

The impact of treatment under subterraneotherapy conditions at the “Wieliczka” Salt Mine Health Resort on the symptoms of diseases of the nose and paranasal sinuses

Wpływ leczenia w warunkach subterraneoterapii w Uzdrowisku Kopalnia Soli „Wieliczka” na objawy w chorobach nosa i zatok przynosowych

Authors' Contribution:

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Manuscript Preparation
E – Literature Search
F – Funds Collection

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ABSTRACT:

Introduction: Chronic rhinosinusitis is an important disease of the upper respiratory system which substantially reduces patient quality of life and the methods of symptomatic treatment are tremendously limited.

Aim: The aim of this study was to evaluate the next therapeutic option which is a combination of respiratory rehabilitation and subterraneotherapy.

Material and methods: The study covered 57 patients of whom 15 were men and 42 women. The average age of patients was 60 +/- 10.87 (standard deviation). 44 patients finished 15 days of therapy which covers full-time treatment. The average age of these patients was 59.7 +/- 11.6 (standard deviation).

Results: In the study group, there was a statistically significant reduction among all analyzed symptoms of chronic rhinosinusitis. The general severity of symptoms decreased from 5.66 cm to 2.57 cm ($p < 0.001$), blockade/congestion of the nose from 5.49 to 2.23 cm ($p < 0.001$), anterior nasal discharge from 5.33 cm to 2.5 cm ($p < 0.001$), posterior nasal discharge from 6.04 cm to 2.71 cm ($p < 0.001$), facial pain/pressure from 3.43 cm to 1.45 cm ($p < 0.001$), headache from 3.73 cm to 1.19 cm ($p < 0.001$) and reduction or loss of smell from 4.17 cm to 1.94 cm ($p < 0.001$).

Conclusions: Such a notable improvement in all analyzed symptoms led us to conclude that respiratory rehabilitation, especially such conducted in adequate climatic conditions, should be a valuable therapeutic option in the symptomatic treatment of patients with chronic rhinosinusitis.

KEYWORDS:

chronic non-allergic rhinitis, respiratory rehabilitation, subterraneotherapy

STRESZCZENIE:

Wstęp: Przewlekły nieżyt nosa i zatok przynosowych jest istotnym schorzeniem górnych dróg oddechowych, znaczenie upośledzającym jakość życia pacjentów. Metody jego leczenia objawowego są jednak niezwykle ograniczone.

Cel: Celem niniejszej pracy była ocena opcji terapeutycznej leczenia objawowego przewlekłego niealergicznego nieżyty nosa i/lub zatok przynosowych w postaci połączenia rehabilitacji oddechowej z subterraneoterapią.

Materiał i metody: Badaniem objęto 57 pacjentów, 15 mężczyzn i 42 kobiety. Wiek badanych wynosił 60,6 +/- 10,87 (odch. st.) lat. Pełne leczenie (15 dni zabiegowych) ukończyło 44 pacjentów, 11 mężczyzn i 33 kobiety. Wiek badanych, którzy ukończyli

leczenie, to: 59,7 +/- 11,6 (odch. st.) lat.

Wyniki: W badanej grupie wystąpiło statystycznie istotne zmniejszenie nasilenia wszystkich analizowanych objawów przewlekłego nieżyty nosa i/lub zatok przynosowych. Ogólne nasilenie objawów zmniejszyło się z 5,66 cm do 2,57 cm ($p < 0,001$), blokada nosa z 5,49 do 2,23 cm ($p < 0,001$), wydzielina z nosa z 5,33 cm do 2,5 cm ($p < 0,001$), uczucie sypiania wydzieliny po tylnej ścianie gardła z 6,04 cm do 2,71 cm ($p < 0,001$), uczucie bólu lub rozpięcia twarzy z 3,43 do 1,45 cm ($p < 0,001$), ból głowy z 3,73 do 1,19 cm ($p < 0,001$) i uczucie ograniczenia węchu z 4,17 do 1,94 cm ($p < 0,001$).

Wnioski: Tak znacząca poprawa w zakresie wszystkich analizowanych objawów pozwala nam wysnuć wniosek, że rehabilitacja oddechowa, w szczególności prowadzona w odpowiednich warunkach klimatycznych, powinna być cenną opcją terapeutyczną w leczeniu objawowym pacjentów z przewlekłym nieżytem nosa i zatok przynosowych.

