

A comparison of the multi-test with the prick test and multi-test 2

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Summary

Allergy skin testing of infants and small children continues to be time-consuming and nerve-wracking. We hoped to have found the solution to these problems by using the multi-test (MT). The latter consists of an applicator with 8 heads, each head consisting of nine plastic needles on which the allergen solution rests. Thus eight allergens can be tested simultaneously. During routine control skin testing we compared MT with our usual method, the prick test (PT), amongst twenty patients. Twenty-seven per cent of the skin reactions differed by more than 1+. When we compared PT results with the previous PT, the correlation of 16% was better despite several years interval between tests, different persons carrying out the tests, and hyposensitization of patients. We adapted the MT system and produced a model, multi-test 2 (MT-2), which consists of eight sterile disposable needles on a stainless steel base. When we compared the MT-2 with PT, only 6% differed by more than 1+. Thus the MT-2 proves to be a useful alternative to the PT for those children, in whom the PT is too difficult to carry out.

Introduction

Multi-test

The multi-test (MT) is a sterile plastic stamp with eight heads, set 2 cm apart, each head containing nine points (Fig. 1). When loaded with an allergen, these needles should perforate the upper layers of the skin, similar to the tuberculin tine test. Because eight separate allergens can be tested at the same time, the patient's time required for testing is reduced. In addition the method is practically painless.

Murphree and Kniker (1979) first described the multi-test method of skin testing. Their results, when compared with the intracutaneous test method, were so good, that the MT appeared to be a valid alternative. On the other hand, Pugley's (1979) results were less satisfactory when he compared the MT with the prick test (Pepys, 1975). In neither paper did the authors compare weal and erythema sizes directly, preferring to

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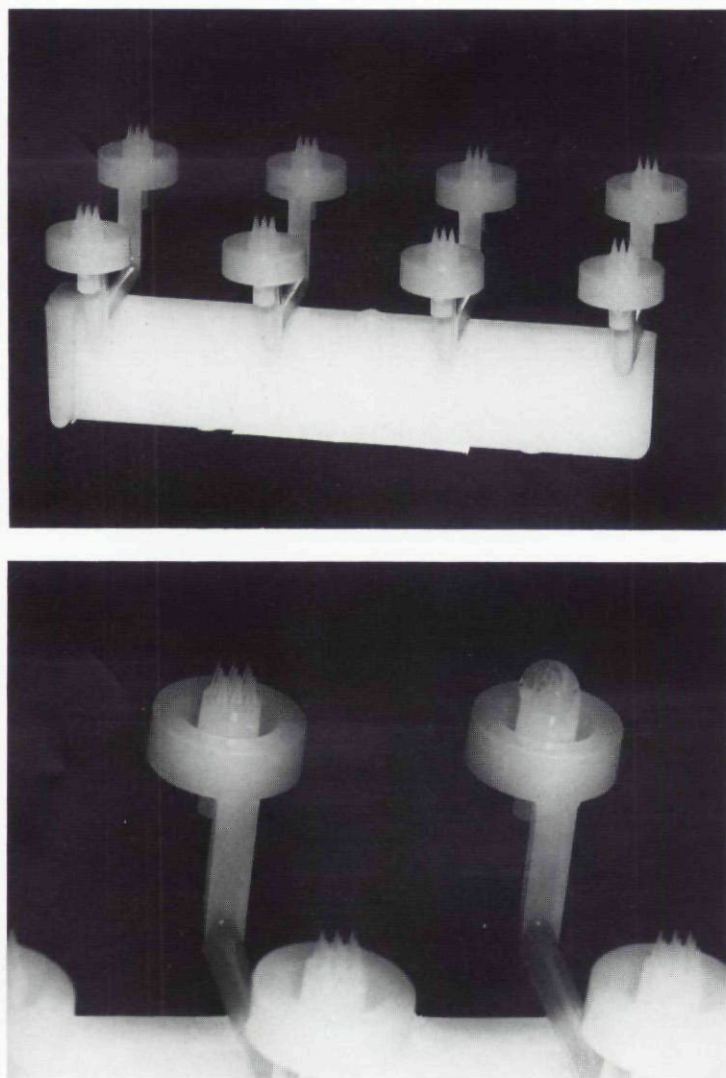


