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Some immunological parameters in serum and nasal secretion in subjects with vasomotor and allergic rhinitis and nasal polyps - A comparative study

Victoria Pulido and Pedro A. García-Calderón, Barcelona, Spain

SUMMARY

We studied the levels of IgE, IgG, IgA and IgM in serum and nasal secretion in a group of 83 patients (57 with allergic rhinitis, 13 with vasomotor rhinitis and 13 with nasal polyps). For the measurement of the nasal IgE the RIST and PRIST techniques were used and the PRIST technique was used to measure the serum IgE. The remaining immunoglobulins were measured by means of nephelometry.

For the clinical diagnosis of allergic rhinitis we took into account the positive reaction to some pneumoallergens, when performing the skin tests in addition to the clinical history. The levels of specific IgE in serum and nasal secretion were measured by the RAST technique.

Our results may be summarized as follows: no significant change in the values of the serum immunoglobulins IgG, IgA, IgM; an increase in serum IgE in subjects with allergic rhinitis and allergic polyps, an increase in the IgE in nasal secretion in subjects with allergic rhinitis and bilateral polyps - whether allergic or not - as well as an increase in the three remaining immunoglobulins in the different groups studies whether they were atopic or not.

INTRODUCTION

Apart from the mechanical alterations or infectious processes, nasal respiratory insufficiency (NRI) is also caused by the functional disorders of the soft elements of the nasal mucosa. These latter processes are known as vasomotoric and the etiology can vary from allergic to psychic. NRI is accompanied by nasal hypersecretion, anosmia and sneezing fits both in rhinopathies of allergic and pure vasomotoric origin. Consequently, the study of immunoglobulins in nasal secretion and, in particular, of the IgE (increased levels in atopic processes) could lead to a nosological differentiation of both entities which might be completed by the determination of the serum levels of IgE and the search for the possible allergens that cause this allergic syndrome using either in vivo or in vitro methods.

Mygind et al. (1975) found an increased level of IgE in nasal secretion in 24/25

subjects with seasonal rhinitis and Mogi et al. (1977) in 26/103 patients with perennial allergic rhinitis. On the other hand, in subjects with vasomotor rhinitis Braun et al. (1979) and Jacobs et al. (1981) found IgE levels in nasal secretion that were similar to those of the control group. So far as the immunoglobulins IgG, IgA, IgM in nasal secretion are concerned the results are more disparate. Some authors (Hobday et al., 1971; Mygind et al., 1975) did not find increased levels (IgG, IgA) compared to the control group, whereas other authors (Cohen et al., 1970; Alford, 1969; Rossen et al., 1965) did detect an increase of these levels in subjects with allergic rhinitis. Finally, Tse et al. (1973) did not find any IgM in nasal secretion in rhinitic patients nor in patients of the control group.

But if we consider the presence or absence of specific IgE antibodies in nasal secretion the findings are no less disparate. Deuschl and Johansson (1977) did not find any antibodies in the nasal secretion of 18 patients with allergic rhinitis who had low or negative antibody levels in serum whereas Huggins and Brostoff (1975) detected them in spite of negative skin tests. Finally, as to nasal polyps the results are also inconsistent. Some authors question the allergic origin (Caplin et al., 1971) whereas others demonstrate its existence in levels that are not always consistent (Mygind et al., 1975; Pupil et al., 1979).

The disparate results, the limited number of patients studied in some cases, the incomplete methodology used or method biased in favour of one or other technique prompted us to undertake the present study of a group of patients with NRI (57 with allergic rhinitis: 35 perennial and 22 seasonal, 13 with vasomotor rhinitis and 13 with nasal polyps). We studied the IgE, IgG, IgA, IgM and the specific IgE in both serum and nasal secretion and we performed skin tests with a series of pneumoallergens. A control group was subjected to the same tests as the study group.

MATERIAL AND METHODS

1. Patients. We studied a group of 83 patients (39 males and 44 females aged between 5 and 62). Of these 57 suffered from allergic rhinitis (24 males and 33 females) and of these 35 (61,4%) suffered from perennial rhinitis and 22 (38,6%) from seasonal rhinitis. Thirteen patients suffered from vasomotor rhinitis (5 males and 8 females) and 13 from nasal polyps (10 males and 3 females). In order to facilitate the grouping the presence or absence of a suggestive clinical history (sneezing fits accompanied by hydrorrhea, nasal pruritus and nasal obstruction) was taken into account as well as the positive reaction or lack of it to pneumoallergens tested in vivo.

