*Article*

# Predictors and their significance in the treatment of inflammation of the nasal cavity and paranasal sinuses of allergic etiology

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**Abstract:** Clinical symptoms evaluation is of great importance for an appropriate management of patients with respiratory allergy. Concomitant diseases shoud be taken in consideration before the choice of the necessary treatment options and nasal allergic inflammation pharmacotherapy. Mostly in case of nasal clinical symptoms the anatomic variations of the nasal cavity, type of sinusinflammation as well as the major nasal complaint shoud be analysed before the rational choice of treatment option. Materials and methods: 16 patients (9 males and 7 women, median age 40+13.72) with clinical symptoms of respiratory allergy were examined and divided into two groups according their sinus inflammation involvement. Nasal clinical symptoms according VAS and individual anatomy were analysed. 7 patients with allergic rhinitis without concomitant sinus inflammation were set to the first group and 9 patients with concomitant central compartment inflammation of ethmoid and maxillary sinuses were set to the second one. Individual anatomy variations and sinuses inflammation according Lund-Mackay score were evaluated by means of CT scans. Atopic state was confirmed by levels of blood sIgE with ImmunoCAP assay (Phadia). Other allergy tests included blood level of general IgE, eosinophilic cationic protein and parameters of respiratory function. Results: the group difference was supposed in case of anterior or middle nasal septal deviation with the strong correlation to central compartment maxillary and ethmoid sinuses inflammation (x2 Pearson = 0.645, p = 0.009). Also, the results supposed the group difference in symptoms of nasal obstruction. Almost all patients of group with concomitant sinus inflammation didn't present to the doctor with the major complaint of nasal obstruction (88.9%, p = 0,049). Rhinorrhea as major symptom was presented by 44.9% patients of this group. Discussion: clinical options for rational pharmacotherapy choice in patients with respiratory allergy should include nasal obstruction evaluation in case or individual anatomy and concomitant inflammation of paranasal sinuses central compartments.

**Keywords:** allergy, atopy, chronic rhinosinusitis, rhinitis, septal deviation.

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## 1. Introduction

Rational pharmacotherapy and the choice of the leading method of treatment in the case of clinical manifestations of respiratory allergy from the nasal cavity must necessarily take into account the data of a comprehensive examination and the presence of concomitant diseases and anatomical features.

For example, in the case of an otorhinolaryngological examination, it is important to analyze endoscopic examination, computed tomography to identify pathology of the paranasal sinuses and variant anatomy of the nasal cavity, which may affect tactics.

Prior to the appointment of treatment, a competent clinical assessment of the initial manifestations of rhinitis and rhinosinusitis is especially relevant.

As is known, by definition rhinitis is an inflammation of the nasal mucosa, which develops according to various data in about 40% of people [1].

Allergic rhinitis is most common among chronic rhinitis, and objective data indicate an increase in this pathology [2].

In the international classification of rhinitis by etiology, allergic, infectious and non-allergic non-infectious variants are distinguished [3].

In the case of an immune response when exposed to aeroallergen, the nasal mucosa reacts with the development of inflammation involving mast cells, CD4+ T-lymphocytes, B-lymphocytes,

macrophages, eosinophils. T-helper cells of type 2 predominate among T-lymphocytes, which are characterized by a cytokine profile with the release of IL-4, IL-5, IL-13, contributing to the production of IgE by plasma cells [1].

In the future, the interaction of IgE on the surface of mast cells of the mucous membranes with aeroallergen leads to the release of inflammatory mediators such as histamine, leukotrienes, which leads to vascular dilation, increased vascular permeability, itching, rhinorrhea, mucous discharge from the nasal cavity [2].

However, mucous discharge from the nasal cavity can also be observed in patients with pathology of the paranasal sinuses, including in the case of a chronic process.

Thus, according to the latest international classification of chronic rhinosinusitis [4], the criteria for diagnosis are the duration of the disease for more than 12 weeks and the presence of at least two complaints in the form of nasal congestion or nasal obstruction, rhinorrhea or postnasal congestion, combined with either pain or pressure in the projection of the sinuses, or with a violation of the sense of smell in adults and cough in children.

All this makes it difficult to choose the right tactics of rational pharmacotherapy in a patient with concomitant pathology of the paranasal sinuses, variant anatomy of the nasal cavity and respiratory allergies.

That is why it is important to conduct research on the analysis of leading complaints in patients with respiratory allergies and concomitant otorhinolaryngological pathology.

