Chapter 12
Sinusitis

Shuchita Khasnavis

Introduction

Sinusitis affects about one in seven people in the USA and nearly always occurs with inflammation of the nasal mucosa [1]. The vast majority of cases are viral in origin and only a small percentage are bacterial. The majority of cases resolve with conservative treatment [2]. The four sinus cavities and their locations are detailed below:

- Frontal sinuses: behind the forehead and part of the frontal bones
- Maxillary sinuses: behind the cheekbones
- Ethmoid sinuses: behind the nasal passages
- Sphenoid sinuses: near the optic nerve and part of the orbits

Sinusitis occurs if obstruction or congestion blocks the paranasal sinus opening thereby causing mucus to build up in the chamber. This blockage allows bacteria and viruses to multiply leading to infection and inflammation. Symptoms of

S. Khasnavis, MD (✉)
Department of Medicine, North Central Bronx Hospital, 3424 Kossuth Ave, Bronx, NY 10467, USA
e-mail: Schuchita.khasnavis@nbhn.net

E. Sydney et al. (eds.), *Handbook of Outpatient Medicine*,
https://doi.org/10.1007/978-3-319-68379-9_12

sinusitis include thick nasal discharge, facial pain or pressure, fever, and reduced sense of smell. Depending on how long these symptoms last, sinusitis is classified as acute, subacute, chronic, or recurrent [3, 4].

- Acute sinusitis: Inflammation of sinuses lasting less than 4 weeks
- Subacute sinusitis: Inflammation and infection of the sinuses lasting between 4 and 12 weeks
- Chronic sinusitis: Infection of the sinuses lasting at least 12 weeks or recurrence of infection
- Recurrent sinusitis: Four or more episodes of ARS/year with interim symptom resolution

Acute Sinusitis

Etiology of ARS: [4, 5]

Ninety to ninety-eight percent of sinusitis is secondary to viral infection. In the vast majority of cases, the cause is a viral upper respiratory tract infection such as the common cold.

Bacterial sinusitis occurs in 0.5–2% of episodes of ARS. The most common organisms are *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella*, *Staph. aureus*, and anaerobes.

Other rare causes of ARS are fungi, allergies, or autoimmune reactions. Fungal rhinosinusitis, the majority of which are aspergillus, tend to occur in people who are immunosuppressed.

ARS is divided into uncomplicated and complicated [3, 6]:

Uncomplicated: When infection and inflammation occurs without extension beyond the paranasal sinuses

Complicated: When infection extends beyond the paranasal sinuses leading to involvement of surrounding structures and causing one of the following: preseptal cellulitis, orbital cellulitis subperiosteal abscess, meningitis, intracranial abscess, epidural abscess, osteomyelitis, and septic cavernous sinus thrombosis

Chronic/Recurrent Sinusitis

Allergies and asthma are two of the conditions most commonly seen in patients with chronic or recurrent sinusitis. Seasonal allergies and rhinitis may cause blockage and predispose to sinusitis. The risk of sinusitis is higher with severe asthma. People with a combination of polyps in the nose and sensitivity to aspirin are at high risk for recurrent or chronic sinusitis. Chronic sinusitis and recurrent sinusitis are also associated with disorders that weaken the immune system such as diabetes, AIDS, cystic fibrosis, and Wegener's granulomatosis. Structural abnormalities of the nose such as polyps, enlarged adenoids, cleft palate, tumors, and deviated septums can lead to the blockage of nasal passages and mucous drainage. Some hospitalized patients with head injuries, nasal tubes, mechanical ventilators, and weakened immune systems are at higher risk for sinusitis.

Other medical conditions affecting sinuses include gastroesophageal reflux, oral or intravenous steroid treatment, hypothyroidism, and Kartagener's syndrome. Miscellaneous risk factors are dental problems, change in pressure while flying, high altitudes, swimming, smoking, and air pollution.

Symptoms of Acute Sinusitis

General symptoms of acute sinusitis (both viral and bacterial) [7] include:

- Purulent anterior and posterior nasal discharge
- Nasal congestion or obstruction
- Facial congestion, fullness, and pain
- Anosmia
- Fever
- Headache
- Ear pain, pressure, and fullness
- Halitosis
- Dental pain
- Fatigue

In general viral sinusitis symptoms last 7–10 days.

