

Nasal challenge

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SUMMARY

Seven years' experience of nasal challenge is presented. On the basis of a material of 1492 controlled provocation tests performed on 715 patients, practical problems concerning the performance period of the provocation, application methods, allergen preparations, interpretation of the results as well as the relevance and correlation of different investigation methods of allergic rhinitis are discussed.

INTRODUCTION

Nasal provocation is mentioned in the literature as early as the 1860's (Kirkman, 1862), but it is not until the last few decades that it has achieved greater popularity in allergy work-up (e.g. Aschan et al., 1958; Halpern et al., 1961; Connel, 1967 and 1968; Naumann et al., 1969; Taylor et al., 1971). Technical difficulties connected with the test, complications which the challenge may cause, the fact that the test is time-consuming, difficulties in interpreting the results, are some factors which may account for the reluctance to adopt the test as an investigation method.

The aim of this study is to discuss questions and problems which concern the practical performance of the nasal provocation test. Special attention is given to correlation and relevance of different methods of examining allergic rhinitis.

MATERIAL AND METHODS

At the Ear-, Nose- and Throat Hospital, University of Helsinki, nasal challenge has been done routinely since 1967. A material comprising 620 patients has previously been presented (Holopainen et al., 1973 and 1975). Later a material of 95 patients was added. With a view of reaching an etiological diagnosis in as many cases as possible, we had the 715 patients complete a systematic investigation programme as follows:

1. Careful case history using a questionnaire
2. Exact nasal status determined from clinical findings (i.e. changes in the mucous membrane, amount and character of secretion, polyps, septum, adenoids, etc.)
3. Exfoliative nasal cytology (nasal smears) and culture
4. Sinus X-ray and dental X-ray

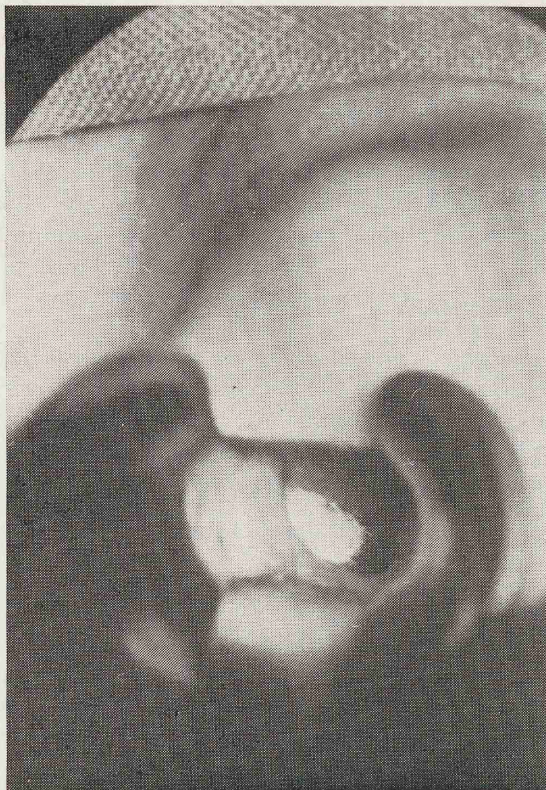


Figure 1. Bud of cotton with antigen solution applied to the inferior turbinate.

5. Scratch and/or intracutaneous tests with approximately 20 antigens
6. Nasal challenge
7. Total and specific IgE (Rist, Rast)*.

The allergic status of the patient was determined primarily on the basis of history and skin tests. Approximately 1350 controlled nasal provocations were carried out on the 620 patients and the results were interpreted on the basis of nasal symptoms and signs without using rhinomanometric measurements. In the smaller material 142 nasal provocations were done and here rhinomanometric measurement was used alongside clinical observation. Nasal provocation was done when the nasal mucous membrane was free or almost free from symptoms. As to medical drugs, it was required that no drugs had been taken for a period of 48 hrs before the challenge. A local application method, as described by Holopainen et al. (1973 and 1974), was used in performing the challenge. An aqueous antigen solution of 0.1-0.2 ml was absorbed into a small bud of cotton or a paper disc and was applied to the mucous membrane of the inferior turbinate (Figure 1).

* During the examination of the smaller material, determination of total and specific IgE using the radioimmunosorbent test (Rist) and radioallergosorbent test (Rast) was added to the investigation programme.

In the tests the basic solution was used and only in exceptional cases, when according to history and skin tests, the patient was extremely sensitive, diluted solutions. Normally nasal challenge was done as an out-patient measure. For patients with pollen allergy, the duration of the antigen exposition usually varied from 2 to 5 minutes, depending on the intensity of the symptoms. The exposition time was longer, up to 15 minutes, for antigens which produce perennial symptoms, e.g. house dust.