## 2. Patients and Methods

16 patients (9 men and 7 women, age 40+13.72) who were observed with clinical manifestations of respiratory allergy were divided into 2 groups depending on the available clinical features. The first group included 7 patients with allergic rhinitis, the second 9 patients with allergic rhinitis and involvement of the medial parts of the maxillary sinuses and cells of the lattice labyrinth in allergic inflammation according to computed tomography. Patients with previous surgical intervention in the nasal cavity and foreign bodies of the paranasal sinuses were excluded from the study.

The clinical diagnosis of allergic rhinitis was established in accordance with the recommendations of the RAACA on Allergic Rhinitis from 2020 and the International Conciliation Document [5]. In patients who underwent allergy testing, sensitization to aeroallergens was determined using specific IgE in the blood by ImmunoCAP (Phadia), documented data on the function of external respiration (FER).

According to the endoscopy of the nasal cavity and computed tomography of the paranasal sinuses, the indicators of involvement of the paranasal sinuses in the inflammatory process on the Lund-Mackay scale and individual variant anatomy of the nasal cavity were determined.

Complaints and their intensity were analyzed in all patients on a visual-analog scale (VAS).

Statistical processing of the results was carried out using the SPSS program, version 23.0.

## 3. Results

Comparison of clinical symptoms in patients in two groups showed a significant difference in the manifestations of the disease and the leading complaint from the nasal cavity. The complaint was considered the leading one with a high index on the visual-analog scale (VAS), its intensity at the initial appeal was 8 + 0.79 points. In patients of the first group with isolated allergic rhinitis, nasal congestion prevailed (in 4 patients out of 7, 57; 14%) and nasal discharge or rhinorrhea (in 3 out of 7 patients; 42.86%).

In the majority of patients of the second group (8 out of 9 patients; 88.9%), it was not obstructive syndrome and nasal congestion that prevailed, but complaints such as mucous discharge from the nose and rhinorrhea (44.4%), sneezing (11.11%), lacrimation (11.1%), dryness (11.1%), pain in the forehead (11.1%). Only one patient out of 9 with respiratory allergies and involvement of the central parts of the maxillary sinuses and the cells of the lattice labyrinth in the inflammatory process and concomitant curvature of the septum, nasal congestion was the leading complaint.

Taking into account the analysis of the variant anatomy of the nasal cavity and paranasal sinuses in patients of two groups, it was revealed that in the group of patients with involvement of the paranasal sinuses in the inflammatory process, such changes in individual anatomy as curvature of the nasal septum in the anterior/middle sections occurred in 9 out of 9 patients, in 100% of cases, unlike the first group where such changes were observed in 3 out of 7 patients (in 42.86%), the difference between the groups was statistically significant ($p = 0.009$).

In the group of patients with isolated allergic rhinitis, where the leading complaint of obstructive syndrome was more common, there was also a curvature of the nasal septum in the posterior parts (in 3 out of 7 people (42.86%), which distinguished it from the second group, where curvature in the posterior parts was not noted, the difference between the groups for this parameter was statistically significant ( $p = 0.029$).

Data were also obtained that in the second group of patients with inflammatory changes in the central parts of the nasal cavity and paranasal sinuses, in contrast to patients of the first group with isolated allergic rhinitis, there were such changes in variant anatomy as infraorbital cells or Haller cells (in 4 patients out of 9, 44.4%), the difference between the groups was statistically significant (p=0.042).

The frequency of development of such a leading complaint as nasal congestion and changes in variant anatomy in two groups is shown in figure 1.