Fig. 1. The multi-test applicator with eight heads, each head containing nine plastic points.

use quantification by groups. Murphree and Kniker (1979) divided the four skin reactions into two groups: clinically relevant (3+ and 4+ skin tests) and clinically irrelevant (negative, 1+ and 2+ reactions). Pugley evaluated the difference between the two skin tests used, and presented groups with good, questionable, and poor comparisons.

We were interested in testing the differing results of the above authors by comparing the modified prick test (PT) (Ruppert, 1979) with the MT, with the hopes of achieving a good correlation in order that we could use the MT for testing infants and young children.

Multi-test 2

As a result of our MT observations, the new model had to fulfil two requirements:

perforation of the skin must be guaranteed *and* perforation must occur at only one site per allergen.

Patients and methods

Multi-test

Multi-test and PT were compared in twenty allergic patients aged 5 to 31 years (average age 14.6 years) during a routine repeat allergy test. Fourteen patients had undergone hyposensitization since the previous allergy test. The MT was loaded with saline and histamine controls as well as six inhalant allergens (Bencard, Tropon). With reference to the previous allergy tests, two or three of the allergens chosen were to result in a positive reaction. After cleaning the forearm with ether, the MT was firmly placed on the volar side of the arm. The same allergens were tested on the other arm using the modified prick test. After 20 min the size of weal and erythema were noted; histamine was noted at 10 min. Only the weal size was used for the evaluation of our results: 1+, 1–3 mm; 2+, 4–7 mm; 3+, 8–11 mm; 4+, ≥ 12 mm.

Multi-test 2

The multi-test 2 (MT-2) consists of a stainless steel base upon which eight sterile disposable needles can be placed. The plastic protection sleeve of the needle was shortened to allow only the facet of the needle to be visible. In addition, the sleeve held the drop of allergen (Fig. 2). The MT-2 was compared with the PT in 20 patients. Testing proceeded in similar fashion to that described above.

Results

Multi-test

Of the 160 skin reactions for each method, forty-three (27%) differed by more than 1+ and nineteen (12%) by more than 2+ (Fig. 3a). Relative to the prick test, there were both false positive and false negative skin test reactions using the MT. The histamine reactions showed a good correlation: fifteen of twenty skin tests resulted in a 4+ or 3+ reaction with both methods. Those skin reactions which were stronger in the MT than the PT usually arose from the confluence of several separate reactions, due to the skin perforation by several of the nine MT needles.

When we compared the two prick tests (previous PT and present control PT) only twenty-five (16%) differed by more than 1+ and five (3%) by more than 2+ (Fig. 3b and Table 1). Analysis showed that twelve pollen reactions had become much weaker. Of these twelve reactions, eight had a 4+ reaction to pollen in the previous PT, and only a 2+ reaction at the present control PT. All eight patients had undergone hyposensitization. In five cases the reaction to feathers had diminished with time. A further five patients showed a stronger reaction at the present test. Three had a known grass pollen allergy and now a tree or weed pollen allergy had been acquired. In two patients the histamine reaction had become stronger. In one case the PT for grass pollen was negative, although it had been strongly positive in the previous test and MT, thereby presenting a false negative PT reaction.

Multi-test 2

Of the 160 skin test reactions per method, only ten (6%) differed by more than 1+ and only one (1%) by more than 2+ (Fig. 3c and Table 1).

