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Research Article

Dynamics of Recovery of Functions of the Nasal Cavity in Patients with Aspirin-Intolerant Polypous Rhinosinusitis in the Postoperative Period

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Abstract
Surgical interventions in the nasal cavity are accompanied by reactive phenomena in the postoperative period. On their background the process of physiological regeneration is disorganized resulting in impaired physiological functions of the nasal cavity.
The objective of the research was to study the recovery process of the main physiological functions of the nasal cavity in patients with aspirin-intolerant polypous rhinosinusitis in the postoperative period.
Materials and methods. 80 patients with aspirin-intolerant polypous rhinosinusitis at the age of 24-57 years were operated on.All the patients were divided into 2 groups: the control group included 30 patients; the main group comprised 50 patients. Patients of the control group received nasal cavity cleaning, nasal mucosa anemisation, irrigation therapy since the first day of the postoperative period.Patients of the main group received an herbal drug BNO-101 additionally. The effectiveness was assessed on the 3rd, 7th and 10th days of treatment.
Results. The postoperative rehabilitation with the inclusion of botanical preparation BNO-101 provided a significant improvement of nasal breathing, mucociliary transport rate and indicators of nasal peak flowmetry compared to the control group. Despite subjective improvement of nasal breathing the indicators of the peak expiratory flow rate in the main group were 34.2% lower than the norm while in the control group they were 54.7% lower than normal ones thereby justifying further treatment.
Conclusions. The postoperative rehabilitation of patients with aspirin-intolerant polypous rhinosinusitis provided more rapid improvement of the main functions of the nasal cavity compared to the control group.

Keywords
polypous rhinosinusitis; aspirin intolerance; postoperative rehabilitation

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Problem statement and analysis of the recent research

Nowadays, treatment of chronic polypous rhinosinusitis remains to be difficult; therefore, it requires further improvement [8]. The existing methods for treating polyposis can be divided into two fundamentally opposite groups: conservative and surgical ones. However, general approaches to treatment of polypous rhinosinusitis associated with aspirin intolerance are slightly different from those to treating polyposis of any other etiology. Certainly, in the context of treating this form of polyposis surgical removal of polyps eliminates the manifestations but it does not eliminate the main cause of the disease. It should not be considered as radical treatment since aspirin-intolerant polypous rhinosinusitis is a metabolic disease caused by genetically determined defect of constitutive cyclooxygenase being the key enzyme of the arachidonic acid metabolism [2, 5]. In this situation, it would be appropriate to cite a good quotation that when a doctor takes a scalpel, he acknowledges his impotence. Nevertheless, polyps should be removed as otherwise it will be difficult to restore nasal breathing. Polypectomy is beneficial for patients relieving nasal symptoms; however, only surgical treatment is ineffective and in most cases (75-80%) it results in the development of recurrent polyposis and disease aggravation. Therefore, most researchers are unanimous in their belief that the integrated approach the main components of which are adequate surgical interventions in combination with anti-relapse therapy is the major and determining one [10, 12]. Functional endonasal endoscopic surgery which allows performing early anti-relapse therapy due to minimal surgical trauma is considered as an optimal operative treatment [1, 4].

Even modern minimally invasive endoscopic interventions are accompanied by reactive phenomena in the postoperative period. They can be conditionally grouped under the name of "postoperative acute (traumatic) rhinosinusitis" which manifests itself as the damage to the ciliated epithelium, edema and exudation, changes in the rheological properties of nasal mucus, degeneration and loss of cilia by ciliated cells, de-

creased ciliary activity of the ciliated epithelium [1, 13]. On the background of the aforementioned changes the process of physiological regeneration of the mucous membrane in the postoperative period is disorganized. The regenerative process becomes pathological [6, 7].

On this basis, the main requirement for the management of patients in the early postoperative period is to achieve the elimination of the aforementioned reactive phenomena within the shortest possible time as well as to orient the process of the mucous membrane regeneration in the physiological direction. We consider that the greatest attention should be paid to the early postoperative period as its orientation in the physiological direction is a guarantee of favorable course of the remote postoperative period as well as a significant prerequisite for the prevention of disease recurrences in the future [1, 7]. It is of particular importance due to the noticeable progress of endoscopic rhinosurgery the sparing and functional orientation of which often cause the need to stimulate the outflow of pathological content from the zone of surgical intervention in order to provide proper functioning of the natural sinus drainage in the postoperative period.

