

CLINICAL CHARACTERISTICS, DIAGNOSTIC APPROACHES, AND TREATMENT OUTCOMES IN PATIENTS WITH CHRONIC RHINOSINUSITIS

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Received: 2026-07-21 · Accepted: 2026-08-25

Abstract

Chronic rhinosinusitis is a persistent inflammatory disorder of the nasal cavity and paranasal sinuses that significantly affects respiratory function, sleep, daily activity, and health-related quality of life. The clinical presentation is heterogeneous and may include nasal obstruction, persistent nasal discharge, postnasal drainage, facial pressure, reduction or loss of smell, headache, cough, and recurrent exacerbations. The complex interaction between mucosal inflammation, impaired mucociliary clearance, anatomical abnormalities, allergic or non-allergic inflammatory mechanisms, infection, and individual susceptibility makes diagnosis and treatment challenging. Modern diagnostic strategies combine detailed clinical assessment with nasal endoscopy, computed tomography, evaluation of olfactory function, and selected laboratory or allergy investigations. Treatment is generally based on disease phenotype, severity, duration, comorbid conditions, and previous therapeutic response. Intranasal corticosteroids and saline irrigation constitute important components of conservative management, while systemic therapy may be considered in selected patients with acute exacerbations or specific inflammatory phenotypes. Functional endoscopic sinus surgery may be indicated when appropriately selected patients remain symptomatic despite adequate medical treatment or when significant anatomical obstruction is present. This article analyzes the major clinical characteristics, diagnostic approaches, and treatment outcomes associated with chronic rhinosinusitis. Particular attention is given to the relationship between symptom severity, endoscopic and radiological findings, inflammatory phenotype, treatment selection, and long-term disease control. A multidisciplinary and individualized approach appears essential for reducing symptom burden, improving sinonasal function, and limiting recurrence.

Keywords: chronic rhinosinusitis, nasal obstruction, nasal endoscopy, computed tomography, sinus inflammation, olfactory dysfunction, intranasal corticosteroids, functional endoscopic sinus surgery, treatment outcomes, quality of life.

1. Introduction

Chronic rhinosinusitis is one of the most common chronic inflammatory disorders affecting the upper respiratory tract. It is characterized by persistent inflammation of the nasal and paranasal sinus mucosa accompanied by a combination of characteristic symptoms and, when appropriately

evaluated, objective evidence of sinonasal disease. The condition can substantially interfere with normal nasal breathing, olfaction, sleep, physical activity, occupational performance, and social functioning.

Unlike acute rhinosinusitis, which is usually associated with a relatively short episode of infection or inflammation, chronic rhinosinusitis persists over an extended period and frequently follows a fluctuating course. Patients may experience continuous symptoms, periods of partial improvement, and recurrent exacerbations. This clinical variability makes the disease difficult to characterize using symptoms alone.

The pathogenesis of chronic rhinosinusitis is multifactorial. Persistent mucosal inflammation can be associated with impaired epithelial barrier function, altered mucociliary transport, local immune dysregulation, anatomical narrowing of sinus drainage pathways, microbial factors, allergy, environmental exposures, and systemic inflammatory conditions. These mechanisms do not occur with the same intensity in every patient, resulting in substantial clinical heterogeneity.

Two broad clinical phenotypes frequently discussed in contemporary rhinology are chronic rhinosinusitis without nasal polyps and chronic rhinosinusitis with nasal polyps. Although these categories are useful clinically, they do not completely describe the biological diversity of the disease. Patients within the same phenotype may demonstrate different inflammatory patterns, disease severity, comorbidities, and responses to treatment.

Nasal obstruction is among the most frequently reported symptoms and may result from mucosal edema, inflammatory tissue, polyps, structural narrowing, or a combination of these mechanisms. Nasal discharge and postnasal drainage may further contribute to discomfort and cough. Altered olfactory function is particularly important because it can influence nutrition, safety perception, emotional well-being, and overall quality of life.

Facial pressure or discomfort is also common, although its presence and intensity do not always correlate closely with objective inflammatory disease. Headache may occur, but clinicians should recognize that not all headaches in patients with sinonasal symptoms are caused by chronic rhinosinusitis. Careful differential diagnosis is therefore essential.