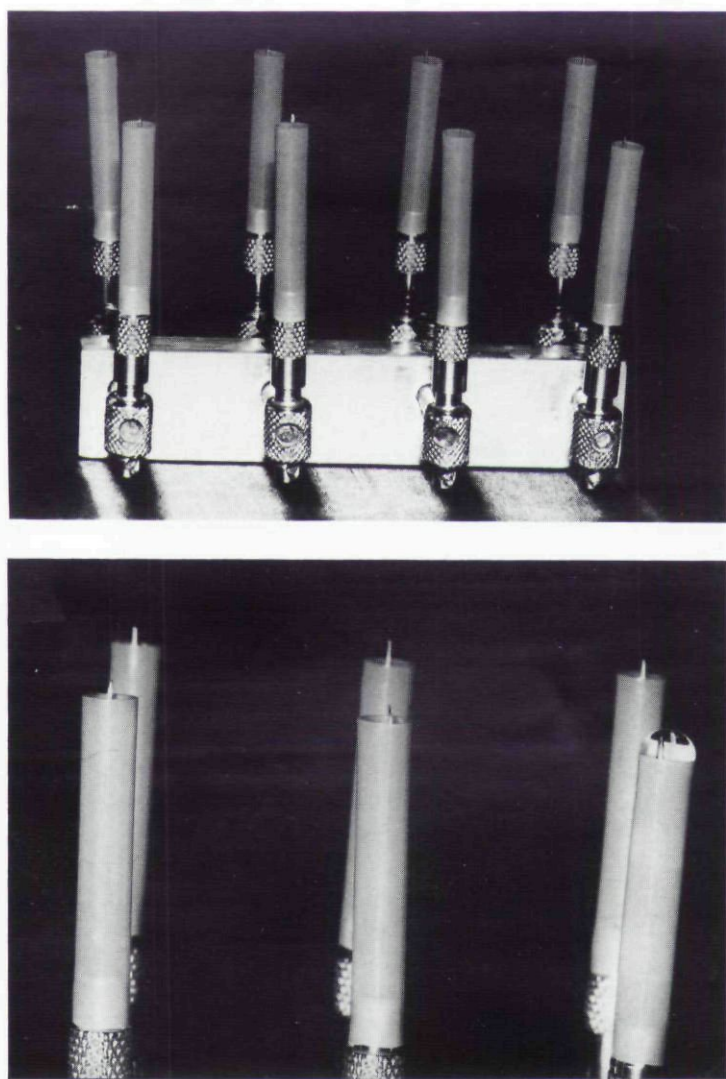


Fig. 2. The multi-test 2 model is an improved version of the multi-test. A single sterile disposable needle and its shortened protection sleeve which serves to hold the drop of allergen solution are placed on a stainless steel base, 8 cm in length.