In the early postoperative period, the use of medicines which possess antiseptic, anti-edemic, anti-inflammatory, mucoactive action and create the possibilities for physiological purification of the injured mucosa, thereby, contributing to its reparative regeneration is pathogenetically justified [7].

Since this refers to local changes in the zone of surgical intervention on the background of significant systemic metabolic changes, in our opinion, pharmacotherapy should be both local and systemic and the choice of therapeutic agents should include the consideration of their effects on the function of the mucociliary apparatus. This combination should find its level in the postoperative treatment of patients with aspirin-intolerant polyposis. Modern combined standardized herbal drug BNO-101 with proven effectiveness and safety meets these requirements. It is used to treat acute and chronic rhinosinusitis due to its versatile pharmacological action as it includes medicinal herbs such as gentian root, primula flowers, sorrel herb, elderberry flowers and verbena herb [9, 11, 14].

The objective of the research was to study the dynamics of recovery of the nasal cavity functions in patients with aspirin-intolerant polypous rhinosinusitis depending on the postoperative rehabilitation scheme.

1. Materials and methods

The study included 80 patients at the age of 24-57 years (the average age was 45.7±0.85) with chronic polypous rhinosinusitis associated with aspirin intolerance and indications for surgical treatment who were treated in the ear, nose, and throat (ENT) department of Ivano-Frankivsk Regional Clinical Hospital during 2012-1015. There were 53 (66%) females and 27 (34%) males which indicates the tendency to a greater prevalence of this pathology among women.

Treatment of patients at the first stage included endoscopic surgeries according to the methods of functional endoscopic sinus surgery (FESS). In the presence of nasal comorbidity (deviated nasal septum, enlarged nasal turbinates, synechia) simultaneous surgery was performed in order to normalize the main functions of the nasal cavity as well as to provide an optimal endoscopic access to the elements of the ostiomeatal complex. All the patients were divided into 2 groups: the control group and the main group.

The control group (C) included 30 patients who received standard therapy (nasal cavity cleaning, nasal mucosa anemisation, irrigation therapy with salt water solutions) since the first day of the postoperative period.

The main group (M) included 50 patients who received an herbal drug BNO-101 according to the instructions (2 pills or 50 drops three times a day) in addition to standard therapy since the first day of the postoperative period.

Clinical evaluation of nasal breathing was performed according to the dynamics of the patients' complaints of nasal congestion on the 1st, 3rd and 7th days of the postoperative period. Subjective improvement of nasal breathing was registered in case when the expressiveness of the complaints did not affect life quality.

The evaluation of nasal mucociliary clearance (NMC) function was carried out using the saccharin test. A small particle of saccharin approximately 1-1.5 mm in diameter was placed on the inferior turbinate 1 cm behind its anterior end. Patients were instructed to swallow every 60 seconds and mention the moment they felt the sweet taste in the mouth. The amount of time was measured using the stopwatch timer. Time taken for sweat taste to be appreciated in the mouth was considered as NMC time. Normally it is up to 20 minutes. The evaluation of NMC function was carried out according to nasal congestion on the 1st, 3rd and 7th days of the postoperative period.

Instrumental evaluation of nasal breathing was carried out using nasal peak flowmetry – the determination of the peak expiratory flow rate (PEFR) on the 1st, 3rd and 7th days of the postoperative period. The measurements were carried out three times using a modified peak flowmeter Vitalograf before and after nasal mucosa anemisation. The best indicator was considered. Previously, there were determined normative indicators in healthy volunteers. The average normative values were 185-205 l/min for one nostril. When analyzing the data the percentage deviation of the indices obtained in patients from normative ones was calculated. The indicator was not calculated when its value was less than 60 l/min, i.e. the ultimate sensitivity of the device.

To assess the differences between groups one-factor dispersion analysis with subsequent use of the Tukey's multiple comparison test at a significance level of 0.05 was applied [13].

