

CHRONIC RHINOSINUSITIS: MODERN APPROACHES TO DIAGNOSIS, TREATMENT, AND PREVENTION IN OTORHINOLARYNGOLOGY

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Abstract

Chronic rhinosinusitis (CRS) is one of the most common diseases encountered in otorhinolaryngology and significantly affects the quality of life of millions of individuals worldwide. The condition is characterized by persistent inflammation of the nasal cavity and paranasal sinus mucosa lasting for more than twelve weeks despite appropriate medical treatment. Chronic rhinosinusitis contributes to substantial healthcare expenditures, reduced work productivity, and increased morbidity. The pathogenesis of CRS is multifactorial and involves complex interactions among microbial infections, allergic reactions, environmental factors, anatomical abnormalities, and host immune responses. Recent advances in diagnostic techniques and therapeutic strategies have improved disease management and patient outcomes. This article reviews current concepts regarding the epidemiology, etiology, clinical manifestations, diagnostic evaluation, treatment modalities, and preventive measures for chronic rhinosinusitis. The findings emphasize the importance of individualized treatment plans and multidisciplinary approaches in achieving long-term disease control and improving patient quality of life.

Keywords: Chronic rhinosinusitis, paranasal sinuses, nasal obstruction, inflammation, endoscopic sinus surgery, otorhinolaryngology, diagnosis, treatment, prevention.

1. Introduction

Chronic rhinosinusitis is a widespread inflammatory disorder affecting the mucosal lining of the nasal passages and paranasal sinuses. It represents a major public health concern due to its high prevalence and long-term impact on physical, psychological, and social well-being. Epidemiological studies indicate that approximately 10–15% of the global population may experience symptoms consistent with chronic rhinosinusitis at some point in their lives. The disease is particularly prevalent among adults, although pediatric cases are also commonly observed.

The condition is defined by persistent symptoms lasting longer than twelve weeks, including nasal congestion, facial pressure or pain, nasal discharge, reduction or loss of smell, and postnasal drip. Chronic rhinosinusitis is generally classified into two major phenotypes: CRS with nasal polyps (CRSwNP) and CRS without nasal polyps (CRSSNP). These phenotypes differ in their inflammatory

pathways, clinical presentation, and response to treatment.

The pathophysiology of CRS has evolved considerably over the past decades. Earlier theories focused primarily on bacterial infections as the principal cause of disease. However, contemporary research highlights the role of chronic inflammation, mucociliary dysfunction, epithelial barrier disruption, biofilm formation, fungal colonization, and dysregulated immune responses. Genetic susceptibility and environmental exposures further contribute to disease development and progression. Patients suffering from chronic rhinosinusitis often experience significant impairments in sleep quality, concentration, work performance, and emotional health. The chronic nature of symptoms can lead to anxiety, depression, and social isolation. Consequently, early diagnosis and effective management are essential for minimizing complications and enhancing patient outcomes. Understanding current evidence-based approaches is crucial for otorhinolaryngologists and healthcare professionals involved in the treatment of CRS.

2. Materials and Methods

This study was conducted as a comprehensive literature review and analytical assessment of current scientific evidence regarding chronic rhinosinusitis. Relevant articles were identified through searches of international medical databases, including PubMed, Scopus, Web of Science, and Google Scholar. Publications from the last fifteen years were prioritized to ensure the inclusion of contemporary diagnostic and therapeutic approaches.

The selection criteria included peer-reviewed studies, clinical trials, systematic reviews, meta-analyses, and professional guidelines related to chronic rhinosinusitis. Studies focusing on epidemiology, pathophysiology, diagnosis, medical treatment, surgical interventions, and preventive strategies were thoroughly examined. Articles lacking scientific rigor or containing insufficient clinical data were excluded from analysis.

Data extraction involved evaluating information concerning patient demographics, risk factors, diagnostic criteria, imaging findings, treatment outcomes, complication rates, and long-term prognosis. Comparative analysis was performed to identify trends and emerging concepts in CRS management. The collected evidence was synthesized and interpreted to provide a comprehensive overview of current knowledge and clinical practice.

3. Results

Analysis of the reviewed literature demonstrated that chronic rhinosinusitis remains a highly prevalent inflammatory disorder with multifactorial etiology. Numerous studies identified allergic rhinitis, asthma, environmental pollution, smoking, immunodeficiency, anatomical variations, and recurrent respiratory infections as major risk factors contributing to disease development.