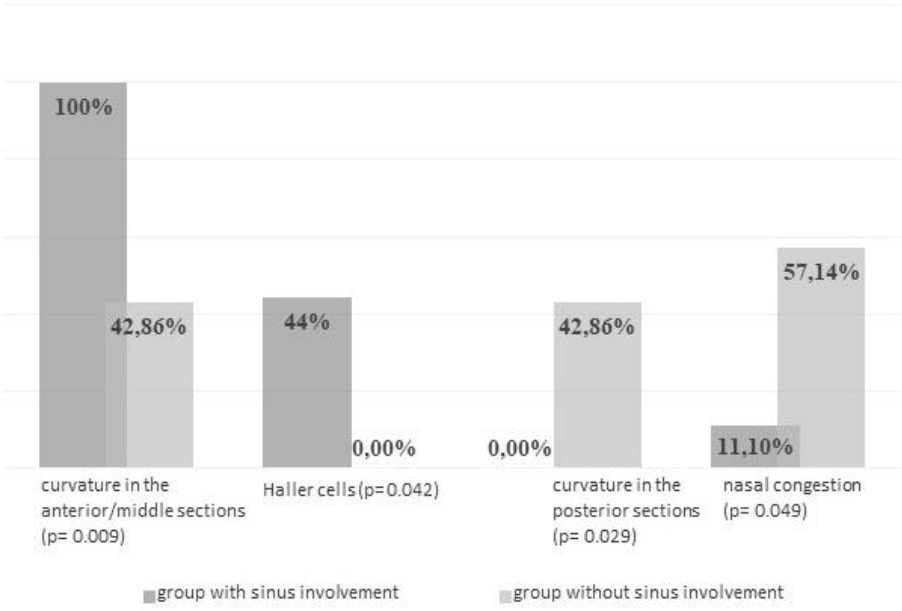


**Figure 1.** The difference between the groups according to the variant anatomy of the nasal cavity and the leading complaint in the form of nasal congestion.

In two groups of patients with both isolated allergic rhinitis and allergic rhinitis and involvement in the inflammatory process of the medial parts of the paranasal sinuses, there was no such comorbid pathology as bronchial asthma according to the assessment of respiratory function.

## 4. Discussion

A variant of central inflammation of the maxillary sinuses and the cells of the lattice labyrinth in chronic rhinosinusitis is known and included in the international classification of 2020 as atopic disease of the central parts of the nose [Grayson].

Taking into account the terminology of "atopic disease", it is important to analyze complaints, their similarity and difference from complaints of patients with allergic rhinitis, since at the moment it is known that 100% of patients with this nosology have respiratory allergies [6].

According to our study, in some patients with respiratory allergies, concomitant inflammation was indeed detected mainly in the medial parts of the maxillary sinuses and the cells of the lattice labyrinth. An example of computed tomography of a patient in a coronary projection is shown in Figure 2.

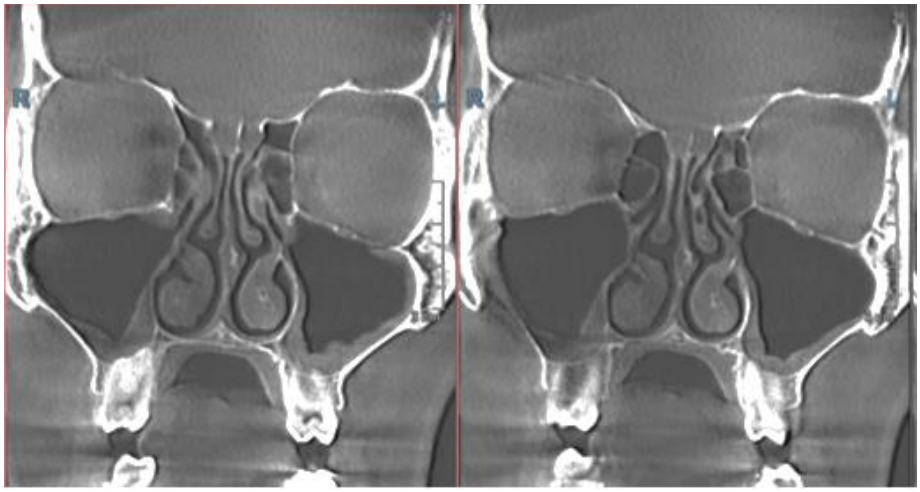

**Figure 2.** Involvement of the paranasal sinuses in the process of inflammation in respiratory allergies.

And such patients with involvement in the inflammatory process of the sinuses did not have such a comorbid pathology as bronchial asthma, which corresponds to the data described by foreign colleagues [6].

However, in the case of a decision on the primary conduct of rational pharmacotherapy and allergen-specific immunotherapy and surgical intervention, it is necessary to evaluate the leading complaints of the patient.

In our case, the majority of patients with respiratory allergies and concomitant involvement of the paranasal sinuses in the process of inflammation (89.9%) did not have symptoms of nasal congestion and obstructive syndrome, despite the presence of a curvature of the nasal septum in 9 patients out of 9 (in 100% of cases), which corresponds to the clinical diagnosis of a curvature of the nasal septum without respiratory dysfunction, and if the patient's management tactics are chosen, it indicates more in favor of primary rational pharmacotherapy of respiratory allergy, supplemented with allergen-specific immunotherapy, with the subsequent fortification of ASIT by supplementing with endoscopic rhinosurgery and/or septoplasty.

## 5. Conclusions

The data obtained by us indicate the importance of the syndromic approach and assessment of the leading complaint when choosing the primary management tactics of a patient with respiratory allergies, which is especially necessary in the case of concomitant pathology in the form of variant anatomy of the nasal cavity and involvement in the process of inflammation of the paranasal sinuses.

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**Conflicts of Interest:** The authors declare no conflict of interest.

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