Modern diagnosis requires correlation between symptoms and objective findings. Nasal endoscopy provides direct visualization of the nasal cavity, middle meatus, mucosal edema, purulent secretions, polyps, crusting, and anatomical abnormalities. Computed tomography provides detailed information about sinus opacification, mucosal thickening, anatomical variations, obstruction of drainage pathways, and disease distribution.

Treatment has also evolved from a predominantly symptom-based approach toward individualized management based on inflammatory phenotype, disease severity, anatomical factors, comorbidities, and response to previous treatment. Medical therapy remains the foundation of treatment for most patients, whereas surgery is considered when appropriate conservative therapy does not provide adequate control or when structural disease requires intervention.

The objective of this study was to comprehensively assess the clinical characteristics, diagnostic approaches, and treatment outcomes of patients with chronic rhinosinusitis, with particular emphasis on the relationship between subjective symptoms, objective findings, therapeutic strategy, and long-term disease control.

2. Materials and Methods

A clinical-analytical study design was used to evaluate patients presenting with symptoms compatible with chronic rhinosinusitis. The assessment included clinical history, physical examination, nasal endoscopy, radiological evaluation, assessment of olfactory function, evaluation of relevant comorbidities, and analysis of treatment response.

Patients were evaluated according to the duration and characteristics of sinonasal symptoms. Particular attention was given to nasal obstruction, anterior nasal discharge, postnasal drainage, facial pressure or discomfort, headache, reduction in smell, cough, sleep disturbance, and recurrent exacerbations. The duration, persistence, and severity of symptoms were recorded during the clinical assessment.

A detailed medical history was obtained to identify factors potentially associated with disease persistence or severity. These included previous episodes of rhinosinusitis, allergic symptoms, asthma-related manifestations, smoking or environmental exposure, previous nasal or sinus surgery, medication use, recurrent respiratory infections, and other relevant comorbid conditions.

Anterior rhinoscopy was performed as an initial examination, followed by nasal endoscopy when clinically indicated. Endoscopic assessment was used to evaluate mucosal edema, inflammatory secretions, polyps, crusting, septal deviation, obstruction of the middle meatus, and other structural abnormalities. Endoscopic findings were interpreted together with the clinical presentation rather than used as an isolated diagnostic criterion.

Computed tomography of the paranasal sinuses was used in patients requiring objective radiological assessment, particularly when symptoms were persistent, disease severity was significant, surgical intervention was being considered, or the diagnosis remained uncertain. CT evaluation focused on the distribution of mucosal disease, sinus opacification, ostiomeatal complex involvement, anatomical variations, and other structural findings.

Olfactory function was evaluated using patient-reported symptoms and, where available, standardized smell assessment. The degree of olfactory impairment was classified according to the severity of reported dysfunction and objective testing results.

Selected laboratory investigations were performed when clinically justified. These could include complete blood count, inflammatory markers, and assessment for allergic or systemic inflammatory conditions. Laboratory testing was not considered a substitute for clinical and endoscopic diagnosis but was used to characterize selected patient subgroups.

Treatment strategies were categorized into conservative medical management and surgical intervention. Medical treatment included saline nasal irrigation, intranasal corticosteroids, symptomatic management, and selected systemic medications when clinically appropriate. Antibiotic therapy was considered only in situations where bacterial infection or an acute exacerbation was clinically suspected.

Patients with persistent symptoms despite appropriate medical management and those with significant structural disease were considered for functional endoscopic sinus surgery. Surgical treatment was individualized according to disease distribution, anatomical abnormalities, presence of nasal polyps, and previous treatment response.

Treatment outcomes were assessed using symptom improvement, nasal obstruction reduction, improvement of discharge and facial discomfort, recovery or improvement of olfactory function, endoscopic findings, frequency of exacerbations, need for additional medication, and patient-reported quality of life.

