

# **Item 90 : Nose and sinus infections in children and adults**

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## Objectifs ENC

- Diagnosing acute nose and sinus infections.
- Explaining therapeutic options and planning patient follow-up.
- Knowing how to diagnose acute sinusitis based on pain features, nasal obstruction, unilateral rhinorrhea, rhinoscopy data, radiology, and general signs.
- Knowing how to recognize ethmoiditis, especially in infants and children.
- Recognizing infectious complications involving surrounding structures (orbital, ocular, and cranial).
- Knowing that chronic serous rhinitis, chronic nasal obstruction, and sneezing are suggestive of nose and sinus allergies.
- Knowing the limits of standard sinus radiology; knowing the indications for computed tomography and magnetic resonance imaging, and how to prescribe them.
- Knowing how to prescribe symptomatic treatment for acute epidemic rhinitis.
- Knowing the pathogens usually involved in acute sinusitis for a probabilistic approach to antibiotic therapy.
- Knowing how acute sinusitis is monitored and what use to make of imaging.

## 1. Pathology of acute nose and sinus infections

### 1.1. Acute rhinitis

#### 1.1.1. Acute rhinitis in adults: the "common cold"

This is a contagious, epidemic condition especially common in autumn and winter, when fatigue, overwork, and stress seem to render the immune system more vulnerable. When patients say they have "caught a cold", this generally means they have been infected by a virus, such as rhinovirus, influenza, coronavirus, or the like.

Typically, patients start out feeling somewhat tired and perhaps sore, with chills and a heavy head. In the hours that follow, various other conditions may set in involving the nasopharynx (dryness, stinging, and burning) or the nasal cavities (itching, sneezing, rhinorrhea, and lacrimation), which is followed by unilateral, bilateral, or alternating nasal obstruction. Nasal discharge is clear, serous, and runny; sometimes very abundant, it irritates the upper lip and nostrils, forcing the patient to constantly blow his or her nose. Patients complain of frontal headaches, stuffy head, and often stuffy ears. There is generally little or no fever (38° C, 100.4° F).

On rhinoscopy, the mucous membrane is very red, with congestion from turbinate hypertrophy. After 2 to 3 days, the discomfort lessens and the discharge becomes thicker, colored (yellowish-green), and sometimes streaked with blood.

A few days later, the discharge changes again, becoming thinner, clearer, and more mucous. Finally, the amount of discharge diminishes, and the nasal obstruction disappears.

The duration and severity of acute rhinitis may vary from one patient to another, average duration being 8-20 days.

## 1.1.2. Clinical types

### **Acute rhinitis in newborns and infants**

This type of rhinitis affects children under 6 months old, who breathe only through their noses. Symptoms range from basic intermittent bilateral obstruction to respiratory distress requiring hospitalization.

Examination of the nasal cavities will show edema of the mucosa and swelling of the inferior turbinates to the point of contact with the septum. Differential diagnoses include choanal atresia, hypoplasia of the piriform apertures, and other facioskeletal malformations.

### **Nasopharyngitis in children**

The clinical signs are noisy mouth-breathing combined with fever rarely higher than 38.5 °C (101.3 °F). Clinical examination reveals:

- bilateral mucopurulent anterior rhinorrhea;
- posterior rhinorrhea visible in the form of a thick mucopurulent coating over the posterior pharyngeal wall;
- discrete redness of the pharyngeal mucosa;
- swollen, inflamed, sensitive lymph nodes on both sides of the neck.

Otосcopy allows for ruling out acute otitis media: it generally reveals slight tympanic congestion or ground-glass appearance to the eardrum, with underlying anatomy still discernible and no bulging or earache.

### **Allergic rhinitis**

Intermittent allergic rhinitis (formerly seasonal allergic rhinitis or hay fever) may present as acute rhinitis, but occurs predominantly in the spring. Its three clinical main signs are nasal obstruction, abundant colorless rhinorrhea, and sneezing fits, often combined with allergic conjunctivitis and an itchy palate. There is no infectious agent. Patients should be interviewed to determine exposure to one or more allergens, as well as any atopic predisposition. Skin tests should be administered in order to confirm specific IgE-dependent hypersensitivity.

## 1.1.3. Treatment

Uncomplicated acute nasopharyngitis or rhinitis is managed for symptoms only:

- nasal cavities flushed with saline solution, then nose blown and/or aspirated (for babies);
- analgesics if needed;
- antipyretics if needed;
- vasoconstrictors administered nasally in adults (unless contra-indicated) if obstruction is disabling.