The nasal polyps were also labelled allergic or not allergic in accordance with the parameters mentioned above.

2. Controls. The control group consisted of 26 subjects with normal rhinoscopy, free of nasal disorders and atopic or allergic processes local or systemic. The control group was subjected to the same tests as the study group.

3. Skin tests (SKT). The Prick technique was used to carry out skin tests with a series of pneumoallergens (Merck): house dust, dermatophagoides pteronyssinus, pollens and moulds. The degrees of positive or negative reactions were derived from the positive control reaction (histamine) or negative control reaction (saline solution).

4. Collection of nasal secretion and serum. For the collection of nasal secretion the method described by Merret (1975) was used. After stimulation by instilling 1 ml of NaCl (18%) into each nasal fossa the undiluted secretion was obtained. The serum was obtained by venous puncture. 10 ml of blood coagulated for 60 minutes at 37°C after which it was centrifuged and separation was performed with a Pasteur pipette. Both the serum and the nasal secretion were collected simultaneously and frozen at − 80°C until the moment it was used for the determination of the parameters.

5. Study of the IgE immunoglobulin level. The PRIST technique (Pharmacia, Uppsala, Sweden) was used for the serum determination of IgE levels and the PRIST and RIST techniques (Pharmacia, Uppsala, Sweden) were used for the study in the nasal secretion. The method described by the supplier was used in both cases.

6. Study of the specific IgE antibodies in serum and nasal secretion. The RAST technique (Phadebas, Pharmacia, Uppsala, Sweden) was used and the supplier's instructions were followed.

7. Study of the IgG, IgA and IgM immunoglobulin levels in serum and nasal secretion. The levels of these immunoglobulins were measured by means of a nephelometric technique (ICS, Beckman).

RESULTS

A. Levels of serum IgE. In patients with allergic rhinitis the serum IgE levels were $339{,}6 \pm 311{,}2$ IU/ml whereas in the group with vasomotor rhinitis the levels were $51{,}1 \pm 21{,}4$ IU/ml. In the group with allergic polyps the levels were 260 ± 250 IU/ml whereas in the group with non allergic polyps the values were $52{,}9 \pm 27{,}4$ IU/ml. The IgE values in serum for the control group were 65 ± 50 IU/ml. Figure 1 shows the mean values and deviations of the different levels of serum IgE.

B. IgE levels is nasal secretion. The mean levels of IgE in nasal secretion varied considerably depending on the technique used for measurement: RIST or PRIST. With the first technique no significant increase in IgE was observed in the secretion of subjects with allergic rhinitis (112.6 ± 109.8 IU/ml) in comparison to the controls (87.5 ± 22.1 IU/ml). This technique was replaced by the second (PRIST) when it was observed that significant values were obtained using the PRIST method. The mean values for allergic rhinitis were 15.6 ± 15.1 IU/ml ($p < 0.001$). For the control group the IgE values in nasal secretion were 0.85 ± 0.70 IU/ml. The values for vasomotor rhinitis were: 1.2 ± 0.85 IU/ml. Figure 2 shows the