3. Results

The clinical assessment demonstrated substantial variability in the presentation of chronic rhinosinusitis. Nasal obstruction was one of the most consistently reported symptoms and was particularly prominent in patients with significant mucosal edema, anatomical narrowing, or nasal polyposis. Patients frequently described difficulty breathing through the nose during both daytime and nighttime, with some reporting worsening during sleep.

Nasal discharge and postnasal drainage were also common. The character and persistence of secretions varied between patients. Some individuals reported predominantly watery discharge, whereas others described thicker or mucopurulent secretions, particularly during exacerbations. Persistent postnasal drainage was frequently associated with throat irritation and cough.

Reduction in olfactory function represented an important clinical characteristic. Patients with extensive inflammatory changes or nasal polyps more frequently reported diminished smell compared with patients whose disease was predominantly characterized by localized mucosal inflammation. In some individuals, olfactory dysfunction was one of the symptoms that most strongly affected quality of life.

Facial pressure and discomfort were reported with variable intensity. The distribution of discomfort did not always correspond directly to radiological disease severity, emphasizing the importance of interpreting facial symptoms within the broader clinical context. Headache was also reported by a proportion of patients, but clinical assessment was necessary to distinguish sinonasal symptoms from primary headache disorders.

Sleep disturbance was an important secondary consequence of chronic nasal obstruction. Patients frequently reported difficulty maintaining comfortable sleep, mouth breathing, nocturnal awakening, or morning fatigue. These findings indicate that the impact of chronic rhinosinusitis extends beyond the upper respiratory tract.

Nasal endoscopy provided important objective information that complemented symptom assessment.

Mucosal edema, inflammatory secretions, narrowing of the middle meatus, and polyps were among the most frequently observed findings. In some patients, endoscopic abnormalities were present despite relatively moderate subjective symptoms, whereas others reported substantial symptom burden with comparatively limited endoscopic findings.

Computed tomography demonstrated different patterns of sinonasal involvement. Some patients had predominantly localized mucosal thickening, while others showed more extensive involvement of multiple sinus compartments. Ostiomeatal complex obstruction and anatomical variations were particularly relevant in patients being considered for surgical treatment.

The relationship between CT findings and symptoms was not always linear. Extensive radiological abnormalities did not invariably correspond to severe subjective complaints. Conversely, some patients with substantial functional impairment demonstrated relatively modest radiological changes. This supports the concept that diagnosis and treatment decisions should not be based exclusively on CT severity.

Patients receiving consistent medical therapy generally demonstrated improvement in nasal obstruction, discharge, and overall sinonasal comfort. Regular saline irrigation helped reduce secretion retention and improve nasal hygiene, while intranasal corticosteroid therapy contributed to control of mucosal inflammation in appropriate patients.

The response to medical therapy varied according to disease phenotype and adherence. Patients who used prescribed intranasal therapy consistently generally demonstrated better symptom control than those with irregular treatment patterns. Education regarding correct administration technique and treatment duration was therefore an important component of disease management.

Patients with nasal polyps frequently required longer-term treatment and closer follow-up.

Inflammatory polypoid disease could improve with topical corticosteroid therapy, but recurrence remained a concern in patients with persistent underlying inflammatory activity.

Selected patients with acute exacerbations received systemic treatment according to clinical indications. The use of antibiotics was individualized rather than applied routinely, with consideration of the overall clinical presentation and likelihood of bacterial involvement.

Patients who underwent functional endoscopic sinus surgery generally demonstrated improvement in nasal airflow, obstruction, secretion-related symptoms, and overall quality of life when appropriately selected. Surgical intervention provided an opportunity to restore sinus ventilation and drainage and to improve access for postoperative topical therapy.

Postoperative management remained important for maintaining treatment benefits. Saline irrigation, topical anti-inflammatory therapy, endoscopic follow-up, and management of persistent inflammatory factors were associated with better long-term disease control. Surgery was therefore considered part of a continuing management strategy rather than an isolated definitive procedure.

Olfactory outcomes varied. Some patients experienced substantial improvement following control of mucosal inflammation and restoration of nasal airflow, while others continued to have impaired smell despite improvement in other symptoms. Persistent olfactory dysfunction may reflect long-standing inflammatory injury, epithelial dysfunction, or underlying inflammatory phenotype.

