



Sinusitis

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Sinusitis is ubiquitous among humans and one of the most common reasons health care office visits in the USA. In 1991 sinusitis accounted for more than 25 million visits to a primary care clinic and was the fifth most common diagnosis for which an antibiotic was prescribed. Expenditures for the treatment of sinusitis in the USA in 1996 were estimated at \$5.8 billion, with 30% of this amount used for pediatric sinusitis.

Sinusitis develops from an interaction of environmental and host factors. The most common cause in all age groups is a viral upper respiratory infection (URI) that results in secondary bacterial overgrowth. Other causes of sinusitis include: allergic; fungal; mucosal or architectural abnormality; periodontal disease; immunologic factors; and environmental exposure to pollutants such as tobacco smoke. Clinicians must differentiate between acute viral sinusitis (common with colds and the flu) and bacterial sinusitis in order to prevent the over-prescription of antibiotics. (See chapter on The Proper Use of Antibiotics).

Prevalence and Distribution

Approximately one billion acute viral respiratory illnesses occur annually in the USA, with as many as 90% resulting in viral sinusitis. Fewer than 2% of viral URIs are complicated by secondary bacterial sinusitis. Children under 15 years of age and adults between 25 and 64 years of age are most frequently affected.

The most common cause of bacterial sinusitis is a viral URI. Seasonal trends in the incidence

of bacterial sinusitis correlate with those of the common cold. However, bacterial sinusitis can occur throughout the year and is associated with allergy, swimming, and nasal obstruction due to polyps, foreign bodies, and tumors. The most common bacteria associated with acute sinusitis in adults include: *Streptococcus pneumoniae* (34%); *Haemophilus influenzae* (35%); and *Moraxella catarrhalis* (2%). In children, *M. catarrhalis* and *H. influenzae* are the most common pathogens isolated from acute sinusitis.

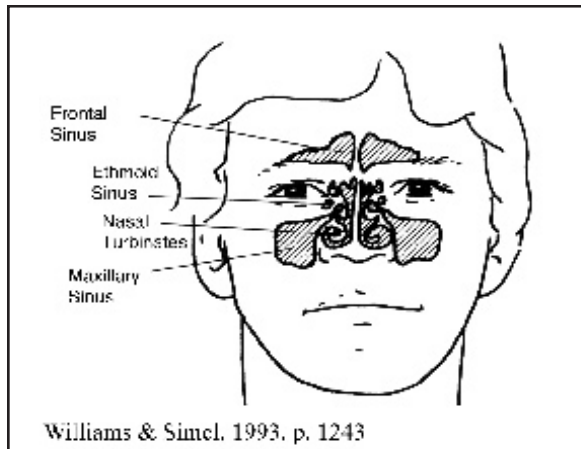
Viral sinusitis follows a well-established seasonal pattern, with annual epidemics in the fall, winter, and spring. Periods of inactivity are common during the summer months. Different virus families tend to have specific periods of high prevalence; rhinovirus is more common in early fall and late spring, whereas coronavirus, respiratory syncytial virus, and influenza virus are more common in winter and early spring.

Mode of Transmission

Sinusitis generally results from the following sequence of events. The virus is transmitted from

*This man with a history of multiple allergies and a deviated septum had recurrent episodes of allergic sinusitis.
Photo by
James O'Connell MD*

Figure 1



infected to susceptible persons, usually through coughing or sneezing, deposited into the nose, and transported to the posterior nasopharynx. Several inflammatory pathways are stimulated and result in engorgement of the nasal turbinates along with intercellular leakage of plasma into the nose and sinuses and discharge from seromucous glands and goblet cells.

The specific factors that determine whether bacterial invasion of the sinus will occur during a viral sinusitis are unknown. However, the nasal passages and nasopharynx are colonized with the same bacteria that commonly cause sinusitis and most likely serve as a reservoir for infection. Sneezing, coughing, and blowing the nose increase pressure differentials and may force bacteria-containing secretions to be deposited in the sinuses. Once deposited into the cavity of a swollen and obstructed sinus, the conditions are favorable for growth of the bacteria.

Prevention

Sinusitis may be prevented in several ways:

- prevention of the common cold by hand washing and covering the mouth when sneezing or coughing;
- protection against influenza by encouraging annual flu vaccines;
- use of prophylactic amantadine or rimantadine during periods of epidemic influenza;
- antihistamines can reduce swelling and prevent the entrance of both viruses and bacteria into the sinus cavities;
- fluids and the use of a humidifier or steam keep the mucous in the nasal passages from becoming thickened;
- cigarette smoke and adverse environmental

pollutants should be avoided whenever possible (but very difficult for persons living in shelters and on the streets); and

- educate individuals about viral URIs and how to manage initial symptoms, as well as when to seek evaluation from a doctor or health care provider.

