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Evaluation and Management of the Patient with "Sinus"

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KEYWORDS

- Sinus • Sinusitis • Acute sinusitis • Chronic sinusitis
- Rhinosinusitis

THE TROUBLESOME PATIENT WITH SINUS COMPLAINTS

Sinus complaints are common presenting symptoms in both general and specialty practice. An estimated 20% of outpatient antibiotic prescriptions in the United States can be attributed to acute or chronic sinusitis.¹ Allergic rhinitis is estimated to affect 10% to 30% of the US population,² and adults experience approximately 4 acute viral upper respiratory tract infections (URTIs) per year.³ Conventional wisdom holds that approximately 0.5% to 2% of viral URTIs will evolve into an acute bacterial sinusitis.³ Some individuals may be prone to develop recurrent upper respiratory infections because of environmental exposures, comorbid conditions such as allergic rhinitis, and rarely, immunodeficiency.⁴ The role of sinonasal anatomic deformity, cigarette smoking, and air pollution as causative factors for upper respiratory illness is likely but unproven. In some instances, no predisposing factors can be identified, and some individuals may be prone to seek medical care for simple URTIs that would be tolerated by most of the population.

Unlike many other conditions, patients with sinonasal symptoms often present complaining of a diagnosis. The patients may complain of sinus, by which they mean sinusitis, or allergies by which they mean allergic rhinitis. This self-diagnosis is often incorrect, and it becomes the physician's responsibility to determine the underlying process. This tendency toward self-diagnosis is fostered by a general societal awareness of respiratory conditions, the patient's upbringing, personal experiences, and previous medical encounters. It is also likely that ubiquitous advertisement of a variety of over-the-counter sinus medications contributes to patient perceptions and misinterpretation of symptoms.

The patient with sinus challenges the generalist physician to make accurate diagnoses, provide appropriate medical treatment that is also acceptable to the patient, minimize the unnecessary use of antibiotics, and limit overutilization of health care

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system resources. One aim of this article is to confront the lay wisdom of patients about sinus disease and help the clinician develop an effective cost-conscious approach to manage these patients. A more encyclopedic synthesis of available information on rhinitis and sinusitis can be accessed via several well-written guidelines.^{2,5}

SYMPTOMS OF SINUS DISEASE ARE OFTEN NONSPECIFIC

Among the frustrations and difficulties that go along with the assessment and treatment of patients with sinonasal complaints, perhaps the most difficult is the process of gathering information that can yield a reliable diagnosis. As discussed later, there are some diagnostic tools to determine the presence of sinus inflammation, but in a primary care setting, the patient's history provides the most useful information.

However, the symptoms of rhinitis and sinusitis can be subtle, absent, or misleading. Symptoms that may be reasonably attributed to sinonasal inflammation include nasal congestion, nasal stuffiness, nasal airway obstruction, a decreased sense of smell and taste, anterior rhinorrhea, postnasal drainage, facial pressure or outright facial pain, cough, fatigue, malaise, ear pressure or fullness, maxillary dental pain, and headache. Detailed questioning of the patient may be required to further elucidate what the patient means when they use these terms. For example, nasal congestion could denote nasal airway obstruction, that is, a perceived increased resistance to nasal airflow. But another patient may use the same term to describe a fullness or pressure sensation within the nasal cavity. So, in addition to acquiring the full list of symptoms that the patient describes, it may also be necessary to clarify the meaning behind commonly used terms.

The symptoms of rhinitis and sinusitis often overlap, and it is increasingly recognized that patients with sinusitis also frequently have inflammation in the nasal cavity, and vice versa. For this reason, the term rhinosinusitis is increasingly used in the literature. Among the symptoms of rhinosinusitis, no single symptom or set of symptoms has been found to be especially sensitive or specific to distinguish acute bacterial sinusitis from other causes of the same symptoms, such as a viral URTI or an exacerbation of allergic or nonallergic rhinitis. In addition, some symptoms such as headache or facial pain, which are commonly attributed to sinus disease by the lay public, may have no relationship to rhinosinusitis. This misperception is reinforced by advertisements for sinus pain remedies. Although midfacial pain may be a prominent symptom of acute maxillary sinusitis, facial pain and headache are not cardinal symptoms of chronic sinonasal inflammatory diseases. Chronic, longstanding, or recurrent headache and facial pain are uncommon symptoms of sinusitis.