Symptoms of Chronic Sinusitis

Symptoms of chronic sinusitis are more vague. The fever may be low grade or absent. The symptoms last at least 12 weeks or are intermittent throughout the year [8].

Physical Findings

A patient with sinusitis usually presents with erythema, edema, or tenderness over the involved sinus [9].

Maxillary sinusitis: The cheek is tender or the patient may present with jaw pain and tooth sensitivity.

Frontal Sinusitis: Pain on palpation of the forehead.

Ethmoid sinusitis: Swelling and tenderness in the eyelids and surrounding tissue.

With any sinusitis, the pain and tenderness may be found in several locations. Purulent nasal discharge may be evident on examination. Diffuse mucosal edema and inferior turbinate hypertrophy may be found.

Diagnosis

In the primary care setting, a thorough history and physical examination can provide reliable diagnosis of acute sinusitis [10]. Differentiation from common viral upper respiratory tract infection is important where nasal congestion is predominant without head congestion and facial pains. Presence of purulent secretions has the highest positive predictive value for clinically diagnosing sinusitis (Fig. 12.1).

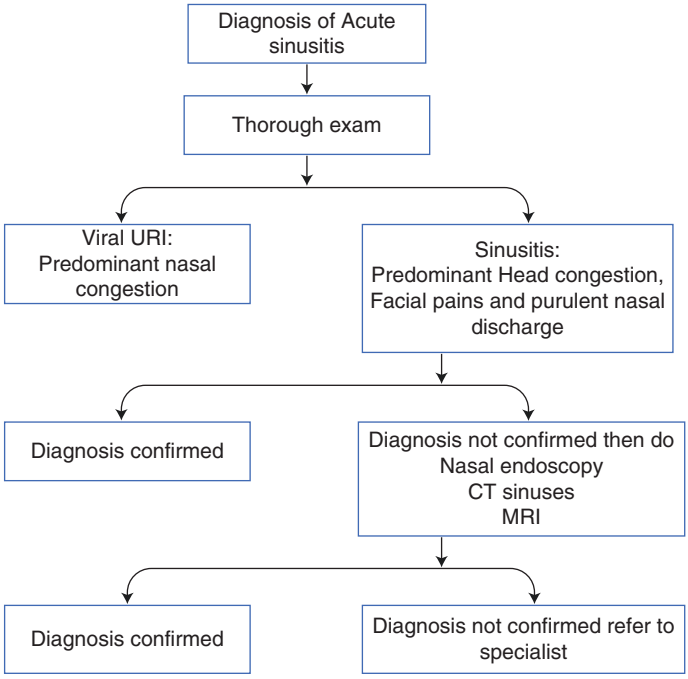

FIG. 12.1 Diagnostic algorithm for acute sinusitis

Diagnostic Tests

- *Nasal endoscopy* or rhinoscopy allows detection of abnormalities of the nasal passage, polyps, and pus. Bacterial culture can be taken from samples.
- *Imaging techniques*
  - CT scan is the best method for viewing paranasal sinuses and reveals the extent of inflammation and disease.
  - X-ray is not as accurate as CT and is used when CT scan and endoscopy are unavailable.
  - MRI is not as effective as CT and is more expensive. It may be used to differentiate between inflammatory disease, malignant tumors, and complications within the skull.

- *Sinus puncture and bacterial culture* is the standard reliable method for making the diagnosis. Due to the invasive nature of this process, it should be reserved for those patients that have not responded to antibiotics or those at risk of having an unusual infection or serious complications.

Treatment of Acute Sinusitis

The primary objective for treatment of sinusitis is reduction of swelling, eradication of infection, and drainage of sinuses. The majority of cases will resolve with supportive care, and few, 2–10%, of acute rhinosinusitis will require antimicrobials [10, 11].

Treatment can be divided into the following categories:

Immunocompetent patients with good follow-up: Supportive treatment with saline irrigation, steam inhalation, and hydration along with medications such as nasal or oral decongestants, antihistamines, and mucolytics are effective. Symptoms usually resolve in 7–10 days.