SŁOWA KLUCZOWE: przewlekły niealergiczny nieżyt nosa, rehabilitacja oddechowa, subterraneoterapia

ABBREVIATION

AR – allergic rhinitis

ARIA – allergic rhinitis is well documented

VAS – Visual Analogue Scale

INTRODUCTION

According to the GA(2)LEN study, chronic rhinosinusitis is a major problem for over 10% of Europeans (7–27%) [1]. Both patients and experts assess this condition as extremely burdensome, costly and having a powerful impact on overall health. Professionals define chronic rhinosinusitis as inflammation of the nasal cavity and paranasal sinuses, characterized by at least 12 weeks of feeling a blockade/congestion of the nose or anterior nasal discharge/posterior nasal discharge and a feeling of facial pressure and/or altered sense of smell (EPOS 2020) [2]. Despite such a high frequency of the disease, treatment is relatively poor and depends on the severity of symptoms and the ability to identify causal factors. Nasal corticosteroids, nasal rinsing and modification of factors that may aggravate symptoms, e.g., smoking cessation, are recommended. Therefore, an additional therapeutic option may be climatic treatment [2–5].

In rhinology practice, more than 40% of rhinitis is non-allergic. This group of conditions seems to be entirely classified as chronic rhinosinusitis, and rarely as periodic. However, it also has a seasonal severity and periodic remission. The increase in the intensity of symptoms usually occurs in turning points in our seasons, mainly in autumn and spring, and depends primarily on changes in climatic conditions – air temperature and humidity. Often, the intensification of symptoms is a consequence of psychological stresses, which are more common during periods of intensive work [6].

Correct diagnosis of the causes of rhinitis often creates difficulties, but it is extremely important for the appropriate treatment and improvement of the patient's quality of life. Pharmaceuticals used in the treatment of rhinitis differ in indications and effectiveness across various phenotypes [6]. The purpose of comprehensive rhinitis treatment is to control symptoms of the disease, improve patient quality of life and prevent complications. While the treatment of allergic rhinitis is well documented (ARIA) [7], there are few therapeutic options left for patients with non-allergic rhinitis. The basic treatment consists in rinsing the nasal

passages and an attempt to eliminate irritants: smoking cessation, elimination of occupational factors, medications (in drug-induced catarrhs), and some foods (gustatory rhinitis) [6, 8].

PURPOSE

Assessment of the effectiveness of pulmonary rehabilitation under subterraneotherapy conditions in the treatment of symptoms of chronic rhinosinusitis.

MATERIAL AND METHODS

Study participants

The study included 57 patients aged 18–75 treated at the “Wieliczka” Salt Mine Health Resort in the underground pulmonary rehabilitation center due to chronic rhinosinusitis sinuses between November 2019 and February 2020.

Patients are qualified for treatment in an underground pulmonary rehabilitation center on the basis of a referral from a specialist doctor (ENT specialist, allergist, pulmonologist, medical rehabilitation specialist) and a diagnosis of ICD-10 J30-J98. The stay lasts 15 days (six-hour underground sessions combined with respiratory and physical rehabilitation). The sessions are held from Monday to Friday. On the starting day, patients undergo an additional medical qualification (specialist in pulmonology, allergology, balneology and physical medicine) at the center, on the basis of which they are qualified or disqualified for treatment and assigned to an exercise group depending on the underlying disease, comorbidities and age.

Study design

Patients referred for treatment to the underground pulmonary rehabilitation center by a specialist in ENT or allergology with the diagnosis J31 and/or J32 were initially qualified for the study. The final qualification was made on the basis of an interview (the patient's medical documentation) and a physical examination.

Patients with coexisting chronic conditions of the lower respiratory tract and with a positive history of allergy (symptoms related to allergen exposure, a history of positive PTS/IgEs) were excluded.