PHYSICAL EXAMINATION FINDINGS ARE OFTEN NEITHER SENSITIVE NOR SPECIFIC

Routine physical examination provides little information that is helpful to define the sinonasal inflammatory process that may be causing a patient's symptoms. Nevertheless, a thorough head and neck examination that focuses on the nasal cavity may provide contributory evidence of the underlying disease process. Textbooks on physical diagnosis often describe sinus tenderness, lack of sinus transillumination, or maxillary dental sensitivity as physical findings that support the diagnosis of acute sinusitis. However, these findings are neither sensitive nor specific.

Intranasal examination can determine the presence of inflammatory changes such as mucosal edema or erythema, and abnormal secretions. The classic findings for allergic rhinitis include pale or bluish nasal mucosa with clear secretions. The infected nose is supposedly erythematous with purulent secretions. Although the appearance of the nose is not specific for a particular diagnosis, it does reveal if significant

inflammation is present. The visualization of purulent secretions draining from the middle meatus may confirm a clinical diagnosis of acute sinusitis, but such visualization is often impossible with the instrumentation available in most primary care offices. If purulent secretions cannot be visualized with anterior rhinoscopy, a surrogate evaluation is examination of the oropharynx to determine if purulent secretions are draining posteriorly.

Anterior rhinoscopy can be performed with a simple otoscope and is a crucial diagnostic maneuver for the sinus patient. If the nose is significantly congested, 0.5 mL of oxymetazoline nasal spray, loaded into a tuberculin syringe may be sprayed into the nose, and the examination can be repeated in 10 minutes. The goal of this thorough nasal examination is to identify purulent secretions draining from the sinuses, not just secretions stagnating in the nose. A simple viral URTI causes damage to the delicate ciliated respiratory epithelium in the nose. At the same time, inflammation induced by the viral infection will stimulate mucus secretion from goblet cells. This mucus may stagnate in the nose, along with neutrophils. Thus, thick, colored, nasal secretions often develop in the setting of an acute viral URTI, and colored secretions in the nasal cavity are not a specific finding for acute bacterial sinusitis. Also, the apparent absence of purulent secretions in the nose or draining in the oropharynx cannot rule out sinusitis. Therefore, physical examination may not be particularly helpful in many circumstances.

DIAGNOSTIC UNCERTAINTY IS COMMON, AND COMPLICATIONS ARE RARE

Although diagnostic uncertainty is a common problem when patients present to a primary care office with sinonasal complaints, the risk associated with an incorrect diagnosis is low. Rhinosinusitis is mostly a nuisance, and serious complications are rare. Neoplasms and serious disease processes usually cause benign symptoms, but these too are rare. The primary therapeutic goals for sinus patients are symptomatic relief and improvement in quality of life. There are no data to suggest that early antibiotic treatment reduces the occurrence of serious infectious complications (eg, orbital abscess, brain abscess, meningitis) or clinical evolution of an acute process into a chronic process (eg, acute sinusitis evolving to chronic sinusitis). An analysis of placebo-controlled studies of antibiotic treatment for acute bacterial sinusitis failed to find any increased risk for complications from nontreatment with antibiotics.⁶ Perhaps the greatest risk of misdiagnosis is the effect that an incorrect diagnosis of a sinus infection has on a patient's future interpretation of upper respiratory symptoms.

There is significant symptomatic overlap between rhinitis and sinusitis. The diagnostic distinction between rhinitis and sinusitis is often challenging, and the differential diagnosis of sinonasal symptoms is quite broad. A distinction between sinusitis and rhinitis is important primarily because sinusitis is treated with antibiotics. Because many medications are useful for both rhinitis and sinusitis (eg, pseudoephedrine, nasal steroid sprays, nasal saline), the clinical distinction of viral versus bacterial disease, and rhinitis versus sinusitis is less important if antibiotic treatment is not being contemplated.