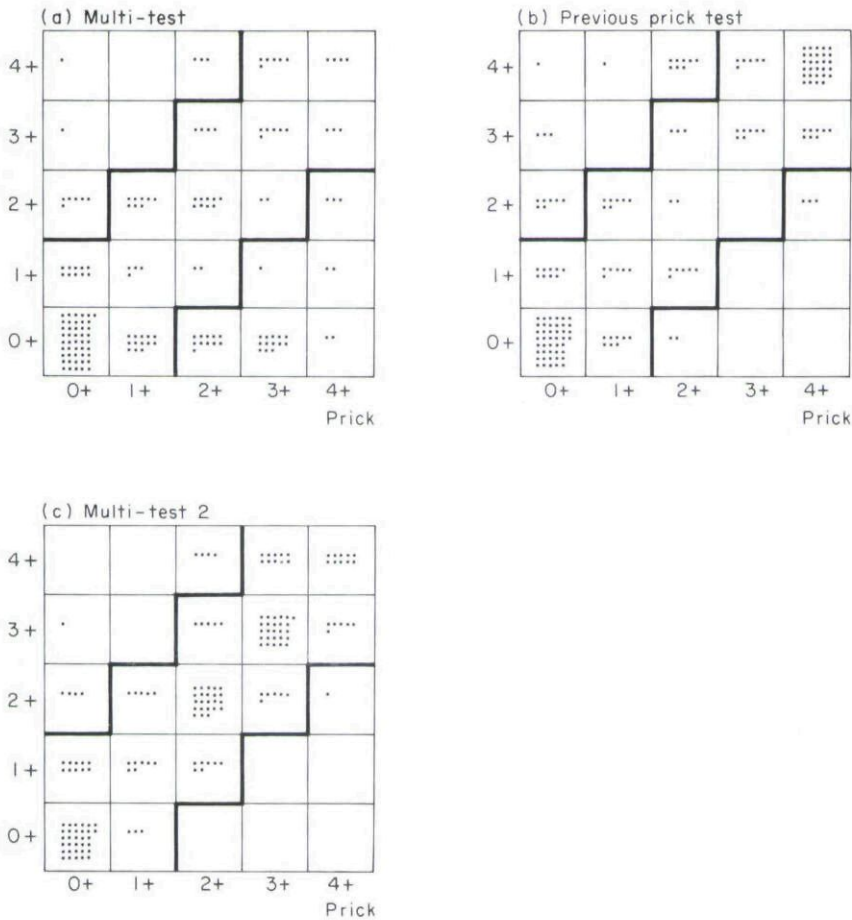


Fig. 3. Comparison of the results of various skin tests. Weal size: 1+, 1–3 mm; 2+, 4–7 mm; 3+, 8–11 mm; 4+, ≥ 12 mm. Values outside the heavy borders differ by more than 1+. (a) Agreement of weal size between prick test and multi-test; (b) comparison of weal size between prick test with previous prick test; (c) agreement of weal size between prick test and multi-test 2.

Table 1. Summary of the results comparing several skin testing methods: multi-test, prick test, and multi-test 2. Weal sizes were defined as: 1+, 1–3 mm; 2+, 4–7 mm; 3+, 8–11 mm; 4+, ≥ 12 mm.

Difference in weal size	PT vs		
	PT vs MT (%)	previous PT (%)	PT vs MT-2 (%)
> 1+	27	16	6
> 2+	12	3	1

Discussion

Multi-test

Using Pugley's definitions for comparison of the MT and PT, our trial resulted in only 24% good, 50% questionable, and 26% poor correlations. Surprisingly, comparison of the two prick tests provided better results, whereas poorer had been expected due to the following reasons: (1) in the time interval between the prick tests, 70% of the patients had undergone hyposensitization; (2) there was a large time interval between the two prick tests, up to 4 years; (3) the previous prick tests had been carried out by several different persons, so that differing interpretations of skin tests could arise.

Analysis resulted in the clarification of the differing skin reactions for both prick tests. In some cases there was a reduction in test reaction after hyposensitization, in others new allergies arose. Why then did the PT and MT differ so greatly? Only the histamine reactions showed a good correlation between the two methods. It is known that histamine can cause strong positive reactions even when the skin is not, or is just slightly, perforated. The negative or weak MT reactions could thus be explained by insufficient skin perforation of the plastic needles. What about those cases, where the PT was negative or weaker than the MT reaction? A close examination of the MT weal showed that they were over-evaluated. Several single reactions produced by the nine-needle MT head had blended together and simulated a stronger reaction.

Our results showed that the commercially available MT could not replace the PT, because the skin was frequently insufficiently perforated or, when perforation did ensue, the allergen could be absorbed at several skin sites. In order to eliminate these disadvantages, we constructed a model which we referred to as multi-test 2.

Multi-test 2

The comparison of MT-2 and PT was much more favourable than the comparison of MT and PT. The MT-2 is not, however, the final product to be developed. Amongst older patients, the 2 cm distance between MT heads is too small; strong reactions with one allergen can produce over-reaction of the neighbouring allergen. Ideally, the base should be a sliding, adjustable apparatus such that the distances between allergen heads can be altered. In addition, allergen loading is too time-consuming. It would be much simpler if short disposable needles, consisting primarily of the facet, were used. Unfortunately, these are not at present available. Thus the physician's time for testing remains the same as that for the prick test.

With increasing numbers of pricks, there is often a crescendo of protest. The MT-2 serves to keep the nerves of all participants calm during an allergy test, because testing is simultaneous and quick. Thus the use of disposable test stamps with 8 individual allergens is valuable for skin testing infants and small children.

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