Clinical manifestations were found to vary depending on disease phenotype and severity. The most frequently reported symptoms included persistent nasal obstruction, mucopurulent nasal discharge, facial pain or pressure, hyposmia, anosmia, headache, and postnasal drainage. Patients with nasal polyps commonly exhibited more severe olfactory dysfunction and extensive mucosal inflammation. Diagnostic evaluation was shown to rely on a combination of clinical assessment, nasal endoscopy, and radiological imaging. Computed tomography (CT) remains the gold standard imaging modality for evaluating sinus anatomy, disease extent, and surgical planning. Endoscopic examination provides direct visualization of mucosal edema, purulent secretions, and nasal polyps, thereby facilitating accurate diagnosis.

Medical therapy continues to serve as the cornerstone of treatment. Intranasal corticosteroids demonstrated significant efficacy in reducing mucosal inflammation and improving symptom control. Saline irrigation was consistently associated with enhanced mucociliary clearance and reduced symptom severity. Short courses of systemic corticosteroids were particularly beneficial in patients with nasal polyps.

Antibiotic therapy showed variable effectiveness depending on disease etiology and microbial involvement. Evidence suggested that prolonged antibiotic use should be reserved for carefully selected cases due to concerns regarding antimicrobial resistance. Biologic agents targeting specific inflammatory pathways emerged as promising therapeutic options for severe CRS with nasal polyps, particularly among patients with coexisting asthma.

Endoscopic sinus surgery was reported to provide substantial symptom improvement in patients who

failed to respond adequately to medical treatment. Functional endoscopic sinus surgery (FESS) improved sinus ventilation, facilitated drainage, and enhanced the effectiveness of postoperative topical therapies. Most studies reported significant improvements in quality of life and symptom scores following surgical intervention.

4. Discussion

The findings of this review underscore the complexity of chronic rhinosinusitis and the necessity for individualized management strategies. Modern understanding recognizes CRS as a heterogeneous inflammatory disorder rather than a purely infectious disease. This paradigm shift has influenced diagnostic approaches and expanded treatment options.

Inflammatory mechanisms play a central role in disease pathogenesis. In patients with CRSwNP, type 2 inflammation characterized by eosinophilic infiltration and elevated cytokine production is frequently observed. These immunological pathways contribute to persistent mucosal edema, tissue remodeling, and polyp formation. Consequently, targeted biologic therapies have emerged as innovative treatment modalities capable of addressing underlying disease mechanisms.

Environmental factors remain significant contributors to disease progression. Exposure to tobacco smoke, industrial pollutants, and airborne allergens may exacerbate inflammation and impair mucociliary function. Preventive interventions aimed at reducing environmental exposures can therefore contribute to improved disease control.

The role of surgery continues to evolve alongside advances in endoscopic technology. Modern functional endoscopic sinus surgery is associated with high success rates and low complication risks when performed by experienced surgeons. Surgical intervention should be viewed as a complementary component of comprehensive disease management rather than a replacement for medical therapy.

Despite significant progress, several challenges remain. Disease recurrence continues to occur in a subset of patients, particularly those with severe inflammatory phenotypes. Long-term follow-up and adherence to maintenance therapy are therefore essential for sustaining clinical benefits. Future research should focus on identifying reliable biomarkers, developing personalized treatment algorithms, and optimizing biologic therapies.

5. Conclusion

Chronic rhinosinusitis is a common and clinically significant inflammatory disorder that imposes considerable burdens on patients and healthcare systems. Advances in understanding disease pathogenesis have transformed diagnostic and therapeutic strategies, emphasizing the importance of inflammation, immune dysregulation, and environmental influences. Comprehensive assessment involving clinical evaluation, nasal endoscopy, and computed tomography remains essential for accurate diagnosis. Medical management, including intranasal corticosteroids and saline irrigation, represents the foundation of treatment, while endoscopic sinus surgery provides effective symptom relief for refractory cases. Emerging biologic therapies offer promising opportunities for patients with severe disease phenotypes. Early diagnosis, individualized treatment plans, and long-term follow-up are critical for improving patient outcomes and quality of life.

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