showed that a patient without any detectable IgA could form reagin-type antibodies. Fireman, Boesman, and Gitlin (1965) have also investigated a patient with ataxia telangiectasia who had no detectable IgA and demonstrated weal-and-flare skin reactions to cows' milk protein. Skin sensitizing antibody to this protein was demonstrated in the patient's serum by the Prausnitz-Küstner test. The IgG globulin fraction isolated from the patient's serum by chromatography was found to contain the reagin-like activity.

Stanworth (1965) has discussed the structure of reagins more fully. He studied reagins by ultracentrifugation and found that they have a sedimentation constant higher than that found for immunoglobulins of molecular weight $\sim 150,000$. Moreover, on diethylaminoethyl cellulose chromatography reagins from normal subjects were detected in a fraction midway between the IgG and IgA fractions. He has therefore suggested the possibility that reagins could consist of end-to-end dimers, one monomer unit being IgA and the other unit IgG.

There is therefore strong evidence that immunoglobulins of the type IgG can be involved in the structure of reagin-type antibodies. This may explain the raised level of IgG in atopic eczema found in the present study. However, it is possible that, as in patients with asthma alone, the concentration of reagins in the serum of patients with atopic eczema is not high enough to contribute significantly to the level of circulating immunoglobulins. If this is so the marked increase in IgG level in atopic eczema could be due to some other, probably unrelated, phenomenon.

The clinical diagnosis of atopic eczema does not usually present any problem, but in some cases there may be difficulty in differentiating atopic from other patterns of eczema. In the present series approximately 70% of the patients with atopic eczema examined were found to have IgG levels >19 mg./ml. and these were associated with IgA levels <5 mg./ml. In con-

trast to this, only two of the 27 patients with other eczematous conditions had comparable IgG levels, and in both these cases the IgA levels were higher than 5 mg./ml. We would therefore suggest that assay of immunoglobulins could be a useful tool in the differential diagnosis of eczematous conditions. A level of IgG >19 mg./ml. associated with a level of IgA <5 mg./ml. would be highly suggestive of the diagnosis of atopic eczema.

Summary

A highly significant rise in the level of circulating immunoglobulins of the class IgG was detected in both adults and children with atopic eczema when compared with patients showing other patterns of eczema or asthma. These results are discussed in the light of recent evidence relating reagenic antibodies to both IgG and IgA immunoglobulins. It is suggested that assay of the immunoglobulin levels in the serum could be useful in the differential diagnosis of atopic eczema.

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New Test for Finger-tip Sensation

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This paper describes a simple objective test for finger-tip sensation which is believed to be a more accurate index of tactile sensation and is less time-consuming than the conventional tests.

The two-point discrimination threshold is the average of several measurements of two compass points approximated until they can be felt as one, in the longitudinal and transverse directions. When carefully carried out it is probably the most useful objective and quantitative test of sensation. It is subject to error when the patient is fatigued, and the period of rest required when several areas are tested makes it a time-consuming examination (Mannerfelt, 1962). Not infrequently, when testing poorly innervated skin, the results are invalidated by one point being felt as two.

Moberg's (1958) picking-up test is an indication of the total sensory impression on gripping with the index finger and thumb. Small objects are handled and identified with the eyes open and then blindfolded. Moberg describes the failure to use the index and thumb as a loss of "tactile gnosis," a term

first used by Broman (1945) as the complex sensation which makes the fingers "seeing." Though patently simple and functional, this test is limited to the index finger and thumb. It is also subject to false positives, as only one normally innervated shank of the grip is required (Sturman and Duran, 1963).

Mannerfelt (1962), assessing reinnervation of skin grafts, found Frey's hairs and Seddon's coin test to be of limited value, showing little correlation with the two-point discrimination threshold.

As an objective test of sensation the sweat test is limited. The volume of sweat is difficult to measure, and it bears no relation to sensory recovery in nerve lesions proximal to the grey rami or in skin grafts. It is a useful corollary test, as are the "signs of trauma" (Moberg, 1962) and the volume test, colour test, and finger-print test (Davis *et al.*, 1964).