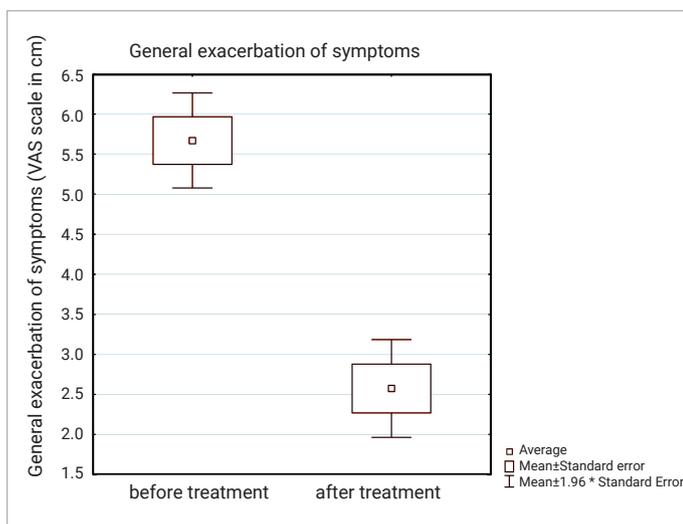


Fig. 1. Assessment of the general severity of symptoms of the nose and/or paranasal sinuses using the VAS scale before and after treatment (15 days of pulmonary rehabilitation in subterraneotherapy conditions) – $p < 0.001$.

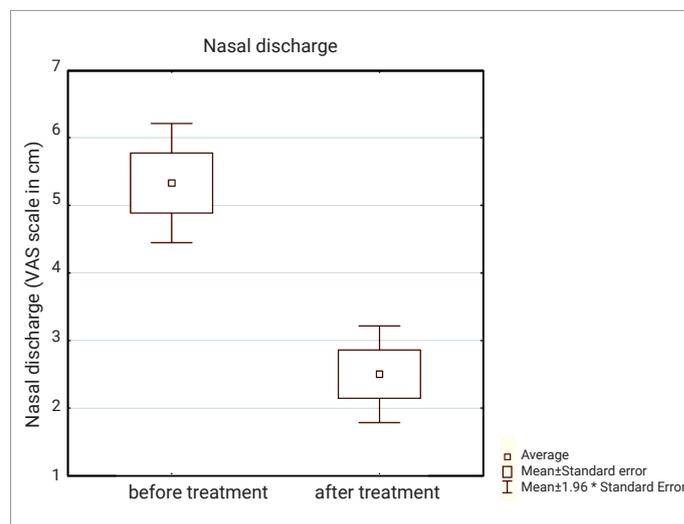


Fig. 3. Assessment of the burdensomeness of nasal discharge using the VAS scale before and after treatment (15 days of pulmonary rehabilitation in subterraneotherapy conditions) – $p < 0.001$.

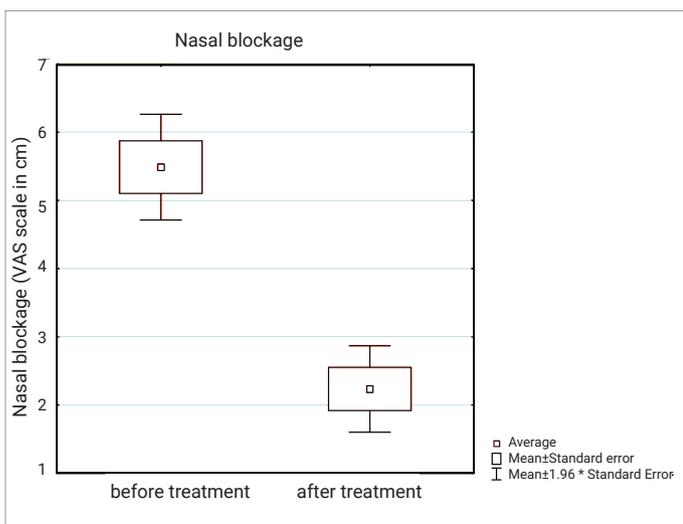


Fig. 2. Assessment of the degree of nasal blockage using the VAS scale before and after treatment (15 days of pulmonary rehabilitation in subterraneotherapy conditions) – $p < 0.001$.

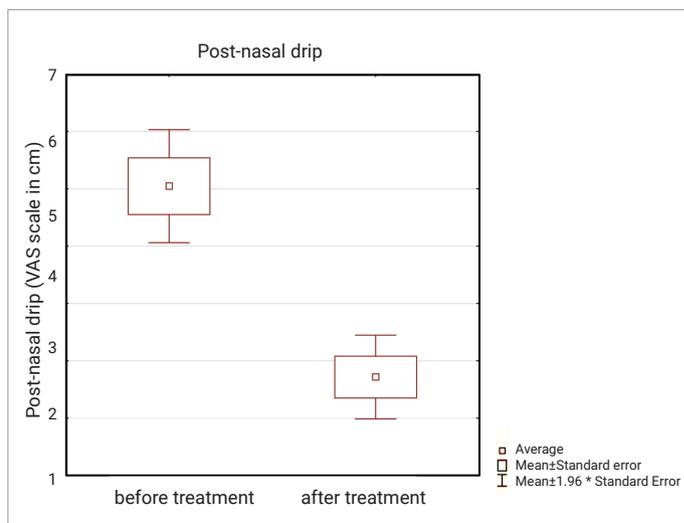


Fig. 4. Assessment of post-nasal drip using the VAS scale before and after treatment (15 days of pulmonary rehabilitation in subterraneotherapy conditions) – $p < 0.001$.