Systemic antibiotic therapy is not justified in uncomplicated acute nasopharyngitis or rhinitis in either adults or children.

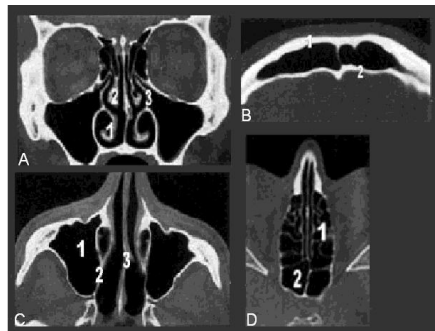
## 2. Acute sinusitis

Acute viral or bacterial infection of the mucosa of one or more sinus cavities.

### 2.1. Anatomy review

The paranasal sinuses are air-filled cavities in the facial skeleton lined with a layer of respiratory mucosa. The maxillary, anterior ethmoid, and frontal sinuses open into the nasal cavity via the middle meatus; the posterior ethmoid sinus via the superior meatus; and the sphenoidal sinuses via their own ostia (Fig.1).

**Fig. 1 : CT scan of normal adult sinuses**



*A. Coronal slice through the ethmoid and maxillary sinuses: right inferior turbinate (1); right middle turbinate (2); left middle meatus, providing drainage and aeration of the left maxillary sinus (3).*

*B. Axial slice through the frontal sinus: anterior wall (1); posterior wall (2).*

*C. Axial slice through the maxillary sinuses: right maxillary sinus (1) right medial wall (2); nasal septum (3).*

*D. Axial slice through the ethmoid sinuses: left ethmoid sinus (1); right sphenoidal sinus (2).*

The sinuses develop progressively with age :

- ethmoid present at birth;
- maxillary sinuses appear after 3 years;
- frontal sinuses after 7 years.

### 2.2. Pathophysiology

Sinus infections may be :

- of nasal origin following acute rhinitis or, more rarely, barotrauma; symptom severity depends on the pathogen's virulence and the ostium's permeability; symptoms may come on abruptly or after a common cold; as the cold subsides, potential infectious agents include:

- pneumococcus;
- streptococcus;
- *haemophilus influenzae*;

- *moraxella catarrhalis*;
- staphylococcus.

– of dental origin following the spread of a tooth infection potentially involving anaerobic bacteria.

## 2.3. Acute maxillary sinusitis

This is the most common type of acute sinusitis. Typically, symptoms are worse in the evening and include throbbing pain under one eye aggravated by effort or lying down, nasal obstruction, and thick or even mucopurulent discharge sometimes streaked with blood, all on the same side of the face, as well as mild fever. Hyperalgesia and sleep-disturbing pain are signs of severe acute sinusitis ("blocked sinusitis").

Anterior rhinoscopy will show pus in the middle meatus on the painful side. Pus may also be found on posterior rhinoscopy or examination of the pharynx.

Pain provoked by palpating the sinuses has no diagnostic value.

Examining physicians should search carefully for signs of rare complications involving the brain, meninges, or eyes, such as meningism, altered consciousness, exophthalmia, palpebral edema, intrinsic or extrinsic ocular motility disorders, as well as visual loss.

## 2.4. Diagnosis

Quite often some signs are present, while others are not, meaning that the pattern of symptoms may vary. Diagnostic criteria have been established in order to help clinicians determine whether a secondary bacterial infection has occurred, and whether antibiotics should be prescribed. The presence of a secondary bacterial infection causing purulent acute maxillary sinusitis can be argued if two of the following three major criteria are fulfilled:

- persistence or aggravation of sinus pain under the eye, with no relief despite symptomatic treatment (analgesics, antipyretics, and decongestants) taken for at least 48 hours;
- type of pain: unilateral, throbbing, worse with head forward, worst at end of day or at night;
- increase in rhinorrhea and in purulence of the discharge, which is even more significant when unilateral.

There are also some minor criteria that, in combination with the above, may corroborate a diagnosis:

- persistence of fever beyond 3 days;
- nasal obstruction, sneezing, sore throat, or cough lasting longer than a few days (during which time nasopharyngitis usually runs its course).