Patients with recurrent disease required more intensive follow-up. Recurrence was particularly relevant among individuals with nasal polyps, persistent inflammatory comorbidities, incomplete adherence to topical therapy, or extensive disease at baseline.

4. Discussion

The clinical findings emphasize that chronic rhinosinusitis should be understood as a heterogeneous inflammatory disorder rather than a single uniform disease. Although nasal obstruction, discharge, facial discomfort, and olfactory dysfunction constitute the major symptom domains, their relative intensity varies substantially between patients.

Nasal obstruction is clinically important because it directly affects breathing, sleep, exercise tolerance, and quality of life. The underlying mechanism may involve mucosal inflammation, polyps, septal deviation, turbinate enlargement, or narrowing of sinus drainage pathways. Identifying the dominant mechanism is important when selecting treatment.

Olfactory dysfunction deserves particular attention. Smell impairment may result from mechanical obstruction preventing odor molecules from reaching the olfactory region, inflammatory changes affecting the olfactory epithelium, or more persistent neuroepithelial dysfunction. Consequently, restoration of nasal airflow does not guarantee complete recovery of smell.

The relatively imperfect relationship between symptoms and CT findings is an important clinical consideration. Computed tomography provides detailed anatomical information, but radiological abnormalities may persist without proportional symptoms. Conversely, symptom severity can be influenced by inflammatory mediators, mucosal sensitivity, sleep disturbance, and other factors that are not fully represented by structural imaging.

For this reason, CT should be used as part of an integrated diagnostic process. Clinical history and symptom characterization establish the initial probability of disease, endoscopy provides direct evidence of mucosal pathology, and CT defines anatomical distribution and structural changes. Combining these sources of information improves diagnostic confidence.

Nasal endoscopy has particular value because it allows direct visualization of regions that cannot be adequately assessed through routine anterior examination. It can identify polyps, inflammatory secretions, edema, crusting, and localized abnormalities. Endoscopic evaluation is also useful during follow-up because it provides an opportunity to monitor mucosal response and postoperative healing. Medical therapy remains central to chronic rhinosinusitis management. Saline irrigation supports mechanical clearance of mucus, allergens, and inflammatory debris. Intranasal corticosteroids can reduce mucosal inflammation and are especially relevant for patients with persistent inflammatory symptoms or nasal polyps.

The effectiveness of topical therapy depends partly on adherence and administration technique. Patients may discontinue treatment prematurely when symptoms improve or may use incorrect spraying techniques. Education regarding regular use and appropriate delivery can therefore influence treatment outcomes.

Systemic corticosteroids may provide short-term benefit in selected patients, particularly those with significant nasal polyposis or severe inflammatory disease. However, repeated systemic exposure carries potential adverse effects and should not substitute for an appropriate long-term topical management strategy.

Antibiotic use requires careful consideration. Chronic rhinosinusitis is primarily an inflammatory disorder, and persistent symptoms do not automatically indicate bacterial infection. Excessive or inappropriate antibiotic use may expose patients to adverse effects without addressing the underlying inflammatory mechanisms. Antibiotic treatment should therefore be guided by clinical circumstances rather than used as routine long-term therapy.

Functional endoscopic sinus surgery represents an important option for appropriately selected patients who remain symptomatic despite adequate medical treatment or who have structural disease preventing effective sinus drainage. The primary purpose of surgery is to restore functional ventilation and drainage and to facilitate continued topical treatment.

The observed postoperative improvement in nasal obstruction and quality of life is consistent with the principle that surgery can provide meaningful benefit when patient selection is appropriate. Nevertheless, surgery does not eliminate the biological tendency toward chronic inflammation. Patients with persistent inflammatory disease, particularly those with nasal polyps, may experience recurrence.

Postoperative care is therefore an essential component of treatment. Regular saline irrigation, topical anti-inflammatory therapy, endoscopic surveillance, and management of associated inflammatory conditions can help maintain surgical benefits.

The presence of asthma, allergic disease, and other inflammatory conditions may influence disease severity and treatment response. Chronic rhinosinusitis should therefore be evaluated within the broader context of the patient's respiratory and inflammatory health.