The reaction was considered to be positive when two of the following criteria were present: sneezing, itching, secretion and subjectively noted obstruction of the nose, the colour of the mucous membrane changed, swelling of the turbinates was noted by rhinoscopy, and finally, the total nasal resistance increased 25 per cent or more as measured by rhinomanometry. To record the change in nasal resistance the Siemens Elema rhinomanometry apparatus was used. Several provocation tests were done successively on the same occasion. After a positive provocation, however, there was an interval of at least 45 minutes.

RESULTS

When comparing the findings of nasal provocations with those of the skin tests in the group of 620 patients with 1350 provocations, parallel correlation was noted in 80 per cent in pollen allergy, and in 58 per cent in perennial rhinitis caused by house dust allergy (Figures 2 and 3). In the material of 95 patients with 142 provocations, where rhinomanometric measurement was used, skin test and nasal challenge correlated in 90 per cent in pollen allergy and in 62 per cent in

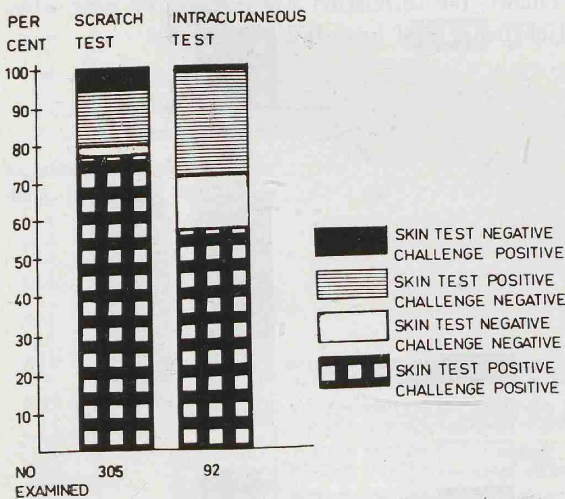


Figure 2. Correlation of skin tests and nasal challenge in seasonal rhinitis (pollens).

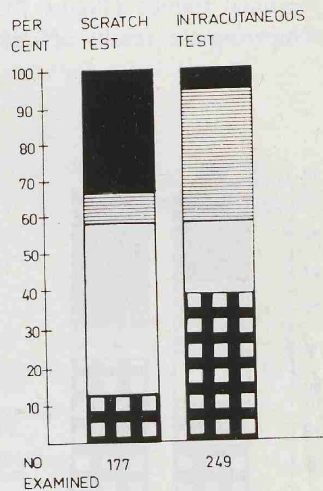


Figure 3. Correlation of skin tests and nasal challenge in perennial rhinitis (house dust).

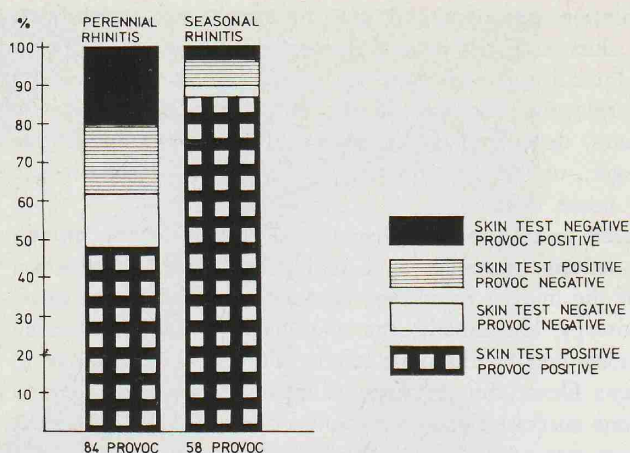


Figure 4. Correlation of skin test and nasal challenge.

perennial rhinitis (Figure 4). In this material other correlations were also analysed. Figure 5 shows that history and nasal challenge correlated in 61 per cent in pollen allergy and in 59 per cent in perennial allergic rhinitis. The correlation between skin tests and specific IgE was convincing in pollen allergy, but rather poor in perennial rhinitis, 83 per cent and 47 per cent, respectively (Figure 6). Specific IgE showed poorer correlation with nasal provocation than with skin tests; the correlation being 65 per cent in pollen allergy, and 33 per cent in perennial rhinitis (Figure 7). Finally, the correlation was remarkably poor when comparing the results of nasal challenge and total IgE (Figure 8).