Standard radiology is not indicated in the face of strong clinical evidence. Computed tomography is more effective, but not indicated unless the diagnosis is in doubt, complications are suspected, or, more rarely, first-line antibiotic therapy fails (Fig.2).

**Fig.2 : Coronal CT slice of a patient with right maxillary sinusitis presenting as inhomogenous opacity of the right maxillary sinus**



**Fig. 2.1**



In unilateral acute maxillary sinusitis without rhinitis, the dental origin hypothesis should be explored. Dental examinations are often revealing and should include appropriate radiology (panoramic and periapical X-rays).

## 2.5. Clinical types

### 2.5.1. By topography

#### **Frontal sinusitis**

Pain is in the forehead, over the eyes, sometimes hemicranial, intense, and throbbing, with rhinorrhea and nasal obstruction. Frontal sinusitis presents a greater risk of complications and must thus not be misdiagnosed (Fig. 3).

**Fig.3**



#### **Sphenoid sinusitis**

Pain may be located in one of several places (occipital region, crown, or behind the eyes), making it important to consider all the options. Nasofibroscope reveals a mucopurulent discharge at the ostium of the sphenoidal sinus. Diagnosis requires a CT scan.

#### **Acute ethmoiditis in children**

Acute ethmoiditis (fever with upper inner eyelid swollen and painful) strikes young children. This condition is rare, but prognosis may be serious. It must be recognized in a clinical setting so that hospitalization can occur followed by the urgent and sometimes parenteral administration of antibiotics.

#### **Infections with edema**

Inflammatory swelling of the orbital region: palpebral edema predominant at the inner corner of the orbit and upper eyelid; no pus from conjunctivitis; painful with high fever (39-40 °C, 102.2-104 °F).

This palpebral cellulitis can be attributed to sinusitis based on the following criteria:

- no pus from conjunctivitis (rules out conjunctivitis and dacrocystitis);

- pus running inconsistently, sometimes with blood, from one side of nose;
- CT scan shows predominantly unilateral opacification of the ethmoid and maxillary sinuses.

Broad-spectrum ambulatory antibiotic therapy is possible if the patient remains stable overall, provided there is clinical follow-up after 48 hours and a gravity sign update given to the family.

### **Infections with orbital abscess**

Pus collects in the orbit between the periosteum and the lamina papyracea, leading to painful exophthalmia, thus far without visual loss or major disruption of ocular motility, although eye movement may be limited and painful. Rule out:

- the rare possibility of maxillary osteomyelitis: edema predominant at the lower eyelid, swollen gums and palate;
- severe staphylococcus infection from a furunculus on the upper lip or ala of the nose;
- streptococcal erysipelas.

### **Complicated infections**

Two complications should always be checked for:

- pus formation in the orbit, to be suspected in cases of paralytic mydriasis, corneal anesthesia, or partial or total ophthalmoplegia;
- intracranial thrombophlebitis: swinging fever with chills and meningism; oculomotor involvement.

Because such complications are late and often irreversible, a contrast-enhanced CT scan should be done in order to locate any orbital abscess as soon as ethmoiditis is diagnosed.

Surgical drainage of the abscess and ethmoiditis is indicated in the presence of pus on imaging, ophthalmoplegia, loss of light reflex, or vision loss (Fig. 4). These signs require immediate hospitalization, bacteriological testing, and the initiation of broad-spectrum double- or triple-agent parenteral antibiotic therapy combining third-generation cephalosporins, fosfomycin or vancomycin, and metronidazole with subsequent adjustment to bacteriological test results.

**Fig. 4**



## **2.5.2. Recurring infections**

Recurring unilateral infections suggest that the origin may be dental or locoregional (tumor, fungus ball, or anatomical anomaly), hence the benefit of CT or even MRI. Protracted infections lasting more than 12 weeks



are labeled as chronic.

Chronic rhinosinusitis can flare up in the form of acute secondary infections. Chronic bilateral infections may lead to nasal polyps, an inflammatory condition of the respiratory mucosa starting in the ethmoid region and potentially causing anosmia and obstruction. They also often cause asthma or bronchial hyper-reactivity, not to be overlooked. Nasal polyposis may occur as part of Samter's triad (polyps, asthma, and salicylate sensitivity).