DIAGNOSTIC CATEGORIES FOR SINUSITIS

There are multiple overlapping classification systems for sinusitis. These classification systems do not necessarily correspond with the International Classification of Diseases diagnostic codes. Sinusitis can be classified according to the sinuses involved (maxillary, sphenoid, and so forth), presumed pathogen (viral, bacterial,

fungi), or time course of the disease process (acute, subacute, recurrent acute, chronic). Although diagnostic specificity is useful, in practice the most important distinctions are the underlying pathogen and the time course of the disease, because these have treatment implications.

A viral URTI (common cold) is a viral rhinosinusitis, although patients may also have symptoms of conjunctivitis, pharyngitis, laryngitis, or bronchitis. The common cold is most frequently caused by rhinovirus, but also by coronaviruses, parainfluenza virus, respiratory syncytial virus, enteroviruses, and adenoviruses. Although clinical presentation can vary, probably as a result of host and viral factors, typical symptoms include rhinorrhea, nasal congestion and obstruction, facial pain and pressure, headache, sneezing, hoarseness, sore throat, malaise, chills, and cough. Rhinorrhea and sneezing are the most common symptomatic complaints, and headache occurs in 30% of cases.⁷ These symptoms overlap significantly with acute bacterial sinusitis and acute exacerbations of allergic or nonallergic rhinitis. That the common cold is really a form of acute viral rhinosinusitis was demonstrated by Gwaltney and colleagues⁸ who performed sinus computer tomography (CT) scans on a sample of subjects with the common cold. Most subjects (87%) had findings of sinus inflammation in the maxillary or ethmoid sinuses. So it is now clear that a viral URTI is not just a viral acute rhinitis but actually a form of rhinosinusitis. The common cold is generally self-limited, but antibiotics are prescribed in 30% to 78% of cases that present to a health care provider.⁹ In a landmark study by Gwaltney and colleagues⁷ the duration of symptoms associated with acute viral URTI, mostly due to rhinovirus, was carefully detailed. The median duration of illness was 7 days, but 25% of subjects had illness for 2 weeks. A small percentage of viral URTIs leads to bacterial sinusitis, otitis media, or exacerbations of asthma and chronic obstructive pulmonary disease. Thus a simple viral URTI can cause significant morbidity.

ACUTE BACTERIAL SINUSITIS

Acute bacterial sinusitis typically develops as a secondary bacterial infection after an acute viral URTI. The pathogens responsible for acute bacterial sinusitis have been well characterized and include *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, and *Staphylococcus aureus*.¹⁰ Rarely, acute maxillary sinusitis can develop from an odontogenic source. A diagnosis of acute bacterial sinusitis may be made in individuals with the symptoms of a viral URTI that have not improved after 10 days or have worsened after 5 to 7 days. In some cases, a clinical diagnosis of acute bacterial sinusitis is appropriate if symptoms are out of proportion to a typical URTI.⁶ The gold standard for diagnosing acute bacterial sinusitis is a maxillary sinus puncture with culture of sinus contents. However, because of the discomfort and potential complications of this procedure, antral puncture is rarely performed for clinical purposes. As has been noted, the signs and symptoms of acute bacterial sinusitis do not vary significantly from a viral URTI. Physical examination findings are unreliable, and because a viral URTI will produce inflammatory changes, radiologic studies are not helpful in differentiating viral from bacterial disease.¹ Williams and colleagues¹¹ performed a prospective study among 247 patients referred for acute sinusitis. Of the 16 symptoms examined, no one symptom was both sensitive and specific. However, regression analysis identified 5 symptoms and signs (maxillary toothache, abnormal transillumination, poor response to decongestants, purulent secretions, and colored nasal discharge by history) that if combined in the same patient, yielded a 92% probability of sinusitis. The findings from this study are often repeated in clinical texts. However, this study did not use correlation with sinus aspirate culture results,

nor have other studies that examined signs and symptoms of acute bacterial sinusitis. Thus, consideration of the time course and severity of a patient's symptoms are considered to be the best methods to distinguish viral from bacterial acute rhinosinusitis. Such an approach errs on the side of overtreatment with antibiotics, but a more specific approach entails inordinate cost and potential patient harm.