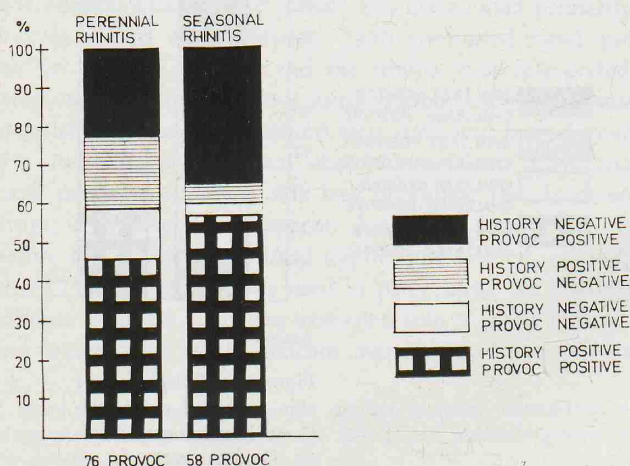


Figure 5. Correlation of history and nasal challenge.

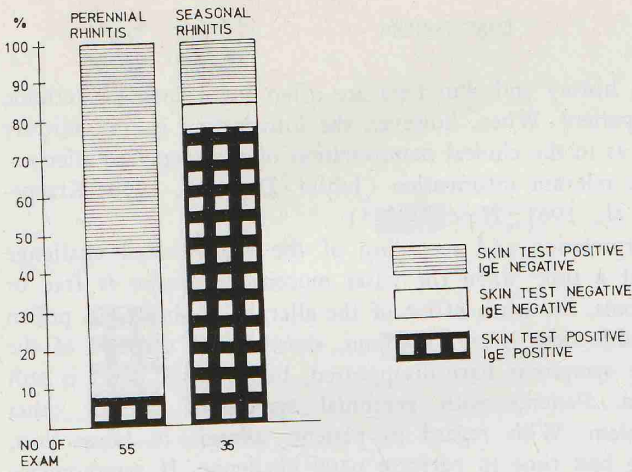


Figure 6. Correlation of skin test and specific IgE.

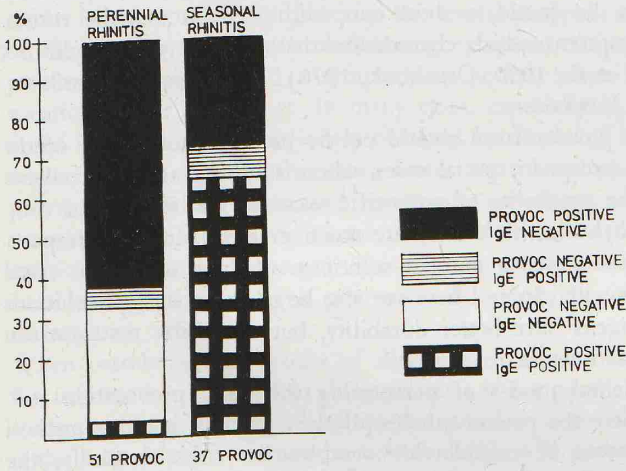


Figure 7. Correlation of nasal challenge and specific IgE.

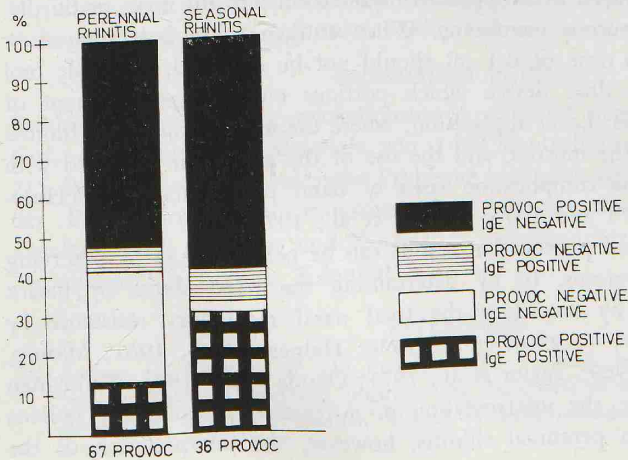


Figure 8. Correlation of nasal challenge and total IgE.

DISCUSSION

Findings obtained from history and skin tests are often sufficient to determine the allergic status of a patient. When, however, the information is contradictory and there is uncertainty as to the clinical manifestation of the suspected allergen, nasal challenge can give relevant information (Juhlin - Dannfelt, 1950; Kraepelin, 1956; Halpern et al., 1961; Hosen, 1965).