The concept of inflammatory phenotype has become increasingly important. Some patients demonstrate predominantly type 2 inflammatory characteristics, whereas others may have different inflammatory profiles. These differences may influence disease behavior, recurrence risk, and responsiveness to specific therapies.

For severe chronic rhinosinusitis with nasal polyps that remains uncontrolled despite conventional management, targeted biologic therapies have expanded therapeutic possibilities. Biologic agents directed against specific inflammatory pathways may reduce polyp burden and improve symptoms in appropriately selected patients. Their use requires careful patient selection, monitoring, and consideration of long-term treatment requirements.

The increasing availability of biological therapies reinforces the importance of accurate phenotyping. Rather than treating all patients identically, clinicians can increasingly consider inflammatory

characteristics, disease severity, previous treatment response, comorbid asthma, recurrence patterns, and quality-of-life impairment.

Another important consideration is patient-reported outcome assessment. Objective endoscopic and CT findings are valuable, but they do not fully capture the patient's experience. Quality-of-life instruments can measure nasal symptoms, sleep impairment, fatigue, emotional effects, and limitations in daily activities.

Long-term management should therefore combine subjective and objective measures. Improvement in symptoms without objective improvement may require reassessment, while persistent radiological abnormalities without clinically meaningful symptoms do not necessarily justify escalation of treatment.

The results also support a multidisciplinary approach. Collaboration between otorhinolaryngologists, allergists, pulmonologists, radiologists, laboratory specialists, and primary-care physicians may be particularly beneficial for patients with severe, recurrent, or treatment-resistant disease.

Future developments in chronic rhinosinusitis management are likely to involve molecular phenotyping, biomarkers of inflammatory activity, digital symptom monitoring, advanced imaging analysis, and personalized treatment algorithms. These approaches may help identify which patients will respond to topical treatment, surgery, or targeted biological therapy.

Overall, effective management requires recognition that chronic rhinosinusitis is a long-term inflammatory condition. Successful treatment is not defined only by short-term symptom reduction but also by sustained disease control, preservation of olfactory function, reduction of exacerbations, improvement of quality of life, and prevention of unnecessary treatment.

5. Conclusion

Chronic rhinosinusitis is a heterogeneous inflammatory disorder with substantial effects on nasal function, olfaction, sleep, daily activity, and quality of life. Nasal obstruction, persistent discharge, postnasal drainage, facial discomfort, and olfactory dysfunction constitute the major clinical manifestations, but their severity and combination vary considerably among patients.

Accurate diagnosis requires integration of clinical history, symptom assessment, nasal endoscopy, and appropriate radiological evaluation. Computed tomography is particularly useful for defining anatomical disease distribution and planning surgical intervention, whereas nasal endoscopy provides direct assessment of mucosal and polypoid changes. Neither method should be interpreted independently of the clinical presentation.

Medical management remains the foundation of treatment. Saline irrigation and intranasal corticosteroids play central roles in controlling symptoms and mucosal inflammation. Systemic medications should be reserved for clinically appropriate situations, while antibiotic therapy should be individualized rather than routinely prescribed for persistent chronic symptoms.

Functional endoscopic sinus surgery can provide significant improvement in appropriately selected patients with persistent symptoms or relevant anatomical obstruction. However, surgery should be regarded as part of a continuing treatment pathway because the underlying inflammatory process may persist and recurrence can occur.

Long-term outcomes are influenced by disease phenotype, inflammatory burden, comorbidities, treatment adherence, and postoperative care. Patients with recurrent or severe disease may require more intensive monitoring and, in selected cases, advanced targeted therapies.

The future of chronic rhinosinusitis management is likely to move toward increasingly personalized diagnostic and therapeutic strategies. Integration of clinical characteristics, endoscopic findings, imaging, inflammatory biomarkers, patient-reported outcomes, and molecular phenotyping may improve patient selection and treatment response. A comprehensive, individualized, and long-term approach remains essential for achieving sustained clinical control and improving the quality of life of patients with chronic rhinosinusitis.

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