All qualified patients completed a questionnaire on occupational and environmental exposure as well as the nature and treatment of symptoms to date.

On the first day of treatment, the patients assessed the following symptoms using a VAS scale [9]: symptom severity, nasal blockage/stuffiness, nasal discharge, nasal drip, pain/a sense of distention, headache, loss of sense of smell.

After the rehabilitation stay was finished, patients participating in the study re-assessed their symptoms using the VAS scale [9].

Statistical analysis of the results

Descriptive statistics for the examined parameters – count, mean, standard deviation, median, minimum and maximum

values – for continuous parameters and as the number and percentage – for categorical parameters. The results of the VAS scale [9] were compared using the independent samples t-test (STATISTICA version 13.3). P values < 0.05 were considered statistically significant.

Informed consent

Before commencing the qualification procedures, each participant gave their free and informed consent to partaking in the study and processing personal data to the extent necessary to conduct the study. The participants received information on the nature, purpose and procedures of the study, and the inconveniences related to it. Information about the study was provided in writing. The study was approved by the bioethics committee.

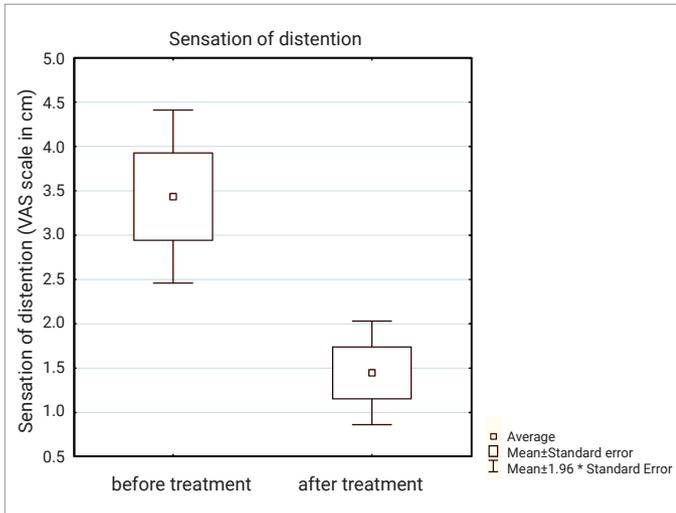


Fig. 5. Assessment of the feeling of facial pain/sensation of distention using the VAS scale before and after treatment (15 days of pulmonary rehabilitation in subterraneo therapy conditions) – $p < 0.001$.

RESULTS

Group description

The study covered 57 patients: 15 men and 42 women. The age of the respondents was 60.6 ± 10.87 (standard deviation) (min. 34 max. 79 years). The mean age of women was 59 ± 11 years, and of men 64.7 ± 8.7 years ($p = 0.28$).

Full treatment was completed by 44 patients, 11 men and 33 women (15 treatment days). The age of subjects who completed treatment: 59.7 ± 11.6 (standard deviation) (min. 34 max. 79 years), women on average 59 ± 11 , men 64.7 ± 8.7 ($p = 0.28$).

The study included 57 patients, 15 men (26%) and 42 women.

The study group included 51 non-smoking patients (89.5%) and 6 smokers. Living in smoking homes (currently) was declared by 16 patients (28%). Working patients: 9 (33.3%), unemployed patients: 38.

The surveyed patients found the following possible factors that could affect the symptoms from the upper respiratory tract:

1. Patients suspected of having allergies – 17, of which only 7 reported the allergens which they suspected (interview indicated childhood allergy, but not currently),
2. Patients with coexisting gastroesophageal reflux – 19,
3. Patients with deviated nasal septum – 24 (42%),
4. Patients suspecting the influence of professional work – 19.

Symptoms located on the left side were reported by 7 patients, on the right side – 8, bilateral – 41, difficult to determine – 1 patient. Laryngological operations were performed on 19 patients – 33.3% of the respondents.