To ensure reliable interpretation and recording of the results nasal challenge should be undertaken at a time when the nasal mucous membrane is free or almost free from symptoms, i.e. when effect of the allergen is absent. In pollen allergy the most favourable time is early autumn, shortly after the end of the pollen season, when the symptoms have disappeared, but the IgE level is still raised in the organism. Patients with perennial symptoms, on the other hand, constitute a problem. With regard to patients allergic to house dust, summer seems to be the best time to perform nasal challenge. If symptomfree periods cannot otherwise be found, a short cure with steroids may be recommended, because the symptoms which characterize the reaction type I, will not be masked (Booij-Noord et al., 1970; Orié et al., 1970). Treatment with antihistamines is contra-indicated, however.

Allergen preparations in powder form should not be used in provocation of the nasal mucous membrane, except in special cases, where solutions are not available (e.g. industrial dust). The possibility of unspecific reactions and the risk of complications (asthma, anaphylactic shock etc.) are much greater than with preparations in liquid form. Pure aqueous antigen solutions are best suited for nasal provocation, but solutions with glycerol base can also be used. In antigen solutions on glycerol base the antigens have better durability, but unspecific reactions can occur on a sensitive nasal mucosa.

There are three fundamental modes of performing the nasal provocation test. Firstly, the sniff test, where the patient inhales allergen powder, but this method is not recommended because of considerable complication risks. Secondly, the antigen can either be sprayed or dropped in liquid form into the nose, or thirdly, applied locally to the mucous membrane. When antigen solution is sprayed or dropped into the nose a dose of 0.1 ml should not be exceeded. A handy tool is an applicator with a dose device which portions out the exact amount of antigen solution at a time. Local application, where the antigen contact is limited to a very small area of the mucosa, and the use of the applicator equipped with dose device, diminish the complication risks of nasal provocation tests (Holopainen et al., 1973, 1974 and 1975; Okuda et al., 1973).

The interpretation of nasal provocation results can be performed a) by observing the patient's nasal symptoms, b) by determining the nasal status by means of rhinoscopy, and c) by recording the total nasal respiratory resistance by means of rhinomanometry (Aschan et al., 1958; Halpern et al., 1961; Masing, 1967; Naumann et al., 1969; Taylor et al., 1971; Okuda et al., 1973; Tarkiainen et al., 1975). As a rule, the interpretation of a reaction provoked by pollens causes no difficulties. In perennial rhinitis, however, the interpretation of the

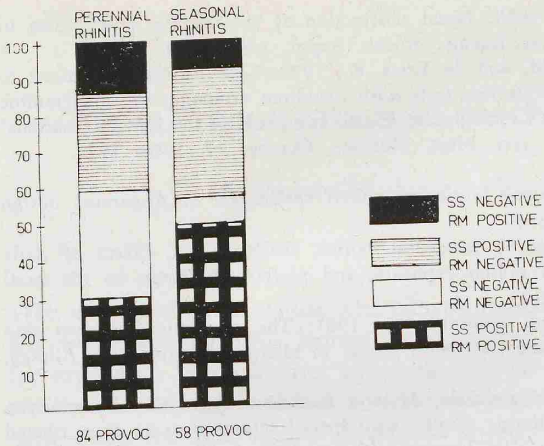


Figure 9. Clinical signs and symptoms correlated to rhinomanometric measurements in nasal challenge.

results is more complicated, because the reactions appear more slowly and blocking of the nose is usually the dominating symptom. Often it is also difficult in perennial allergy to find a symptomless period, when the reaction to the provocation would be distinct. In many cases, especially in perennial rhinitis, additional information was definitely obtained by means of rhinomanometry measurements (Figure 9). On the other hand, there were quite many cases of nasal provocations, where signs and symptoms (sneezing, secretion, etc.) were very prominent, while nasal resistance remained almost unchanged. Thus rhinomanometric measurement of nasal resistance used together with observation of the nasal symptoms and signs guarantee the reliability of nasal challenge as an investigation method.

When correlating the results of different investigations it becomes evident that the information obtained in different tests is not parallel in all cases, and further studies are urgently needed before the question as to which investigation method is the most relevant one can be answered. We will perhaps be in a better position to judge, once the results of the treatment have been carefully analysed and then correlated to the information obtained in the investigations.

ZUSAMMENFASSUNG

Erfahrungen von Nasenprovokationstesten während sieben Jahre werden präsentiert. Auf Basis eines Materials von 1492 kontrollierten Provokationstesten an 715 Patienten werden praktische Probleme bezüglich des Ausführungszeitpunktes der Provokation, Applikationsmethode, Allergenpräparate, Interpretation der Resultate sowie Relevanz und Korrelation verschiedener Untersuchungsmethoden der allergischen Rhinitis diskutiert.

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