2. Results and Discussion

When considering the patients' complaints the greatest attention was paid to difficulty breathing through the nose or nasal

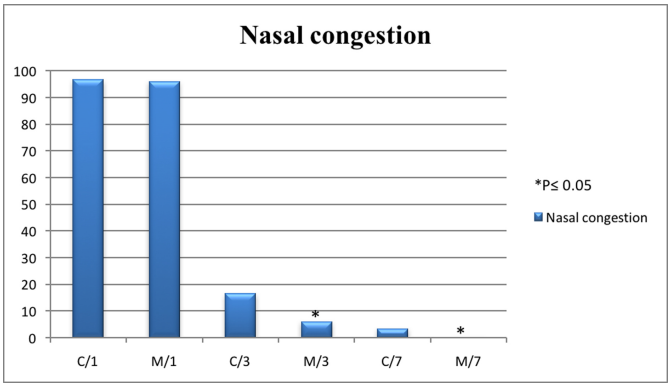

Figure 1. Dynamics of subjective complaints

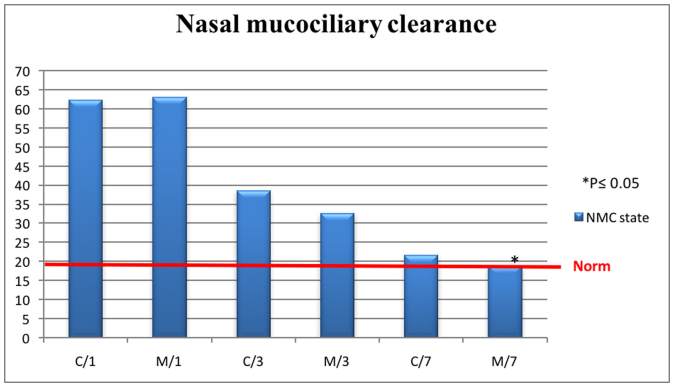

Figure 2. Dynamics of transport function restoration

congestion. The patients' complaints were evaluated in each group separately. Fig. 1 illustrates their dynamics during treatment.

Difficulty breathing through the nose within the first day of the postoperative period was the most common symptom being observed in almost all patients of the control (96.6%) and the main groups (96%) (Fig. 1). Severe regression of this clinical symptom was observed on the 3rd day of the postoperative rehabilitation and its percentage in the control group constituted 16.6% (5 patients) and in the main group it was 6% (3 patients). The difference between groups was statistically significant. On the 7th day, nasal breathing improved significantly in most patients of the control group (29 persons – 96.56%) and all the patients of the main group (50 persons – 100%). There was observed a significant difference in the results of treating patients of both groups in the context of nasal breathing restoration on the 3rd and 7th days of the postoperative period (Fig. 1).

Therefore, the normalization of the rheology of nasal mucus as well as balanced anti-inflammatory and anti-edemic action of herbal drug components resulted in more rapid normalization of difficulty breathing through the nose in patients of the main group compared to the control one.

When studying the state of mucociliary transport function of the nasal mucosa on the 1st day of the postoperative period, third-degree nasal mucociliary dysfunction was observed in all the patients (Fig. 2).

In the control group, the mean value for saccharin perception time was 62.3±0.03 min and in the main group it was 63.1±0.09; the differences in the mean values for saccharin perception time between groups before treatment were statistically insignificant ($p>0.05$). During treatment, gradual reduction in saccharin perception time was noted. In the control group on the 3rd day, the mean value for saccharin perception time was 38.6±0.08 min (second-degree nasal mucociliary dysfunction). 7 days after treatment onset, the value for saccharin perception time in patients of this group was 21.6±0.09 min (first-degree nasal mucociliary dysfunction) (Fig. 2).

The results of treating patients of the main group were better. On the 3rd day, patients developed second-degree nasal mucociliary dysfunction (the saccharine test – 32.6±0.14 min). These indicators were better compared to those of the control group; however, they indicated the tendency to the improvement only as the difference between both groups was statistically insignificant ($p>0.05$). On the 7th day, the indicators of mucociliary clearance became normal (the saccharine test – 18.8±0.10 min). The difference between the control group and the main group was statistically significant, $p<0.05$.

Thus, the results of studying mucociliary clearance demonstrated that treatment of patients of the main group resulted in complete restoration of mucociliary transport function, while in patients of the control group first-degree nasal mucociliary dysfunction was observed. The results of treating patients of the main group had a tendency to the improvement on the 3rd day and were significantly better on the 7th day after treatment ($p<0.05$).