Statistically significant differences in initial symptoms between women and men were observed only when assessing the severity

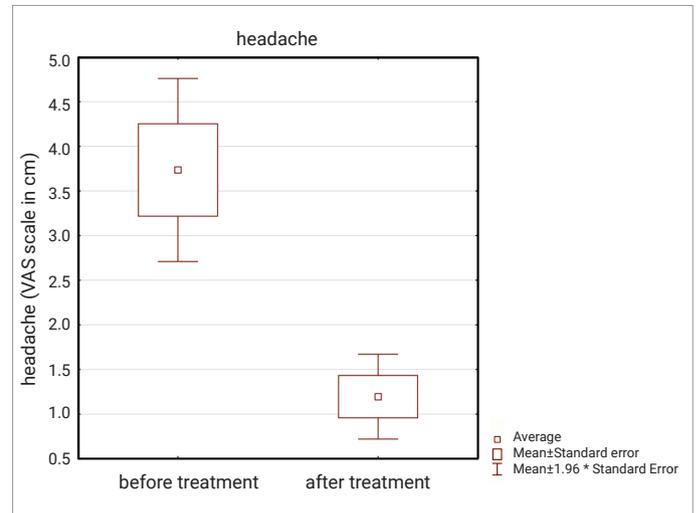


Fig. 6. Assessment of the severity of headache using the VAS scale before and after treatment (15 days of pulmonary rehabilitation in subterraneo therapy conditions) – $p < 0.001$.

of headache (4.38 cm vs 1.8 cm, $p = 0.03$), while after treatment the difference ceased to be statistically significant (women: 1.03 vs 1.25 cm in men, $p = 0.69$)

No statistically significant difference was observed between smokers and non-smokers, and between smokers and those living in a smoke-free environment in the initial assessment of symptoms. Similarly, there were no differences between working and non-working people and patients after ENT surgery versus those without it.

Similarly, apart from a substantial difference in the assessment of the burdensomeness of secretion in passive smokers versus people living in a smoke-free environment (1.9 vs 3.7 cm), there was no statistically significant difference in the severity of symptoms between the above groups after the end of treatment.

Analysis of group

In the study group, there was a statistically significant reduction in the intensity of all the analyzed symptoms of chronic rhinosinusitis. The overall severity of symptoms decreased from 5.66 cm to 2.57 cm ($p < 0.001$), nasal obstruction from 5.49 to 2.23 cm ($p < 0.001$), nasal discharge from 5.33 cm to 2.5 cm ($p < 0.001$), post-nasal drip from 6.04 cm to 2.71 cm ($p < 0.001$), feeling of pain or sensation of distention from 3.43 to 1.45 cm ($p < 0.001$), headache from 3.73 to 1.19 cm ($p < 0.001$) and a feeling of reduced sense of smell from 4.17 to 1.94 cm ($p < 0.001$).

DISCUSSION

Although non-allergic rhinosinusitis, compared to chronic diseases of the lower respiratory tract, generates a considerably lower risk of death and long-term complications for patients, its symptoms significantly impair the patient quality of life. The burdensomeness of symptoms may be the cause of chronic frustration

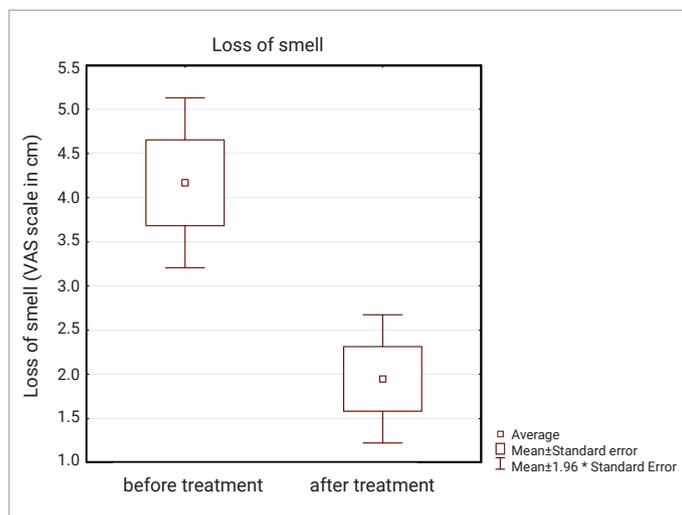


Fig. 7. Assessment of the loss of smell using the VAS scale before and after treatment (15 days of pulmonary rehabilitation in subterraneootherapy conditions) – $p < 0.001$.

when the effectiveness of the current specialist treatment (usually ENT, allergological, gastrointestinal) is negligible and does not produced the desired results. Tabish [10] points out that this situation prompts patients to seek help in alternative medicine treatments, the effectiveness of which is not always proven in EBM research. Therefore, in taking care of the patient's safety, it is worth offering symptomatic treatment methods tested in other diseases. In the case of patients with conditions of the upper respiratory tract, such treatment is undoubtedly pulmonary rehabilitation.