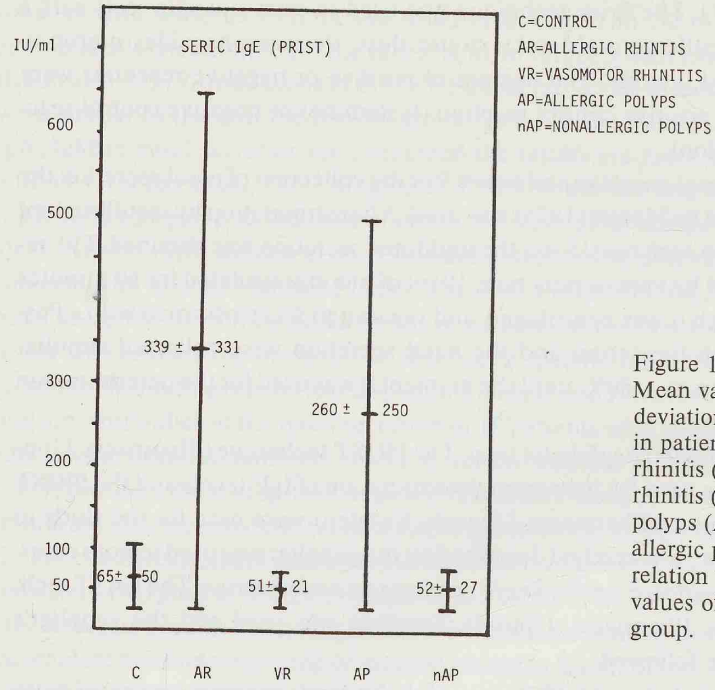

Figure 1.
Mean values and deviations of serum IgE in patients with allergic rhinitis (AR), vasomotor rhinitis (VR), allergic polyps (AP) and non allergic polyps (nAP) in relation to the mean values of the control (C) group.

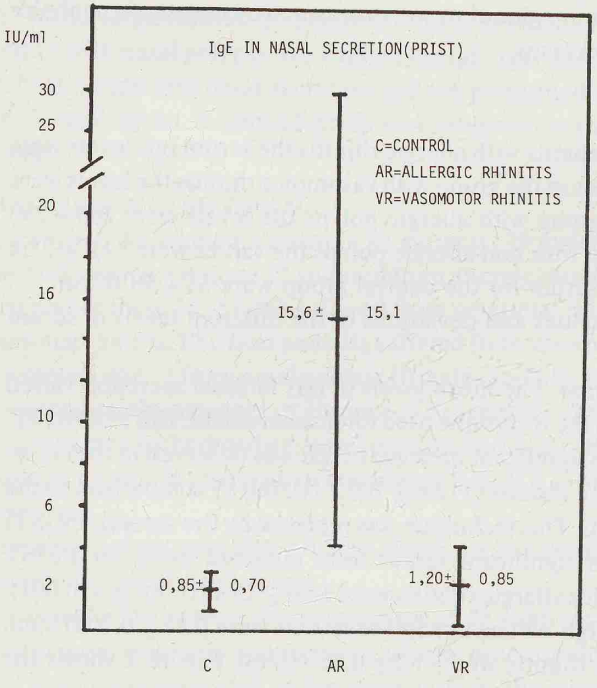

Figure 2.
Mean values and deviations of the IgE in nasal secretion (using the PRIST technique) of the control group (C) and the study group: allergic rhinitis (AR) and vasomotor rhinitis (VR).

mean values and deviations of the IgE in nasal secretion using the PRIST technique for the control group and for allergic and vasomotor rhinitis. In case of bilateral nasal polyps the IgE levels in nasal secretion, using the RIST technique, were: 263.8 ± 223.4 IU/ml ($p < 0.001$) whereas for unilateral polyps the values were 58.3 ± 31 IU/ml (NS). The PRIST technique was not used to study the IgE level in nasal secretion for the study group. This second subdivision of the group with polyps arose because we found in the allergic group (increased level of serum IgE) differences in the values of IgE in nasal secretion in the unilateral group in contrast to the bilateral group. This is demonstrated by our results (see discussion).

C. IgG, IgA and IgM concentration in serum. Table 1 shows the levels of these serum immunoglobulins in the control group and in the group of subjects with allergic and vasomotor rhinitis and nasal polyps.

Table 1. Mean values and deviations of serum Ig.

no.		IgG	IgA	IgM
26	control	1158 ± 305	200 ± 61	108 ± 37
57	allergic rhinitis	1115 ± 236	203 ± 89	132 ± 65
13	vasomotor rhinitis	936 ± 342	193 ± 71	127 ± 73
13	polyps	1088 ± 38	207 ± 98	128 ± 27

