

Comparison of a New Lancet and a Hypodermic Needle for Skin Prick Testing

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Skin prick tests with a standard allergen panel were carried out in duplicate (one on each arm) on all patients referred to an allergy out-patient clinic. A new lancet with 1-mm point length and a disposable hypodermic needle were used. Patients were randomized to lancet-needle, lancet-lancet, or needle-needle, and the skin prick tests were done by experienced or inexperienced nurses. The mean of the biggest and smallest diameters was used as a measure of the size of the wheal. Skin reactions from a total of 142 patients were included. For both lancet and needle a significant difference was noted when comparing experienced versus inexperienced investigators' reproducibility expressed as coefficient of variation. There was no significant difference in reproducibility when comparing lancet and needle results, and no significant difference in wheal size when comparing with histamine references. Surprisingly, the reactions on left arms were generally larger than those on right arms.

Key words: reproducibility; skin prick test; standard needle.

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Skin prick testing (SPT) is still considered the first test to perform in the diagnosis of immediate type allergy, and provided a good correlation can be found between clinical history and cutaneous reactions, further testing will seldom be needed. Furthermore, in the Nordic countries SPT is recommended for evaluation of the biologic activity of allergen extracts (1).

The main problem of skin prick testing is the relatively poor reproducibility of the method. The results depend partly on the quality of the allergens, partly on the person who performs the testing (training and accuracy) – and in this connection also the technical accessories used are of great importance.

During recent years various standard lancets have been introduced, which are supposed to simplify the technical performance of SPT (2, 3, 6).

At our clinic SPT is carried out partly by nurses from other departments, who are in

turn "lent" to the Allergy Clinic. In order to increase the reproducibility of their SPT, we were interested in a simplified technique.

MATERIAL AND METHOD

Patients

All patients referred to the allergy outpatient clinic at the county hospital in Hillerød during the first 6 months of 1982 participated in the study. For statistical analysis data were included only from patients with a recognizable skin reaction (i.e. urticarial wheal diameter ≥ 2 mm) to at least one allergen.

Nurses

SPT was performed either by the nurse on the permanent staff at the Allergy Clinic who has performed SPT daily for several years, or

Table 1

Coefficients of variation (CV) and number of degrees of freedom (DF) for prick testing with histamine and standard allergens calculated separately for experienced and inexperienced nurses and for testings performed with lancet or needle. Degrees of freedom are equivalent to number of comparisons

Nurses Technique Statistics	Experienced				Inexperienced			
	Lancet		Needle		Lancet		Needle	
	CV	DF	CV	DF	CV	DF	CV	DF
Histamine	9%	25	11%	23	22%	15	12%	6
Allergen	53%	129	46%	120	75%	62	66%	16

by nurses from other departments. The latter group performed SPT only occasionally, at months' intervals.

Equipment

The standard allergen panel included the following allergens: birch (*Betula pubescens*), timothy (*Phleum pratense*), mugwort (*Artemis vulgaris*), cat, dog, horse hair and dander, house dust allergen, two types of house dust mites (*Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*), and three moulds (*Alternaria iridis*, *Cladosporium herbarum*, and *Mucor racemosus*). All extracts were from Allergologisk Laboratorium, Copenhagen, and standardized to a concentration of 5 HEP (histamine equivalent prick) in 50% glycerol. Histamine dihydrochloride 1 mg/ml was used as reference, and isotonic saline in 50% glycerol was used as control.

The new lancet had a 1 mm point length ("Allergy pricker", Dome/Hollister-Stier®). The needle was a sterile disposable hypodermic needle 40 mm long and 0.8 mm in diameter (Yale Luer Lok® No. 14).

Technique

The skin prick test was performed on the volar side of the forearms in a straight row from approximately three fingers' breadth below the elbow flexure to a hand's breadth above the wrist. The pricks were placed at intervals of 15 mm. A numbered strip of tape was stuck on the skin, and the extracts were placed beside the respective numbers. The prick in the skin was

made with the new lancet and the needle through the drop in the following ways:

The lancet was held perpendicular to the skin, going through the drop with a moderate jab (3, 6).

The needle was directed through the drop at an angle of 60–70° to the skin, the needle point only "catching" the skin and lifting it, thus making a canal through which the extract could penetrate intracutaneously. The needle was then pulled out carefully in an inversely directed movement, and the drop wiped off (4, 5).