Symptoms

Acute sinusitis is heralded by: nasal congestion; a purulent nasal discharge; a heightened sense of smell (hyposmia); facial pain that is often unilateral; pain in the upper teeth; eye pain; headache, often increasing in intensity when bending over; and a cough that is often worse at night. Fever, malaise, halitosis (bad breath), and a sore throat due to post-nasal drip can also occur. Acute sinusitis is usually preceded by a URI that worsens or does not resolve after 8-10 days. Most common colds and viral URIs resolve or are much improved by the end of one week.

Chronic sinusitis is more difficult to diagnose than acute sinusitis, and has a more subtle and indolent course. The symptoms are the same as those noted above but usually milder and persist for more than three months. This chronic infection is more common among immunocompromised persons, atopic individuals with allergies, and those with severe asthma. Different pathogens are involved in chronic sinusitis, requiring more broad-spectrum antibiotics and longer courses of treatment than required for acute sinusitis.

Diagnosis

Despite advances in technology, the diagnosis of sinusitis remains a challenge. The clinical diagnosis of acute bacterial sinusitis should be reserved for patients with symptoms lasting seven days or more and who have maxillary pain with tenderness in the face or upper teeth accompanied by purulent nasal secretions. Clinicians should be aware that most cases of acute sinusitis are viral and resolve without antibiotics. Bacterial sinusitis tends to be over-diagnosed and antibiotics prescribed too frequently. Because the symptoms are similar for acute viral and bacterial sinusitis, we recommend that antibiotics be held until symptoms have been present for at least seven days and reserved for those patients with the maxillary pain and purulent discharge noted above. Unfortunately, even the duration of symptoms is not always a reliable predictor of bacterial sinusitis, as many viral syndromes can last longer than a week. When symptoms have lasted longer than a week,

Table 1: Bacterial Etiology of Sinusitis

Organism	Percent of Adult Cases by Sinus Aspirate	
	Acute	Chronic
Streptococcus pneumoniae	40	7
Haemophilus influenzae	30	10
Moraxella catarrhalis	7	-
Anaerobic bacteria	8	50-100
Staphylococcus aureus	3	17
Streptococcus pyogenes	3	-
Streptococcus viridans	3	15
Gram-negative bacteria (including enteric gram-negative bacilli)	-	5

Table 2: Viral Etiology of Sinusitis

All viruses which cause upper respiratory tract infections may act as initiating triggers for sinusitis
Relatively mild tissue damage may result in a reduction of local mucosal immunity rendering the individual susceptible to secondary bacterial infection
The majority of bacterial sinusitis is probably initiated by a preceding viral infection

Adapted from Saccho, H. and Schoub, B., Lessons in Infectious Diseases, 4(12).

clinicians should investigate for allergic and fungal as well as bacterial causes of sinusitis.

The physical exam should include a fairly comprehensive head and neck exam together with examination of the lungs and cervical lymph nodes. Anterior rhinoscopy should be performed to check the appearance of inferior turbinates and nasal secretions, as well as for the presence of nasal polyps. Transillumination as a diagnostic tool is the subject of considerable controversy and is often limited by the skills and experience of the examiner. Cultures of nasal secretions are not generally useful, limited by lack of sensitivity for detecting sinusitis. Sinus puncture and aspiration of purulent secretions is the gold standard but not used much due to invasiveness and pain. This test is reserved for complicated cases and generally not performed in a primary care setting.

A CT scan is an excellent tool for diagnosis and has replaced sinus x-rays as the diagnostic image of choice for sinusitis. CT scans are not recommended for routine use, due to a lack of specificity and frequent abnormal findings in viral sinusitis. Clinicians may choose to reserve radiography with CT scans for antibiotic treatment failures.

Laboratory tests are not specific and thus not helpful in the diagnosis of bacterial sinusitis. Labo-

ratory investigation may be necessary in individuals with chronic or recurrent sinusitis in order to elucidate the underlying cause. Such testing may include HIV or other immunodeficiency testing, allergy testing, and even sweat chloride testing for cystic fibrosis (for children with recurrent symptoms).

Treatment

Most cases of sinusitis are viral and will generally resolve without antibiotic treatment. Once a bacterial etiology has been determined, the goal of treatment is twofold: relieve symptoms and cure the infection.

Symptomatic relief can be achieved with saline nasal spray, warm compresses, steam humidification, cough suppressants, and pain relievers. Nasal decongestants are useful but cause rebound congestion after three to five days; oral decongestants may be preferable. Nasal steroid sprays such as fluticasone (Flonase™) may help relieve swelling, especially in patients with allergic symptoms and polyps. However, both oral and topical steroids should not be used in non-allergic acute sinusitis but reserved for chronic cases and patients with a history of atopy. Antihistamines may also provide relief for rhinitis and various allergic symptoms.