### 2.5.3. Hyperalgesia: severe acute maxillary or frontal sinusitis

The pattern of symptoms differs in that the pain is more intense, and no improvement occurs despite medical treatment. Pain can be relieved immediately by puncturing the sinuses through:

- the inferior meatus (severe acute maxillary sinusitis);
- the canine fossa (severe acute frontal sinusitis).

### 2.5.4. Complicated infections

Eye and orbit: palpebral cellulitis, subperiosteal orbital abscess, and orbital cellulitis (cf. acute ethmoiditis in children).

Brain and meninges: cerebral abscess, meningitis, subdural empyema, and thrombophlebitis of the cavernous or superior sagittal sinus.

Frontal bone osteitis.

These complications are often encountered in young patients. They may be life-threatening or lead to visual loss, which is why they should be diagnosed early on through detailed clinical examinations performed systematically whenever symptoms suggest acute sinusitis.

### 2.5.5. Immunocompromised hosts

In immunocompromised patients (Type 1 diabetes, HIV, prolonged corticosteroid treatment, chemotherapy-induced aplasia, malignant blood disease and bone marrow transplant, immunosuppressive drug regimen, etc.), acute invasive fungal infections must be spotted early on despite limited symptoms, such as fever of unknown origin. Prognosis is very poor.

## 2.6. Treatment

Combines antibiotics, possibly short-course systemic corticosteroid therapy (0.8 mg/kg/day for 3 days, AFSSAPS), decongestants, and analgesics/antipyretics. NSAIDs are not indicated in acute sinusitis.

Recurring sinusitis calls for etiological therapy.

### 2.6.1. Guidelines for antibiotic therapy

The main bacteria involved in sinusitis are *haemophilus influenzae* and *streptococcus pneumoniae*. Many strains exhibit reduced sensitivity or resistance to antibiotics. Given current marketing authorizations and the resistance of bacteria, first-line antibiotic therapy will involve one of the following per os:

- co-amoxiclav 1g x 3/day or taken 3 times a day for a total of 80 mg/kg/day in children;

- cephalosporins: second-generation (cefuroxime axetil) or third-generation (cefpodoxime proxetil or cefotiam hexetil);
- pristinamycin, especially in cases of beta-lactam allergy;
- telithromycin is an acceptable alternative.

Fluoroquinolones active against pneumococcus (levofloxacin, moxifloxacin) should be reserved for the most severe and seriously complication-prone cases such as frontal or sphenoid sinusitis, or for when first-line antibiotics fail in maxillary sinusitis, after bacteriological or radiological documentation.

Treatment for acute purulent maxillary sinusitis typically lasts 7 to 10 days. Cefuroxime axetil, cefpodoxime axetil, and telithromycin have been shown effective in 5-day treatments, pristinamycin in 4-day treatments (Table I).

**Table I : Symptomatology of sinusitis in adults and first-line antibiotic therapy, by topographical location**

Location	Symptoms	First-line antibiotic therapy
Maxillary	Pain under one or both eyes, worse when head forward, sometimes throbbing and worst in late afternoon or at night	Amoxicillin/clavulanic acid  2nd and 3rd generation cephalosporins (except cefixime): cefuroxime axetil, cefpodoxime proxetil, cefotiam hexetil,  pristinamycin
Frontal	Headache over eyes	<i>Idem</i> or fluoroquinolones active against pneumococcus (levofloxacin, moxifloxacin)
Ethmoid	Pressure at inner corner of eye, palpebral edema, retro-orbital headache	<i>Idem</i> or fluoroquinolones active against pneumococcus (levofloxacin, moxifloxacin)
Sphenoid	Constant retro-orbital headache radiating to crown and similar to intracranial hypertension in terms of location, intensity, and persistence  Purulent discharge on the posterior wall of the pharynx (dripping ostium far back) visible with tongue depressed	<i>Idem</i> or fluoroquinolones active against pneumococcus (levofloxacin, moxifloxacin)

## 2.6.2. Indications for antibiotic therapy

- Acute bacterial maxillary sinusitis: Antibiotics are indicated if two of the three major criteria defined above are fulfilled, if first-line symptomatic treatment fails, or if the infection is of dental origin;
- Frontal, ethmoid, or sphenoid sinusitis: Antibiotics are indicated (Table I);
- Clinical signs suggesting complicated sinusitis: Meningism, exophthalmia, palpebral edema, eye motility disorders, or sleep-disturbing pain. Antibiotic therapy is usually initiated in the hospital after bacteriological testing.