ORIGINAL CONTRIBUTIONS

TITRE OF CONTACT HYPERSENSITIVITY (TCH) AS A MEANS OF DETERMINING THE DEGREE OF HYPERSENSITIVITY IN CONTACT DERMATITIS

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Data is presented on a new method to determine the degree of contact hypersensitivity in a patient having contact dermatitis. Eighty six patients showing positive patch tests with a few selected antigens were tested with increasing dilutions of the same antigen in addition to the standard concentration. The maximum dilution giving a positive patch test was designated as the titre of contact hypersensitivity (TCH). The values of TCH in different patients varied widely confirming the belief that different patients have different degrees of contact hypersensitivity. In 55 patients, the TCH was determined again within seven days. In 29 cases, it remained the same, in 21 cases it changed by one dilution, while in the remaining 5, there was a difference of two dilutions between the two determinations. TCH seems to be a fairly reliable index of the degree of contact hypersensitivity.

Key words : Patch test, Titre of contact hypersensitivity.

Allergic reactions mediated by antibodies can be easily graded by estimating the antibody titres in the patient's blood, and these titres are commonly used to assess the severity as well as the progress of the disease. In the case of contact dermatitis on the other hand, there is no method available so far, to assess the degree of contact hypersensitivity. The method of grading the patch test reaction[1] into +, + +, + + + or + + + + is not applicable for this purpose, because this greading is based on the type of the lesions produced at the patch test site and not on the severity of the dermatitic reaction, and the type of the lesion does not necessarily reflect the severity of the reaction. A patch test which produces fewer papules/ papulo-vesicles certainly indicates lesser degree of contact hypersensitivity compared to another which produces more lesions, provided the amount of the antigen applied is the same, but with the current method of grading the grade of the patch test reaction will remain the same.

It is now well known that a certain minimum concentration of the antigen is essential before a positive patch test reaction can be obtained. Our earlier experience[2,3] suggested that this minimum concentration varies from patient to patient. In the present study therefore, patch tests were undertaken with progressively increasing dilutions of some antigens in patients known to have a positive patch test reaction with the corresponding antigen, to find out the highest dilution (or the lowest concentration) of the antigen which produced a distinctly positive patch test reaction. This was designated as the titre of contact hypersensitivity (TCH) for that patient.

Materials and Methods

Eighty six patients known to have positive patch tests with a few selected antigens such as *Parthenium hysterophorus*, nickel sulphate,

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nitrofurazone, potassium dichromate and mercurochrome were included in the study. Patch tests were undertaken using the standard concentration of the antigen and also increasing dilutions of the same. The antigen of *Parthenium hysterophorus* was prepared by powdering the air-dried leaves of the plant and extracting 10 g of this powder with 60 ml distilled water, overnight at room temperature. (This extract had been tested for its potency and irritancy on known patients). The concentrations of nickel sulphate, nitrofurazone, potassium dichromate and mercurochrome were 5%, 2%, 0.5% and 2% respectively. All antigens were used in an aqueous base. The dilutions were also made in distilled water. The volume of the antigen used for each test was 0.05 ml. The results of patch tests were read after 48 hours and whenever in doubt, on subsequent days as well for upto 96 hours. Presence of at least papules at the patch test site was considered essential for positivity.

In as many patients as possible, the patch tests with the standard antigens and their dilutions were repeated within seven days, to see the extent of variations from the values obtained in the previous test. Care was taken to apply the second set of patch tests at sites as far away as possible from the sites of the previous tests.

Results

Of the 86 patients, 42 had positive patch tests with *Parthenium hysterophorus*, 15 with nickel sulphate, 13 with nitrofurazone, 11 with potassium dichromate and 5 with mercurochrome. The values of TCH in these patients varied widely (Table I) ranging from the undiluted standard antigen to as high as $1 : 10^6$ for *Parthenium hysterophorus*, $1 : 10^3$ (0.005%) for nickel sulphate, $1 : 10^2$ for nitrofurazone (0.02%) and potassium dichromate (0.005%). In the case of mercurochrome, the variation in the TCH was minimal, the TCH being 0.1% in 4 patients and 0.2% in the fifth.

Repeat estimation of the TCH could be done in 55 patients. In 29 of these, the first and the second values showed no difference, in 21 cases

Table I. Titres of contact hypersensitivity in various patients for their corresponding antigens.

Antigen		Number of cases with Titre of Contact Hypersensitivity									Total
			1	2	3	4	5	6			
Parthenium	Titres used	Undi-luted	1:10	1:10	1:10	1:10	1:10	1:10			
hysterophorus	Number of patients	10	6	9	5	6	5	1			42
Nickel sulphate	Titres used	5%	2%	1%	0.5%	0.2%	0.1%	0.05%	0.01%	0.005%	
	Number of patients	—	1	1	2	4	1	1	2	3	15
Nitrofurazone	Titres used	2%	0.5%	0.2%	0.1%	0.05%	0.02%	0.01%	0.005%		
	Number of patients	2	—	2	3	3	3	—	—		13
Potassium	Titres used	0.5%	0.2%	0.1%	0.05%	0.02%	0.01%	0.005%			
dichromate	Numbr of patients	2	—	1	2	5	—	1			11
Mercurochrome	Titres used	2%	1%	0.5%	0.2%	0.1%	0.05%				
	Number of patients	—	—	—	1	4	—				5

Table II. Variations in the TCH when the test was repeated within 7 days.

Antigen	Number of cases tested	Number of cases showing difference between the two determinations			
		Nil	1 dilution	2 dilutions	3 dilutions
Parthenium hysterophorus	32	18	13	1	—
Potassium dichromate	10	5	4	1	—
Nitrofurazone	8	3	2	3	—
Nickel sulphate	3	2	1	—	—
Mercurochrome	2	1	1	—	—
Total	55	29	21	5	—

there was a difference of one dilution and in the remaining 5, the two values differed by two dilutions (Table II).

Comments

For routine detection of cases having contact hypersensitivity, it is essential to use a standard concentration of each antigen for patch tests. This is essentially the concentration which would detect all cases having contact hypersensitivity to that agent, but would not produce a reaction in any individual not having contact hypersensitivity.

As is obvious from the present study, many patients are capable of reacting to even lower concentrations, and presumably, the higher the degree of contact hypersensitivity in a patient, the lower the concentration that will give rise to a positive patch test. Thus, in each patient, the maximum dilution or the least concentration which still produces a positive patch test would reflect the degree of contact hypersensitivity. This concentration does not seem to be an arbitrary figure, because on repeating the patch test within a short period, the value for the TCH was found to be the same or almost the same in most of the patients. There were nevertheless, some patients in whom the TCH was not stable and showed wider variations within a short period, but since such cases are few only, this method of grading seems valuable. Some patients who have been repeatedly tested for determining the TCH over a period of several months have shown variations in the TCH reminiscent of those observed in the antibody titres in various diseases mediated by humoral antibodies, and thus, it may be possible to objectively monitor the progress of contact hypersensitivity in a patient by serially determining the TCH at regular intervals.

References

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