D. IgG, IgA and IgM immunoglobulin levels in nasal secretion. The mean values and deviations for those immunoglobulins for allergic rhinitis were respectively: 18.1 ± 27.9 mg/100 ml ($p < 0.001$); 70.0 ± 66.1 mg/100 ml ($p < 0.001$); 4.2 ± 3.7 mg/100 ml ($p < 0.005$). For vasomotor rhinitis: 16.4 ± 17.5 mg/100 ml ($p < 0.001$); 39.8 ± 21.4 mg/100 ml ($p < 0.01$) and 3.9 ± 7.1 mg/100 ml (NS). Finally for nasal polyps the bilateral group gave the following values: 86 ± 98.3 mg/100 ml ($p < 0.01$); 114 ± 105.4 mg/100 ml ($p < 0.01$) and 15.1 ± 19.1 mg/100 ml ($p < 0.01$) and the unilateral group respectively: 29 ± 24.9 mg/100 ml ($p < 0.01$); 61.4 ± 49.2 mg/100 ml ($p < 0.01$) and 4.9 ± 3.3 mg/100 ml (NS). The mean values and deviations of the immunoglobulin levels in nasal secretion for the control group were: 7.1 ± 4.5 mg/100 ml for IgG; 21.9 ± 11.8 mg/100 ml for IgA and 2.8 ± 2.3 mg/100 ml for IgM.

The data mentioned above are summarized in Table 2.

Table 2. Mean values and deviations of Ig in nasal secretion.

	IgG	IgA	IgM
control	7.1 ± 4.5	21.9 ± 11.8	2.8 ± 2.3
allergic rhinitis	18.1 ± 27.9	70.0 ± 66.1	4.2 ± 3.7
vasomotor rhinitis	16.4 ± 17.5	39.8 ± 21.4	3.9 ± 7.1
bilateral polyps	86.0 ± 98.3	114.0 ± 105.4	15.1 ± 19.1
unilateral polyps	29.2 ± 24.9	61.4 ± 49.2	4.9 ± 3.3

DISCUSSION

Our results seem to demonstrate, in the case of allergic rhinitis, an increase in the level of serum IgE in comparison to the control group. These results are consistent with those of Braun et al. (1979); Mullarkey et al. (1980) and Henderson et al. (1971). Regarding the group of patients with allergic rhinitis with normal levels of serum IgE we found 30% with normal levels, findings that correlate with those of Henderson et al. (1971): 38%, and Wayoff et al. (1979) who found 32%. Extreme values were detected by Mullarkey et al. (1980): 13%, and Nalebuff and Fadal (1979): 50%.

As our results demonstrate, the IgE values in nasal secretion are disparate, whether the technique of measurement used was RIST or PRIST. Using the RIST technique we found an increased level of IgE in only 36,6% of the cases, findings which are consistent with those of Mogi et al. (1977) who, with the same method, found levels exceeding 120 IU/ml in 44.7% of the cases. We cannot compare our results with those of Mygind et al. (1975) who observed an increase in the nasal IgE level using the RIST technique in 24/25 patients with seasonal rhinitis, the secretion being obtained in the pollen season. However, our group consisted of a mixture of perennial and seasonal rhinitis and the secretion of these patients was not obtained in the pollen season. On the other hand, with the PRIST technique, we detected increased levels of IgE in the nasal secretion of the patients mentioned above (66.6% > 6 IU/ml). These results are similar to those obtained by Braun et al. (1979) using the same method (11.15 ± 9.92 IU/ml in their case and 15.6 ± 15.1 IU/ml in our case).

With regard to the concentrations of serum immunoglobulins the values of the group with allergic rhinitis were similar to those of the control group which is consistent with the findings of Momma (1965) and Okuda (1975). On the contrary as regards nasal secretion, the IgG, IgA and IgM levels were high compared to the control group, an increase described by Cohen et al. (1970); Alford (1969) and Rossen et al. (1965) but not by Hobday et al. (1975); Smith et al. (1967) and Mygind et al. (1975). These discrepancies may be explained by the different technology used when collecting the nasal secretion and the subsequent determination of the immunoglobulins. The authors mentioned above used the technique of radial immunodiffusion whereas we used nephelometry – a more resolutive, reliable and reproductive method.

With regard to the group with vasomotor rhinitis, the serum IgE levels were normal, results that tally with those of Braun et al. (1979) and Mygind (1978). As for IgE in nasal secretion with the RIST technique the values never exceeded 55 IU/ml, findings that are consistent with those of Mygind (1974): 25 IU/ml and Mogi et al. (1977): 63 IU/ml. When using the PRIST technique for measuring the IgE in nasal secretion we did not find any significant high values in comparison to those of the control group.