The test described below arose from a need for a simple test to measure the reinnervation of skin grafts or flaps to the finger-tips which would be objective, functional, and specific for the tactile areas of all the fingers.

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Method

The patient is asked to identify metal letters raised in sharp relief by running his finger-tip over the surface as a blind person would read Braille. Steel type letters, 1 by 0.8 cm., have proved ideal (Fig. 1), the most easily recognized and those identical in reverse being H, O, U, V, and Y. Five letters are examined unhurriedly in one hand, and the patient then applies the letters himself to the pulp under test. Incorrect identification or failure to identify the letter after 30 seconds is recorded as an error, and a score is obtained out of five.

FIG. 1.—Set of five letters.

The value of the test has been assessed while examining the sensory reinnervation of 51 finger-tip reconstructions by skin-graft or flap, and a comparison made between the two-point discrimination test, Moberg's picking-up test, and the letter test.

Results

The distal pulp of 47 normal patients was examined; the average two-point discrimination threshold was 0.33 cm. longitudinal by 0.31 cm. transverse, and there was no significant difference between the 29 cases of the thumb and index from the 18 of the middle, ring, and little fingers (Table I). All these scored 100% in the letter test.

TABLE I.—Normal Two-point Discrimination of Distal Pulp

Site	No.	Average Two-point Discrimination (cm.)	
		Longitudinal	Transverse
Thumb and index	29	0.35	0.32
Middle, ring, and little fingers	18	0.32	0.31

TABLE II.—Correlation of Letter Test with Two-point Discrimination in 51 Finger-tip Grafts or Flaps

Letters Correct (maximum of 5)	No. of Patients	Average Two-point Discrimination	
		Longitudinal	Transverse
5	8	0.45	0.51
4	10	0.55	0.58
3	3	0.70	0.66
2	6	0.73	0.64
1	10	0.75	0.71

TABLE III.—Correlation of Moberg's Picking-up Test with the Two-point Discrimination and Letter Test

Moberg's Picking-up Test	No.	Average Two-point Discrimination		Average Letter Test Score
		Longitudinal	Transverse	
+	8	0.78	0.73	2.3
-	14	0.94	1.01	0.9

Of the 51 grafts or flaps to the finger-tips 37 could distinguish some letters correctly. Their score is compared with the two-point discrimination in Table II and Fig. 2, showing a direct relationship. Moberg's picking-up test was applicable

in 22 of the 51 sites, the 8 positives having a distinctly better letter-test score than the 14 negatives (Table III).

FIG. 2.—Comparison of letter test and two-point discrimination in 51 finger-tip grafts or flaps.

Discussion

The letter test proved useful in assessing the reinnervation of skin grafts and is believed to have several advantages over other tests. (1) It is functional in that the fingers are constantly being used in such sensory exercise. It records "tactile gnosis," that sensation which makes the fingers "seeing," as accurately as Moberg's picking-up test but without its limitations of site and false-positives. The average letter-test score of 46% for the eight positives suggests that there are not a few false-positives. (2) It measures minimal loss in sensation. The normal two-point discrimination of the distal pulp is 0.3 cm. At 0.5 cm. five letters can still be accurately identified, but at 0.6 cm. there is an error of 30%, and at 0.7 cm. a 70% error. No skin graft is perfectly innervated (Moberg, 1958), but many approach normality, and this is recorded by the letter test in a qualitative manner. (3) A wide area is tested at once as the finger moves over the letter, while the two-point discrimination tests only the area between the compass points. (4) It is carried out in two to three minutes without fatiguing the patient.

The test is now being usefully applied to carpal-tunnel syndrome, where it is essential to elicit signs of minimal sensory loss before the development of muscle atrophy.

Summary

A test for finger-tip sensation which requires the patient to identify metal letters is described. It proved useful in assessing the reinnervation of 51 grafts or flaps to the finger-tips, and was directly related to the two-point discrimination. Its advantages are stressed. It is presented as a useful addition to the clinician's diagnostic equipment and as a practical test for a busy clinic.

A set of five letters may be obtained from Edward Pryor & Son, Ltd., Broom Street, Sheffield, at a cost of one guinea.

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