Antibiotics are usually reserved for moderate to

severe cases. The emergence of drug-resistant strains of bacteria has created controversy in the treatment of acute bacterial sinusitis. Most consensus guideline committees still recommend the less expensive and narrow spectrum antibiotics as first-line therapy: amoxicillin (Amoxil™); doxycycline (Vibramycin™); and trimethoprim-sulfamethoxazole (Bactrim™, Septra™). The reasons for using these medications are the self-limited nature of sinusitis in most cases, the difficulty with the overuse of antibiotics in this common and often misdiagnosed infection, and the rare incidence of complications. Some clinicians argue that the high incidence of antibiotic resistance merits more aggressive use of broad-spectrum antibiotics as first-line therapy, specifically amoxicillin-clavulanate (Augmentin™), cefpodoxime (Vantin™), and levofloxacin (Levaquin™). However, we believe that the use of narrow-spectrum antibiotics is still the preferable treatment among homeless populations. The recommended course of treatment is 10 days for acute bacterial sinusitis and 3-8 weeks for chronic sinus infections.

Intravenous antibiotics are usually reserved for complicated infections or when intracranial or orbital extension is suspected. Fungal infections and those involving polyps are more complicated and may require surgery and different antibiotics. Referral to an otolaryngologist is necessary if symptoms worsen after 2-3 days of a broad-spectrum antibiotic or at any time that complications are suspected. Surgery may be necessary to clean and drain the sinuses, especially in the patient with recurrent episodes despite treatment. Consultation with an otolaryngologist is advised for these cases. Surgical repair of a deviated septum or nasal polyps may prevent recurrence.

With children, problems are often eliminated by removal of adenoids that block nasal and sinus passages. The most common type of surgery today is functional endoscopic sinus surgery, in which the natural openings from the sinuses are enlarged to allow adequate drainage.

Complications

Sinusitis very rarely can result in intracranial, orbital, and respiratory complications. Complications should be suspected whenever a patient reports a high fever, severe pain, extreme headache, visual changes, papillary or extraocular movement (EOM) abnormalities, or meningeal symptoms. Complications of sinusitis may include:

- chronic sinusitis;
- osteomyelitis (of facial bones);
- meningitis;
- orbital cellulitis or abscess (orbital complications more common in young children);
- abscess formation (brain) and subdural empyema;
- cavernous sinus thrombosis (and cortical vein thrombosis).

Bacterial resistance to certain common antibiotics may also occur, as well as exacerbation of asthma and bronchitis. Sinopulmonary disease is a generally recognized combination, especially when the condition has become chronic. Urgent referral to an otolaryngologist is in order if symptoms become markedly worse after 2-3 days of broad-spectrum antibiotics or if a provider notes possible signs of intracranial or orbital extension of infection.

Special Considerations for Homeless Populations

Homeless people are more likely to develop sinusitis than the general population due to both lifestyle and environmental risk factors. For example, smoking cigarettes is considered a risk factor for both acute and chronic sinusitis. Drinking alcohol causes nasal and sinus membranes to swell, which may inhibit the resolution of sinusitis and exacerbate symptoms. Drugs such as cocaine and heroin may have a deleterious effect on the nasal mucosa when “snorted” or ingested intranasally. Outside temperature fluctuations, poor hygiene, dehydration and poor nutrition, nasal trauma from falls or assaults, and constant exposure to environmental allergens and pollutants may all lead to frequent or complicated episodes of sinusitis.

Homeless people have a high incidence of upper respiratory illnesses and pulmonary disease when compared to the general population. These and various other co-morbid illnesses such as diabetes, liver disease, and HIV/AIDS are associated with complicated and recurrent sinus infections.

Oral infections due to poor dental hygiene are endemic in homeless populations, further complicating the clinical presentation and successful treatment of sinusitis. Also, completing a full course of antibiotics may be difficult for the homeless patient and may lead to treatment failure or recurrence of symptoms. Various ancillary treatments, such as humidification with steam, are impractical for most shelter residents or people who sleep on the street and are thus likely neglected in the treatment of sinusitis.

Summary

Sinusitis is an extremely common infection, most likely with an even greater incidence in the homeless population. Viral sinusitis is far more common than bacterial, and the diagnostic challenge for clinicians is to distinguish between these two types of sinusitis. Judicious use of antibiotics is warranted, and antibiotics should only be prescribed when bacterial sinusitis is suspected or determined. The presence of typical symptoms for longer than one week, accompanied by purulent nasal discharge and facial pain over the maxillary area or upper teeth, are suggestive of a bacterial sinusitis. A careful examination of the head and neck, as well as the

lungs and cervical lymph nodes, can help confirm a bacterial etiology. Offering adjunctive therapies such as sinus irrigation, antihistamines, decongestants, cough suppressants, and warm compresses are prudent for all cases of sinusitis, regardless of etiology. Avoiding unnecessary antibiotic use will help prevent drug resistance; overzealous use of antibiotics in the past has resulted in resistance among many strains of the common pathogens and changed the antibiotics of choice for this infection. Consultation with an otolaryngologist (ear, nose, and throat specialist) is recommended for patients with recurrent or resistant cases of sinusitis or when complications arise. ■■

Sinusitis Medication List

Generic	Brand Name	Cost
amoxicillin-clavulanate	Augmentin	\$\$\$
cefepodoxime	Vantin	\$\$\$
cefuroxime	Ceftin	\$\$\$
fluticasone nasal spray 0.05%	Flonase	\$\$\$
levofloxacin	Levaquin	\$\$\$

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