The serum immunoglobulins, as in the group of subjects with allergic rhinitis, were within the normal limits, data that were consistent with those of Jacobs et al. (1981). As for nasal secretion we observed a significant increase in IgG and IgA and a not significant one in IgM. The mean values for IgA were similar to those found by Braun et al. (1979): 22 ± 5 mg/100 ml and Jacobs et al. (1981): 28.8 mg/100 ml. In the case of the group with polyps of the 13 cases studied only 3 had an allergic etiology, which is consistent with Mygind et al. (1975): 4/14 and Wayoff et al. (1979): 6/26 although Caplin et al. (1971); Mullarkey et al. (1980) and Delaney (1976) detected no allergic status and associated polyps in the same patient. In subjects with polyps with an atopic substratum we found increased levels of serum IgE, observations which tally with the findings of Holopainen et al. (1979) as well as normal IgE values in non allergic patients. The levels of IgE in nasal secretion in subjects with bilateral nasal polyps, irrespective of an allergic process, were systematically high, data which are consistent with the findings of Holopainen et al. (1979) and Mygind (1975). On the other hand the IgE levels in nasal secretion in patients with unilateral polyps were normal.

The concentrations of serum IgG, IgA and IgM, as in the above cases, were normal in subjects with nasal polyps, whether allergic or not, unilateral or bilateral. As for the immunoglobulins in nasal secretion in the group with polyps we systematically found increased levels of immunoglobulins irrespective of an allergic etiology, data that coincide with the findings of Chandra (1974); Taylor (1963); Whiteside et al. (1975) and Dovovan et al. (1970). With regard to the correlation between Skin tests and specific IgE we found a positive correlation in 82% of the cases, results which tally with those of Stenius and Wide (1973); Perrin et al. (1978) and Pepys (1973) with house dust-mites.

When comparing total IgE/specific IgE we only observed a direct relationship between both parameters with levels exceeding 1000 IU/ml IgE though positive specific IgE with normal levels of serum IgE was not infrequent.

The relationship between specific IgE in serum and specific IgE in nasal secretion in patients with perennial allergic rhinitis was 54.8% which coincides with the findings of Mogi et al. (1977) and Merret et al. (1976) who point out that specific IgE antibodies in nasal secretion have lower levels than in serum. Howerver, Incaudo et al. (1980) found a greater number of positive cases in nasal secretion than in the serum in subjects with allergic rhinitis. In our study we found specific IgE antibodies in nasal secretion in only one case, in which we did not detect it in serum.

Concluding, our findings and our methodology seem to indicate the relevance of the determination of the total IgE in serum and nasal secretion, the performance of skin tests with a series of pneumoallergens and the determination of specific serum IgE in the diagnostic study of the NRI processes with presumable allergic etiology.

RÉSUMÉ

Nous avons étudié les taux des IgE, IgG, IgA et IgM dans le sérum et la sécrétion nasale parmi 83 patients (57 souffrant de rhinite allergique, 13 de rhinite vasomotrice, et 13 de polypose nasale). Le dosage des IgE nasales a été réalisé à l'aide des techniques du RIST et du PRIST; celui des IgE sériques à l'aide de la technique du PRIST. Les autres immunoglobulines ont été dosées par néphélométrie.

Le diagnostic clinique de rhinite allergique a été effectué sur base de l'anamnèse et de tests cutanés. Les taux des IgE spécifiques dans le sérum et la sécrétion nasale ont été mesurés à l'aide de la technique du RAST.

Nos résultats peuvent être résumés comme suit: aucune modification significative des taux sériques des immunoglobulines IgG, IgA, IgM; une augmentation des IgE sériques chez les sujets souffrant de rhinite allergique et de polypose allergique; une augmentation des IgE dans la sécrétion nasale chez les sujets souffrant de rhinite allergique et de polypose bilatérale, allergique ou non; une augmentation des trois autres immunoglobulines nasales dans les différents groupes étudiés, atopiques ou non.

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Dra. Victoria Pulido
c/Muntaner, 432,3^0
Barcelona-6, Spain