Acute bacterial sinusitis can cause severe and potentially life-threatening complications including meningitis, orbital cellulitis, orbital abscess or intracranial abscesses. These complications are rare, especially in adult populations. The natural history of untreated cases of acute bacterial sinusitis has not been thoroughly studied. However, in placebo-controlled studies of acute bacterial sinusitis, approximately two-thirds of patients experienced spontaneous symptom resolution.¹² Although theoretically an untreated acute bacterial sinusitis can evolve into chronic sinusitis, the role of acute sinusitis in the pathogenesis of chronic sinus disease is unclear, and antibiotic trials for acute sinusitis have not examined this question.

Chronic sinusitis is a condition that continues to be a source of confusion and controversy. The terms chronic sinusitis and chronic rhinosinusitis (CRS) are now used interchangeably to refer to a group of disorders that are characterized by inflammation of the nasal and paranasal sinus mucosa over a prolonged period of time (>12 weeks), with accompanying clinical signs and symptoms.¹³ This definition allows for a variety of underlying pathophysiologic processes, extrinsic triggers, and clinical phenotypes. Chronic sinusitis can be categorized according to the presence or absence of nasal polyps,⁵ but a widely accepted and useful classification system for the various subtypes of chronic sinusitis remains elusive.

The diagnosis of chronic sinusitis is as problematic as the accurate diagnosis of acute bacterial sinusitis. The symptoms of chronic sinusitis are similar to acute sinusitis (in some ways, chronic sinusitis is clinically a cold that will not go away). However, there is significant symptomatic overlap between chronic rhinitis and chronic sinusitis. Physical examination abnormalities that are detectable on a routine head and neck examination may be absent in chronic sinusitis. Widespread use of sinus imaging is costly, and most generalists who treat chronic sinusitis do not use nasal endoscopy. For these reasons, a consensus statement published in 1997 recommended that the clinical diagnosis of chronic sinusitis rely primarily on the patient's history, using a set of major and minor clinical factors to make the diagnosis.¹³ However, when this approach was evaluated in clinical studies that combined symptomatic history with objective evaluation for sinus inflammation (nasal endoscopy, sinus CT), it was revealed that this approach overdiagnosed chronic sinusitis in about 50% of cases.¹⁴ A recent clinical practice guideline recommends that the diagnosis of chronic sinusitis should be accompanied by objective evidence of paranasal sinus inflammation. This objective evidence can be obtained via radiologic studies or by rhinoscopy that shows purulent mucus, edema, or polyps in the middle meatus.⁴ The added costs of radiography or nasal endoscopy are offset by the savings from a reduction in unnecessary treatment. Thus, a clinical diagnosis of chronic sinusitis should no longer rely on symptoms alone.

A variety of microorganisms can be cultured from the nose and paranasal sinuses of patients with chronic sinusitis. However, there is significant room for debate regarding whether the presence of these microorganisms indicates a causative role in the patient's inflammatory disease. Traditionally, bacteria have been assumed to be the causative organisms in chronic sinusitis, and antibiotic therapy is commonly used to treat the disease. Microbiologic studies have demonstrated that the bacteriology of chronic sinusitis is different from acute bacterial sinusitis; in chronic sinusitis, anaerobes and gram-negative organisms are frequently present. Polymicrobial

involvement is common in chronic sinusitis, and the bacteriology changes in patients who have previously undergone sinus surgery.¹⁰ Some bacteria in the paranasal sinuses may form biofilms that are refractory to eradication with standard antimicrobial therapy. However, chronic sinusitis is not necessarily an infectious disease, and microorganisms that colonize the nose and paranasal sinuses may stimulate inflammation without tissue invasion.⁵ Recent attention has focused on the possible role that fungi or enterotoxin-producing staphylococci may play as extrinsic factors that trigger the inflammation observed in chronic sinusitis. These theories have treatment implications that remain to be resolved.

DIAGNOSTIC TOOLS FOR SINUSITIS

Besides the history and physical examination, the primary diagnostic aids for sinusitis are radiologic imaging and nasal endoscopy. Because viral URTIs cause inflammatory changes within the paranasal sinuses, radiographic imaging for the diagnosis of acute bacterial sinusitis is not appropriate unless a complication or alternative diagnosis is suspected (such as a malignancy, or facial pain not caused by sinusitis).⁴ Examples of complications that warrant imaging include orbital, intracranial, or facial soft tissue spread of infection. If imaging is considered, CT is preferred over plain films or magnetic resonance imaging (MRI) because of improved visualization of the paranasal sinus anatomy. Evaluation of abscess formation requires intravenous contrast, and if intracranial involvement is suspected, MRI is appropriate.⁴ In general, adjunctive testing is neither necessary nor appropriate in most cases of acute rhinosinusitis.

