E- Global Congress
Hosted online from Dubai, U. A. E., E - Conference.
Date: 30th January 2024
Website: https://eglobalcongress.com/index.php/egc
ISSN (E): 2836-3612

CHRONIC SINUSITIS: PATHOPHYSIOLOGY, DIAGNOSIS, AND MANAGEMENT

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Abstract

Chronic sinusitis, also known as chronic rhinosinusitis (CRS), is a prolonged inflammatory condition affecting the paranasal sinuses and nasal passages lasting more than 12 weeks. Unlike acute sinusitis, which is commonly infectious in origin, chronic sinusitis is characterized by persistent mucosal inflammation that may or may not be associated with infection. CRS significantly affects patients' quality of life, with symptoms including nasal obstruction, facial pain, postnasal drip, and hyposmia. This article reviews the pathophysiology, clinical presentation, diagnostic approaches, and evidence-based treatment options for chronic sinusitis, with emphasis on the importance of multidisciplinary care and individualized management strategies.

Keywords: Chronic sinusitis, chronic rhinosinusitis, nasal inflammation, endoscopy, CT imaging, corticosteroids, nasal polyps

Introduction

Chronic sinusitis is a common but complex medical condition involving persistent inflammation of the mucosal lining of the paranasal sinuses lasting longer than 12 weeks. It affects up to 12% of the population globally and often results in a substantial healthcare burden. Chronic sinusitis can occur with or without nasal polyps and is frequently associated with comorbidities such as asthma, allergic rhinitis, or aspirin-exacerbated respiratory disease (AERD).

The disease is increasingly viewed not as a simple infection but as a multifactorial disorder involving immune dysregulation, microbial dysbiosis, and mucociliary dysfunction. Diagnosis requires a careful

ISSN (E): 2836-3612

combination of clinical evaluation and objective confirmation through imaging or endoscopy. Treatment varies depending on disease phenotype and may include medical therapy, nasal irrigation, corticosteroids, antibiotics, immunotherapy, or surgery.

Main Body.

1. Pathophysiology

Chronic sinusitis is driven by persistent inflammation rather than acute infection. The exact pathophysiology is multifactorial and varies by subtype:

- CRS with nasal polyps (CRSwNP): Associated with eosinophilic inflammation, Th2-mediated immune responses, and often coexists with asthma or AERD.
- CRS without nasal polyps (CRSsNP): Often shows neutrophilic infiltration and may involve bacterial biofilms, impaired mucociliary clearance, or anatomical obstructions.

2. Clinical Presentation

The hallmark symptoms of chronic sinusitis include:

- Nasal obstruction or congestion
- Facial pressure or fullness
- Postnasal drip or nasal discharge
- Reduction or loss of smell (hyposmia/anosmia)
- Chronic cough, fatigue, or dental pain in some cases

Symptoms must persist for ≥12 weeks for diagnosis.

3. Diagnosis

Diagnosis is based on:

- Clinical criteria: At least two of the above symptoms (one must be nasal blockage or discharge), lasting ≥12 weeks.
- Objective findings: Mucosal changes seen on:
  - Nasal endoscopy (polyps, mucosal edema, discharge)
  - CT scan (sinus opacification, mucosal thickening, obstruction)

ISSN (E): 2836-3612

Materials and Methods

This article is based on a narrative review methodology. Databases including PubMed, Scopus, and Google Scholar were searched using keywords such as "chronic rhinosinusitis," "nasal polyps," "CRS diagnosis," and "CRS treatment." Articles and clinical guidelines published between 2010 and 2024 were reviewed. Preference was given to randomized controlled trials, systematic reviews, and international guidelines such as EPOS (European Position Paper on Rhinosinusitis and Nasal Polyps) and AAO-HNS (American Academy of Otolaryngology – Head and Neck Surgery) standards. Information was synthesized to reflect current best practices.

Discussion

Chronic sinusitis remains a diagnostic and therapeutic challenge due to its heterogeneity. The distinction between CRSwNP and CRSsNP is critical, as these subtypes exhibit different inflammatory patterns and responses to therapy. Imaging and endoscopic examination are essential tools in diagnosing and phenotyping CRS, especially when planning surgical interventions.

Despite advances in understanding the inflammatory pathways, CRS is still often mismanaged — particularly through the overuse of antibiotics or delayed surgical referral. Modern treatment strategies emphasize long-term topical corticosteroids, saline irrigation, and the use of biologic therapies (e.g., Dupilumab) in patients with refractory CRSwNP.

Surgical intervention (functional endoscopic sinus surgery, or FESS) is reserved for patients with persistent symptoms despite maximal medical therapy. Postoperative management, including continued steroid use and follow-up endoscopy, is essential for long-term control.

There is a growing interest in the role of the sinonasal microbiome, immune regulation, and genetic factors in the pathogenesis of CRS, offering new opportunities for personalized treatment strategies in the future.

Conclusion

Chronic sinusitis is a multifactorial, chronic inflammatory condition that requires a nuanced diagnostic and therapeutic approach. Accurate classification, symptom duration, and objective findings are vital for

ISSN (E): 2836-3612

effective management. Current best practices favor a stepwise treatment model: starting with maximal medical therapy and proceeding to surgical intervention if necessary. Emerging biologic therapies offer new hope for patients with severe or refractory disease, particularly those with CRSwNP. Improved understanding of underlying mechanisms and continued research into personalized treatments will be key to optimizing patient outcomes in chronic sinusitis care.

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