Surgical treatment of aspirin-intolerant polyposis is initially a symptomatic method and the main goal of this intervention is to relieve symptoms of nasal obstruction. However, subjective sensation of improved nasal breathing should not be considered as a criterion of treatment efficacy, since immediately after complete nasal obstruction even a slight subjective relief of nasal breathing is positively perceived by patients. Therefore, the dynamics of the postoperative period was objectified using nasal peak flowmetry. When analyzing the data the percentage deviation of the indices obtained in patients from normative values obtained in healthy individuals was calculated (Fig. 3). In all the patients of both groups on the 1st day of the postoperative period, the phenomena of complete nasal obstructions were observed. Immediately after anemisation of the mucous membrane of the nose, nasal patency improved in all the patients. According to peak flowmetry data however, the indicators of nasal patency reduced by one half compared to normative values: 45.8% in the main group and 45.6% in the control one.

On the 3rd day of the postoperative rehabilitation in patients of both groups subjective improvement of nasal breathing was noted. When assessing the control group objectively the PEFR indicators without anemisation were 23.3%. In

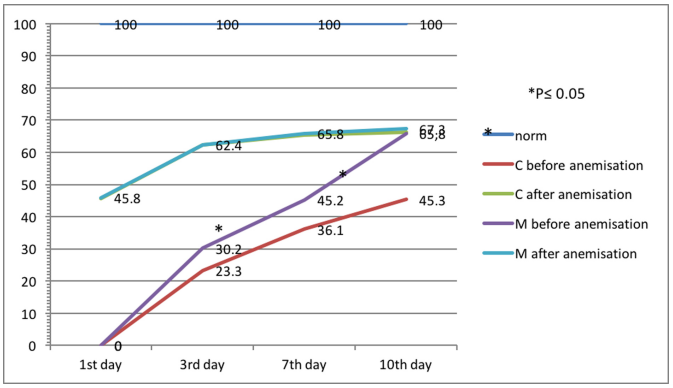

Figure 3. Dynamics of nasal breathing restoration according to nasal peak flowmetry data

patients who additionally received BNO-101 the PEFR indicators without anemisation were better – 30.2% (the difference between groups was statistically significant). After anemisation these indicators improved significantly in both groups – 62.4% in the main group and 62.2% in the control one (Fig. 3).

On the 7th day of the postoperative period alongside with subjective improvement of nasal breathing the indicators of nasal peak flowmetry without anemisation improved in both groups as well. Its results were better in the main group compared to the control one: 45.2% vs. 36.1%, respectively (the difference between groups was statistically significant). After anemisation, the indicators of both groups did not differ both between themselves and from the results of previous measurements: 65.8% in the main group and 65.4% in the control one (Fig. 3).

On the 10th day of the postoperative period, the PEFR indicators in the main group almost completely coincided with those obtained after nasal mucosa anemisation: 65.8% vs. 67.3%, however, they did not reach normative values. In the control group, the PEFR indicators without anemisation were worse compared to the main one: 45.3% vs. 65.8% (the difference between groups was statistically significant). Similarly, in the control group, the indicators without anemisation were worse than those obtained after anemisation – 66.2% (Fig. 3).

Thus, the dynamics of restoration of the PEFR in patients who received BNO-101 was faster than in patients of the control group. On the 10th day of the postoperative day the indicators were equal to the required ones, i.e. those obtained after careful anemisation of the nasal cavity. In the control group, the dynamics restored slower and on the 10th day the parameters did not reach the required values.

However, the required PEFR parameters in both groups were significantly lower than normative values indicating the necessity of further treatment of these patients.

Thus, the results of the research demonstrated that in patients of the main group who received herbal drug BNO-101 in addition to basic therapy in the postoperative period, the dynamics of restoration of nasal breathing and mucociliary transport function was the most intense. In our opinion, the combination of systemic action of drug components with topical preparations when treating patients of the main group allowed us to effectively influence the key elements in the pathogenesis of postoperative rhinosinusitis compared to local treatment of patients of the control group.

3. Conclusions

1. The postoperative rehabilitation with the inclusion of botanical drug BNO-101 when treating patients with aspirin-intolerant polypous rhinosinusitis provides faster improvement of nasal breathing according to the criterion of subjective complaints.

2. Despite a significant subjective improvement of nasal breathing the indicators of the peak expiratory flow rate in the main group were 34.2% lower than the norm while in the control group they were 54.7% lower than normal ones thereby justifying further treatment and reflecting specific features of aspirin-intolerant polypous rhinosinusitis etiopathogenesis.

3. The scheme of the early postoperative rehabilitation provides faster normalization of mucociliary transport function compared to the control group.

4. Prospects for further research

The study of the duration of relapse-free period in patients with aspirin-intolerant polypous rhinosinusitis using the proposed method of the early postoperative rehabilitation is promising.

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