The decision to use antibiotic therapy for acute bacterial sinusitis is based on how symptoms present or progress. Symptoms favoring treatment include duration of 7–10 days, high fever (>102), purulent nasal discharge, and worsening of symptoms after conservative management. Choice of antibiotics should cover the following: *S. pneumonia*, *H. influenzae*, and *M. catarrhalis* [11, 12].

Antibiotic treatment of choice is amoxicillin 875 mg/clavulanic acid 125 mg BID or 500 mg/125 mg TID. If resistance is suspected, then use a higher dosage amoxicillin/clavulanic acid 2000 mg/125 mg BID.

For patients with penicillin allergy, any of these medications can be used: doxycycline, levofloxacin, moxifloxacin, or clindamycin plus a third-generation oral cephalosporin. See treatment algorithm.

Antibiotics should be continued for at least 5–7 days.

If there is no improvement in 72 h with initial therapy or there is worsening of symptoms, then the antibiotic should be changed. Switch to a second-line therapy (second-line

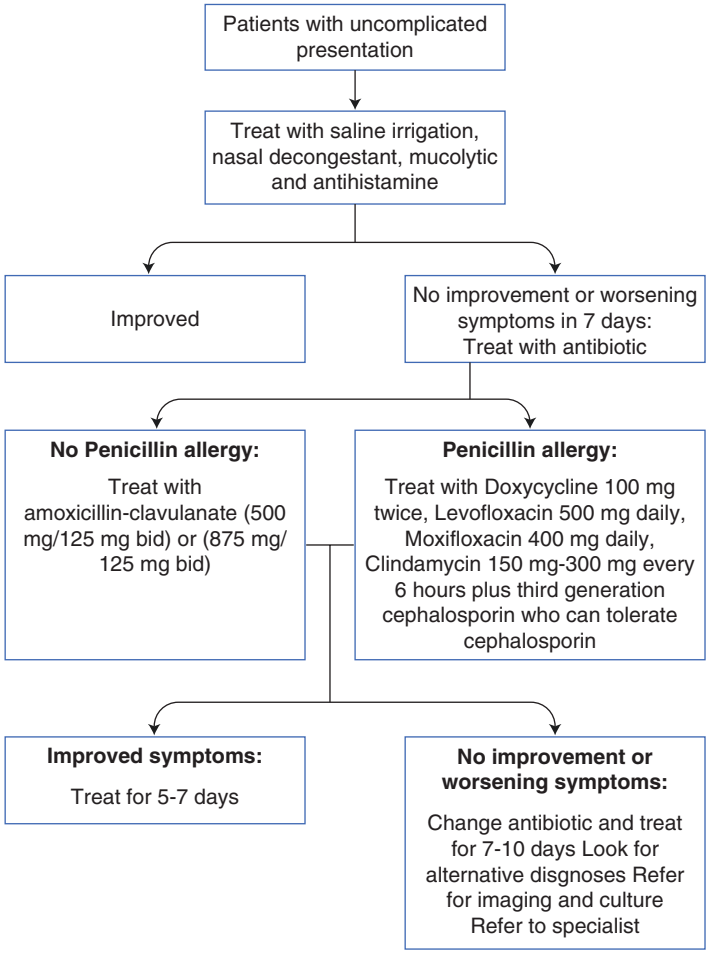

FIG. 12.2 Treatment algorithm for acute sinusitis

agent will depend on initial therapy), refer patients for imaging studies and send cultures, and consider alternative diagnoses (Fig. 12.2).

Risk Factors for Resistance to Antibiotics

Age > 65
Hospitalization in last 5 days
Antibiotic use in previous month
Immunocompromised patients
Comorbidities: Diabetes, cardiac disease, renal failure, hepatic disease
Severe infection, fever >102
Threat of suppurative complications
Immunocompromised and severe symptoms may warrant immediate antibiotics and specialist referral

Relapse: Recurrence of symptoms after oral therapy within 2 weeks represents inadequate eradication of infection. If symptoms are mild, treat with the same antibiotic for a longer duration. If symptoms are severe, switch to an alternative antibiotic.

Adjunct therapy: Oxymetazoline and phenylephrine hydrochloride nasal spray may be used for 3–5 days. Long-term use may cause rhinitis medicamentosa, otherwise known as rebound congestion. Topical corticosteroids are not indicated for acute sinusitis.

