

COMPARATIVE SKIN TESTING IN THE ANTECUBITAL AND POPLITEAL SPACES

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IT IS well recognized that the antecubital and popliteal spaces are favorite sites for atopic dermatitis, but a search of the literature has not revealed any adequate explanation for this finding. In 1920, Schloss¹ using the scratch test on the forearm found that the nearer the test to the elbow fold, the larger the reaction obtained. Larsen, Paddock, and Alexander² in 1932 first reported testing in the antecubital area. They found that in 14 ragweed sensitive patients, tests done in the elbow fold were never smaller and were usually larger than tests introduced 10 cm. farther down on the forearm. Tests with histamine are not reported. Because of this paucity of information, it seemed worthwhile to explore further the responsiveness of the crease areas using both specific and nonspecific urticariogenic excitants.

TECHNIQUE

Because of the unusual character of the skin in the crease areas, considerable preliminary testing was done before it was possible to develop a reliable testing technique. Injection of the testing solutions as close as possible to the surface of loose wrinkled skin was found to be the most important factor in the performance of this technique.

Over 150 subjects ranging in age from 12 to 70 years were studied. An approximately equal number of males and females were used. Most of the atopic patients were receiving treatment for hay fever. They had been carefully selected to eliminate subjects with skin disturbances. All testing was done in sites well away from treatment areas. The nonatopic patients were individuals who were being used as recipients for passive transfer studies and had been thoroughly screened to rule out allergy.

Histamine base in the dilution of 1-10,000 was the nonspecific excitant used to produce whealing. The atopens employed in the sensitive subjects were nonirritating and were used in a strength which would produce specific positive reactions of slight to moderate size (.7 to .8 cm. in diameter) since Bowman³ has shown that reactions of this size are the most desirable for comparative testing. Tests in the crease areas were always done approximately 1 cm. above or below the crease of the antecubital or popliteal space while the comparative test on the arm or leg was made from 15 cm. to 20 cm. above or below the crease area. Both the medial and lateral sides of the extremities were studied, but with due regard to Bowman's observation³ that the medial surface was more active than the lateral. Thus tests in the medial or lateral parts of the crease area were compared to tests in corresponding positions on the arm or leg.

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Since the skin of the upper arm is most commonly employed for routine intracutaneous testing, the major portion of the investigation was devoted to a comparison of tests in this region and in the antecubital area.

RESULTS

The results obtained in comparative testing of the antecubital area and the arm with histamine and allergens are listed in Table I.

TABLE I

SUBJECT	EXCITANT	TOTAL NO. OF COMPARATIVE TESTS	NO. OF CASES SHOWING LARGER RE-ACTIONS IN CREASE AREA	NO. OF CASES SHOWING LARGER RE-ACTIONS ON ARM	NO. OF CASES SHOWING EQUAL RE-ACTIONS AT BOTH AREAS
Atopics	Histamine 1:10,000	63	48 (76 per cent)	8 (13 per cent)	7 (11 per cent)
Nonatopics	Histamine 1:10,000	35	23 (66 per cent)	6 (17 per cent)	6 (17 per cent)
Atopics	Atopens	40	33 (83 per cent)	3 (7 per cent)	4 (10 per cent)

A similar tendency toward greater reactivity in the crease area was observed on comparative testing of the forearm and the antecubital area.

The same results were also obtained with histamine and atopens in comparative tests involving the popliteal area, as listed in Table II.

TABLE II

	IN PATIENTS TESTED WITH HISTAMINE		IN PA-TIENTS TESTED WITH ALLERGENS
	ATOPICS	NON-ATOPICS	ATOPICS
Number of cases showing larger reactions in crease area	10	4	11
Number of cases showing larger reactions above crease area	1	1	0
Number of cases showing larger reactions below crease area	0	0	2
Number of cases showing equal reactions at both areas	2	0	1

DISCUSSION

Fewer comparisons were made on the crease area of the leg than on the arm since the results were decisive both with specific and nonspecific excitants. In comparative tests done simultaneously on the upper and lower extremities of the same individuals, the wheals in the antecubital and popliteal spaces gave practically the same measurements. Atopic individuals tended to show increased whealing in the crease area both to histamine and allergens. Thus a patient who was tested simultaneously with a pollen extract in one arm and with histamine in the other usually displayed crease hyper-reactivity in each arm.

One patient, who was born with a paralyzed arm that had never been bent, showed increased reactivity in the crease area of the paralyzed as well as of the normal arm.

The author was able to confirm the findings of Bowman³ who showed that responsiveness to histamine increased as tests were introduced progressively down the arm, whereas responsiveness to atopens diminished under the same circumstances. The crease area, however, was not included in these comparisons.

The factors responsible for the increased reactivity of the crease areas of the extremities are not well understood. Little is known about differences in the physiological or anatomical make-up of these sites which could influence capillary permeability.

Tuft, Tuft, and Heck⁴ have recently demonstrated increased reactivity of the sweat glands in the areas developing atopic dermatitis. They showed that intramuscular Benadryl could block this response and that after the dermatitis was far advanced, exposure to offending allergens could no longer produce sweating in these sites. In studying the PH of the skin or the secretion of the skin, Blank⁵ found that the antecubital fossa consistently had the most acid PH of any skin area of the body. Bernstein, Herrmann⁶ and others, who have studied the PH of diseased skin, have found that in certain disorders such as eczema, the PH in the affected area tends to be more alkaline. These findings may have some bearing on the localization of atopic dermatitis but their mode of action is not clear.

Hyper-reactivity in the creases following both specific and nonspecific excitation has been demonstrated. An adequate explanation for this observation, however, has not yet been found.

SUMMARY

1. In both atopic and nonatopic individuals, skin tests with histamine produced larger reactions in the antecubital fossa than on the arm or forearm. A similar but even greater difference was observed in atopic subjects when tested in this manner with atopens to which they were sensitive.

2. Skin tests with histamine performed in the popliteal space in both atopic and nonatopic individuals showed a pronounced increase in reactivity as compared to sites either above or below this space. The differences were even more pronounced when comparative skin tests were made with atopens.

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REFERENCES

1. Schloss, O. M.: Allergy in Infants and Children, *Am. J. Dis. Child.* **19**: 433, 1920.
2. Larsen, N. P., Paddock, R., and Alexander, H. L.: Bronchial Asthma and Allied Conditions—Clinical and Immunological Observations, *J. Immunol.* **7**: 81, 1922.
3. Bowman, K. L.: Pertinent Factors Influencing Comparative Skin Tests on the Arm, *J. ALLERGY* **7**: 39, 1935.
4. Tuft, L., Tuft, H., and Heck, M.: Atopic Dermatitis—Role of the Sweating Mechanism, *J. Invest. Dermatol.* **15**: 333, 1950.
5. Blank, I. H.: Measurement of the PH of Skin Surface, *J. of Invest. Dermat.* **2**: 66, 1939.
6. Bernstein, E., Herrmann, F.: The Acidity on the Surface of the Skin, *N. Y. State J. Med.* **42**: 436, 1943.