In Recommendation No. 57/2019 of 30 December 2019 of the President of the Agency for Health Technology Assessment and Tariff System on the change of medical technology in the field of pulmonary rehabilitation, experts unanimously emphasize that pulmonary rehabilitation represents one of the key multi-dimensional elements of disease management, which is a non-pharmacological activity in patients with respiratory diseases. The aim of pulmonary rehabilitation is both to educate patients and to obtain and maintain their fitness with diseases such as COPD, cystic fibrosis, bronchiectasis, asthma, interstitial lung disease, lung cancer and others. In this document, experts mention the obvious benefits of rehabilitation: improvement of exercise tolerance, quality of life, reduction of anxiety, depression, stimulation of activity, reduction of hospitalization frequency. However, this document is also lacking a literal mention of chronic rhinosinusitis as a major disease entity requiring symptomatic treatment. What is more, this condition was not listed among the most common diseases of the respiratory system that were analyzed by experts (but it included, among others, interstitial lung disease with an incidence of 11-24/100,000) [11]. Omitting chronic diseases of the upper respiratory tract in

treatment and rehabilitation plans for patients with respiratory conditions is undoubtedly a mistake. Licari et al. discuss the concept of a single respiratory passage – correct both in pathophysiological, morphological and practical terms. For patients, breathing through the mouth with untreated, cool and dry air ends with obstructive diseases of the lower respiratory tract, usually with exacerbation of symptoms. Another classic hypothesis of the so-called “allergic march” refers to the sequence of events beginning with rhinitis and followed by bronchial asthma. Thus, allergic rhinitis (AR) and bronchial asthma require an integrated diagnostic and therapeutic approach to control both diseases. The etiology and mechanisms of non-allergic UAD are still unknown, while the importance of the proper functioning of the upper respiratory tract in maintaining the efficiency of the lower respiratory tract remains undisputed [12].

Patients with non-allergic rhinitis decide to undergo respiratory rehabilitation and climatic treatment usually as a consequence of ineffective specialist treatment (usually ENT, allergology, gastrology). Therefore, the symptomatic improvement observed by our team in this group of patients represents a valuable therapeutic indication for the physician. Subterraneootherapy combined with pulmonary rehabilitation brought an improvement in the VAS score in our group, comparable to the effects of nasal glucocorticoid treatment in allergic rhinitis, which is considered the “gold standard” of symptomatic treatment of this disease entity. After 14 days of treatment, Wang et al. observed that patients had a reduction in nasal blockage from 5.51 to 2.43 cm, and of discharge from 5.87 to 2.5 cm. Similar values were also recorded by our team after 15 days of rehabilitation under subterraneootherapy conditions in patients with non-allergic rhinitis [13].

Interestingly, the available literature includes studies showing the effectiveness of other balneological treatments in patients with non-allergic rhinitis. Cantone et al. demonstrated the effectiveness of crenotherapy in a randomized trial [14]. In the crenotherapy group, there was a significant improvement in the severity of symptoms measured with the VAS scale in terms of the amount of secretions (7.06 ± 1.04 vs 3.32 ± 1.22 , $P < 0.05$), nasal obstruction (7.26 ± 0.97 vs 3.43 ± 1.14 , $P < 0.05$) and sneezing (7.48 ± 1.07 vs 3.44 ± 1.09 , $P < 0.05$). There was also an improvement in the endoscopic image of the nasal mucosa on the VAS scale (4.26 ± 1.04 vs 1.50 ± 1.19 , $P < 0.05$) among patients receiving crenotherapy.

CONCLUSIONS

Respiratory rehabilitation, in particular rehabilitation carried out in appropriate climatic conditions, should be a valuable therapeutic option in the symptomatic treatment of patients with chronic rhinosinusitis.

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