 1.1	24
NL 1.2	21
NL 1.3	18
OL 4.0	25

graphed in Fig. 2 with the NL-results of the weal in relation to the OL-results with the formula: $\text{NL mm}^2 / \text{OL mm}^2 \times 100$.

As illustrated in Fig. 2 the weal increases until prick depth 1 mm and goes no further. The weals with NL-1.0 mm correspond to approximately 80% of the weals with the ordinary method.

As illustrated in Table 1, which states the bleeding frequency for the different lancets, we see an increasing risk for bleeding with point lengths of more than 1.0 mm.

Test with lancet point of 1.0 mm

In phase B the lancet with a point of length 1.0 mm was used for pricks with PP-extract on 12 patients with grass pollen allergy and positive skin reaction. Altogether 105 NL-pricks and 72 OL-pricks were performed. The median values together with the 10% and 90% percentiles are shown in Fig. 2 on the right. As seen in the Figure the reaction of 1 HEP in the allergic patients corresponds to the reaction to histamine tested in all patients with a prick depth of 1.0 mm.

Reproducibility

Based on double control by performing the test on one arm and both arms, the reproducibility of the prick test with histamine chloride and PP-extract, respectively, was tested by three different investigators. There was no difference in the reproducibility on one arm and both arms, and no difference in the weals when the test was performed proximally and distally in the test area on one arm. Furthermore, as no difference was found in reproducibility between the three investigators, all the results are indicated in one. The thickness of the skin does not influence the results.

As shown in Table 2 the weal reaction for lancets with a prick length of 1.0 mm has a diameter of more than 3.0 mm. This is essential for obtaining an approximate degree of certainty when assessing the reaction. The s.d. for NL-1.0 mm and for the

Table 2

Weal reactions and reproducibility for the new lancet NL-1.0 mm and the old lancet (OL) with histamine and pollen (*Phleum pratense*) test

Phase	Lancet	n	$\bar{x}$ mm ²	s.d. mm ²	s.d.%
A: Histamine test	NL-1.0 mm	80	15.2	4.0	26
	OL	43	18.8	3.7	20
B: Pollen test	NL-1.0 mm	103	23.9	10.8	45
	OL	36	30.5	10.6	35

n = number of double controls.

$\bar{x}$ = mean of weal areas.

s.d. = standard deviation.

old method was the same. As expected, the s.d. in phase B with PP-extract was greater than the s.d. for the histamine reference.

DISCUSSION

The new method with NL-1.0 mm has given weal reactions comparable to the OL-method where the prick depth depends on the experience of the investigator. Because of its special construction and standardized point length the NL is easy to handle. The weal reactions with the NL-method are approximately 80% of the size of the reactions with the OL-method and have the same reproducibility. The weal reaction

diameter with a positive histamine reference 1 mg/ml is more than the 3.0 mm which are required to obtain an approximate degree of certainty when reading the reactions.

We therefore recommend the mass production of the disposable new lancet described here. This will simplify the prick test and reduce the uncertainty involved with variable experience.

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