The diagnosis of chronic sinusitis requires confirmation of paranasal sinus inflammation by examination or radiography. The differential diagnoses for CRS symptoms include allergic and nonallergic rhinitis, nasal septal deviation, and various other causes of headache and facial pain. Reliance on history alone has been shown to be an unreliable means to distinguish chronic sinusitis from these other possibilities. Routine anterior rhinoscopy is often insufficient because of poor visualization. Nasal endoscopy that demonstrates purulent drainage, polyps, or edema in the middle meatus or sphenoidal recess is sufficient to make the diagnosis. In addition, endoscopy facilitates culture-directed antibiotic treatment because purulent exudates draining from the sinuses can be sampled with minimal morbidity. However, because endoscopic tools and training are not widely available in primary care settings, radiologic imaging is a primary diagnostic modality for chronic sinusitis.

A noncontrasted CT of the sinuses is considered the gold standard imaging test for the diagnosis of chronic sinusitis.⁴ CT can assess the patency of sinus outflow tracts, identify fluid collections and mucosal thickening within the paranasal sinuses, and occasionally reveal tumors, masses, or mucoceles that are not suspected from the clinical history. In addition, CT may identify anatomic abnormalities that are predisposing to sinus outflow tract obstruction. As a diagnostic modality, CT is not foolproof. Imaging may fail to detect small polyps and mucus recirculation phenomena. In addition, sinus abnormalities are frequently present despite a lack of chronic sinusitis symptoms.¹⁵ Multiple studies have shown that the extent of CT abnormalities does not correlate with symptom burden.¹⁶ CT is the best diagnostic tool for chronic sinusitis, but as with any diagnostic test the imaging findings must be correlated with the patient's history. A variety of other diagnostic tests may be used in select circumstances for patients with acute or chronic sinusitis including cystic fibrosis testing, allergy tests, and immunologic evaluation. However, a discussion of these testing modalities is outside of the scope of this article.

MEDICAL TREATMENT

Medical treatment for the patient with sinus should be directed toward the underlying diagnosis and pathophysiologic process. A variety of comprehensive clinical practice guidelines and practice parameters for the treatment of rhinitis and acute sinusitis have been developed from exhaustive reviews of the literature, and these provide useful guidance for appropriate medical treatment.^{2,4,12} However, many patients with sinus do not have a history and examination that fits into a neat diagnostic category. For these individuals a symptom-based treatment approach is appropriate, and the history should be revisited in an attempt to identify the primary symptoms as well as aggravating and relieving factors for these symptoms. These patients can be difficult to treat, but positive treatment outcomes can result from an approach that educates patients about the physiologic basis for their symptoms and establishes a commitment to a patient search for beneficial measures. It is surprising how frequently patients will self-treat in an incorrect fashion (eg, taking antihistamines for facial pain.) The physician is well positioned to recommend more appropriate medical intervention and monitor symptomatic improvement.

Medical treatment of acute bacterial sinusitis has been thoroughly studied. The best established treatment for acute bacterial sinusitis is a 7 to 10 days course of oral antibiotics, although some antibiotics have demonstrated benefit with shorter courses of therapy. Despite the increase in antibiotic resistance and the known prevalence of β -lactamase-producing organisms, amoxicillin and trimethoprim/sulfamethoxazole are still often recommended as first-line therapy for acute sinusitis.^{10,12} Early treatment failure, severity of symptoms, and likelihood of resistant organisms are cited as reasons to consider β -lactamase-resistant or broader spectrum antibiotics. A recent body of randomized trials has also demonstrated that nasal steroid sprays reduce symptom severity and hasten symptom resolution in the setting of acute sinusitis.¹⁷ Therefore, consideration should be given to the use of a nasal steroid spray in addition to an antibiotic. Other symptomatic measures such as oral and topical nasal decongestants, analgesics, and nasal saline are believed to be helpful in acute sinusitis despite a lack of clinical trials.