Treatment of Chronic Sinusitis

Chronic sinusitis results from damage to the mucous membrane from past infection. The role of antibiotics is controversial unless there is a concomitant acute infection [8, 11]. Antibiotics should be continued for 4–6 weeks and should cover organisms causing acute sinusitis and also *Staphylococcus* species and anaerobes. These include amoxicillin/clavulanate, cefpodoxime proxetil, cefuroxime, gatifloxacin, moxifloxacin, and levofloxacin. Nasal corticosteroid spray and saline irrigation may provide additional relief. A short course of oral steroids may be used for extensive mucosal thickening and severe congestion. If no improvement, surgery may be considered.

Patients with allergies, sinusitis, and asthma should have treatment targeting each condition. Treatment may include nasal steroids, leukotriene antagonists, antihistamines, and immunotherapy.

Additional Evaluation

Laboratory evaluation may be necessary to look for an underlying disorder. Lab tests may include sweat chloride test for cystic fibrosis, ciliary function test, HIV, and immunoglobulin testing. Any patient with recurrent sinusitis should have an allergy consultation.

Emergency treatment: Patients with fungal sinusitis or signs of infection, spreading beyond the paranasal sinuses (e.g., to the brain or bone), need urgent treatment with parenteral antibiotics and surgery.

Prevention: The best way to prevent sinusitis is to practice good hand hygiene and obtain influenza and pneumococcal vaccines as per recommendations.

Clinical Pearls [13]

- Acute sinusitis is viral in nature in the vast majority of cases and usually resolves in 7–10 days without treatment.
- Presence of purulent secretions has the highest positive predictive value for clinically diagnosing sinusitis.
- The antibiotic of choice without penicillin allergy is amoxicillin/clavulanate.
- CT of sinuses is the imaging procedure of choice.

Don't Miss This!

- Patients with immunocompromised conditions and severe symptoms may need immediate attention, imaging studies, and antibiotic treatment to prevent extension of infection.

References

1. Meltzer EO, Hamilos DL, Hadley JA, et al. Rhinosinusitis: establishing definitions for clinical research and patient care. Otolaryngol Head Neck Surgery. 2004;131:S1.
2. Tan T, Little P, Stokes T. Guideline development group, antibiotic prescribing for self limiting respiratory tract infection in primary care: summary of NICE guidance. BMJ. 2008;337:a437.
3. Rosenfeld RM, Piccirillo JF, Chandrasekhar SS, et al. Clinical practice guideline (update): adult sinusitis. Otolaryngol Head Neck Surg. 2015;152:S1.
4. Chow AW, Benninger MS, Brook I, et al. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. Clin Infect Dis. 2012;54:e72–e112.
5. Spector SL, Bernstein IL, Li JT, et al. Parameters for the diagnosis and management of sinusitis. J Allergy Clinical Immunol. 1998;s107:102.
6. King D, Mitchell B, Williams CP, Spurling GK. Saline nasal irrigation for acute upper respiratory tract infection. Cochrane Database Syst Rev. 2015:CD006821.
7. Rosenfeld RM. Clinical practice. Acute sinusitis in adults. N Engl J med. 2016;375:962.
8. Hamilton DL. Chronic sinusitis. J Allergy Clin Immunol. 2000;106:213–27.
9. Young J, DE Sutter A, Merenstein D, et al. Antibiotic for adults with clinically diagnosed acute rhinosinusitis a meta analysis of individual patient data. Lancet. 2008;371:908.
10. Anon JB, Jacobs MR, Poole MD, et al. Antimicrobial treatment guidelines for acute bacterial rhinosinusitis. Otolaryngol Head Neck Surg. 2004;130(1 Suppl):1–45.
11. de Bock GH, Dekker FW, Stolk J, et al. Antimicrobial treatment in acute maxillary sinusitis. J Clin Epidemol. 1997;50:881.
12. Osguthorpe JD, Hadley JA. Rhinosinusitis, current concept in evaluation and management. Med Clin North Am. 1999;83:27.
13. Hwang PH. A 51-YEAR woman with acute onset of facial pressure, rhinorrhea and tooth pain, review of acute rhinosinusitis. JAMA. 2009;301:1798.