The skin reactions were recorded in mm as the mean of the biggest and smallest diameters of the urticarial wheal.

Design

On each patient the skin prick test was performed in duplicate using the standard allergen panel. Patients were randomized for the testings by

- a) lancet on both arms
- b) needle on both arms
- c) lancet on right arm and needle on left arm
- d) needle on right arm and lancet on left arm

Statistics

Skin reactions were only included for the statistical analysis provided at least one arm had a recognizable reaction to antigen, i.e. urticarial wheal having a diameter of 2 mm or more. Skin reactions, which on both arms were 10 mm or more, were excluded. Negligible reac-

tions and extensive reactions were thus considered irrelevant as there would be no doubt about whether the skin reactions were positive or negative.

For patients who had prick testing performed with the same technique on both arms, the coefficients of variation for the lancet and needle were calculated separately for experienced and inexperienced nurses, and the F-test was used for comparison. The difference between right and left arm reactions was evaluated by means of paired rank sum test.

For patients who had prick tests performed with different techniques, the wheal sizes were divided by the size of the histamine reference and compared by means of paired ranks sum test.

RESULTS

The investigation comprised 142 patients who had a recognizable reaction against at least one allergen. The reproducibility for lancet versus needle and for experienced versus inexperienced nurses was expressed as coefficient of variation between right and left arm and calculated separately for prick testing with histamine and allergens. The results are shown in Table 1.

Regarding SPT with histamine no significant differences were found in coefficients of variation between lancet and needle for experienced ($P > 0.05$) and inexperienced nurses ($P > 0.05$). Prick testing with allergens showed much larger coefficients of variation but also here there were no significant differences regarding reproducibility for experienced ($P > 0.05$) or inexperienced nurses ($P > 0.05$).

However, it was shown that the experienced nurse, disregarding technique and test extract, obtained a better reproducibility than the inexperienced. The differences were significant for prick testing with lancet using both histamine ($P < 0.01$) and allergens ($P < 0.01$), and also using the needle technique with allergens ($P < 0.05$). The difference in reproducibility was not significant ($P > 0.05$) comparing SPT

with needle and histamine, here the numbers were small.

A secondary finding by means of paired ranks sum test showed that the reactions of left arms were generally bigger than those on right arms ($0.01 < P < 0.05$). When the allergen reactions were compared with those obtained from the histamine references, the size of the skin reaction was the same for lancet as for needle.

DISCUSSION

The results show that skin prick testing with histamine and standard allergens, with either a standard lancet or the traditional needle, gave comparable reproducibility, regardless of the relative experience of the administering nurse. However, the skilled nurse obtained a significantly better reproducibility both with lancet and needle.

As reported by others (2, 3, 6) we have found a much greater coefficient of variation in prick testing with allergens compared with prick testing with histamine. However, there have been no earlier reports regarding differences between wheal size on right and left arms.

Others have been able to demonstrate a better reproducibility with standard lancets. This might be due to more artificial testing conditions, i.e. with histamine and one allergen only and in a selected population (2, 3, 6). Our results emphasize training and accuracy in skin prick testing. The new lancets apparently do not solve this problem, and skin prick testing will still have to be performed by skilled and trained personnel.

REFERENCES

1. Aas, K., Backman, A., Belin, L. & Weeke, B.: Standardization of allergen extracts with appropriate methods. *Allergy* 33, 130-137, 1978.
2. Brown, H. M., Su, S. & Thantrey, N.: Prick testing for allergens standardized by using a precision needle. *Clin. Allergy* 11, 95-98, 1981.
3. Malling, H.-J., Andersen, C. E., Boas, M., Holgersen, F., Munch, E. P. & Weeke, B.: The allergy prickler. *Allergy* 37, 563-567, 1982.

4. Pepys, J.: Skin tests in diagnosis. In Gell, P. G. H. & Coombs, R. R. A. (eds.): Clinical aspects of immunology, 2nd ed., p. 192. Blackwell Scientific Publications, Oxford, 1968.
5. Pepys, J.: Skin testing. Br. J. Hosp. Med. 14, 412, 1975.
6. Østerballe, O. & Weeke, B.: A new lancet for skin prick testing. Allergy 34, 209-212, 1979.

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