The appropriate medical management of chronic sinusitis has not been thoroughly studied. The medical management of chronic sinusitis typically includes antibiotics, antiinflammatory agents, and saline lavage. Usually, broad-spectrum antibiotic therapy is recommended that covers aerobic and anaerobic organisms, and β -lactamase producers.¹⁰ An antibiotic course of 4 to 8 weeks is recommended. Antiinflammatory medication consists of a brief course of systemic corticosteroid along with prolonged use of a topical nasal steroid spray. Uncontrolled cohort studies have shown that this approach results in significant symptomatic improvement in most patients.¹⁸

There is a paucity of randomized trials for the treatment of chronic sinusitis, and there are no accepted clinical practice guidelines for the medical management of chronic sinusitis. The lack of clinical trial data and treatment guidance is a direct result of difficulty in defining the disease process and categorizing its subtypes. As mentioned previously, chronic sinusitis is a broad term that includes multiple pathophysiologic processes that result in chronic sinus inflammation. Traditional treatment approaches have tended to lump all chronic sinusitis together.

One dominant working model has assumed that chronic sinusitis is an intense bacterial sinusitis that evolves from an initial acute bacterial sinusitis. Explanations for the persistence of this bacterial infection have included sinus outflow tract obstruction, bacterial osteitis, and biofilm formation. In many cases of chronic sinusitis these

factors may be important. However, appropriately powered placebo-controlled trials of oral antibiotic treatment for chronic sinusitis have not been performed. A single randomized placebo-controlled study of low-dose roxithromycin for nonpolypoid CRS showed equivocal results.¹⁹ A few topical antibiotic trials have been performed, but the results were essentially negative.^{20,21} Other approaches, such as the use of intravenous antibiotics have not been studied in any sort of controlled trial. Thus, the antibiotic treatment of chronic sinusitis is still poorly substantiated and more placebo-controlled trials are needed.

There is a much stronger body of clinical evidence for the treatment of CRS with nasal polyps. Topical nasal steroid sprays as well as oral steroids have been shown via randomized placebo-controlled trials to reduce nasal polyp size and reduce symptoms.^{22,23} Antibiotics have not been appropriately studied in polypoid CRS, but multiple trials have examined the efficacy of topical amphotericin B, in a test of the fungal hypothesis. These studies have not shown any significant clinical benefit, and topical amphotericin B is not recommended for the treatment of chronic sinusitis with nasal polyps.^{24–26} Although antiinflammatory agents like corticosteroids seem to be beneficial for chronic sinusitis with nasal polyps, there is no standard dosing regimen. Brief courses of systemic steroids are recommended because of their long-term toxicities. Topical nasal steroids do seem to have a dose-response effect, and given their low bioavailability, increasing doses of topical steroids are preferred over systemic administration.

INDICATIONS FOR REFERRAL

The patient with sinus will frequently benefit from consultation with an otolaryngologist. Absolute indications for referral include complications from sinusitis, suspected neoplasm, mucocele, or fungal sinusitis. However, the most common indications for referral include persistent symptoms despite apparently appropriate medical treatment, atypical symptoms, anatomic abnormalities, recurrent sinusitis, and massive nasal polyposis. Surgery is frequently used for patients with anatomic deformity, inadequate improvement with medical therapy, or conditions that are not amenable to medical therapy (eg, deviated septum, mucocele). Although most rhinosinusitis is a medical disease, some patients will only benefit from a combination of medical and surgical approaches. Consultation with an otolaryngologist may permit a more precise diagnosis and treatment of the underlying cause of the sinus complaints.

SUMMARY

The patient with sinus can be difficult to treat for a variety of reasons. Although the patient's history is the most important aspect of diagnosis, this history also provides nonspecific information. There is considerable overlap between rhinitis and sinusitis symptoms, and patients may inappropriately ascribe their symptoms to sinus disease. Precise diagnostic tools are lacking for acute illness, and the best medical management approach for patients with chronic sinusitis is poorly defined. In cases of diagnostic uncertainty or poor treatment response, consultation with an otolaryngologist is appropriate.

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