

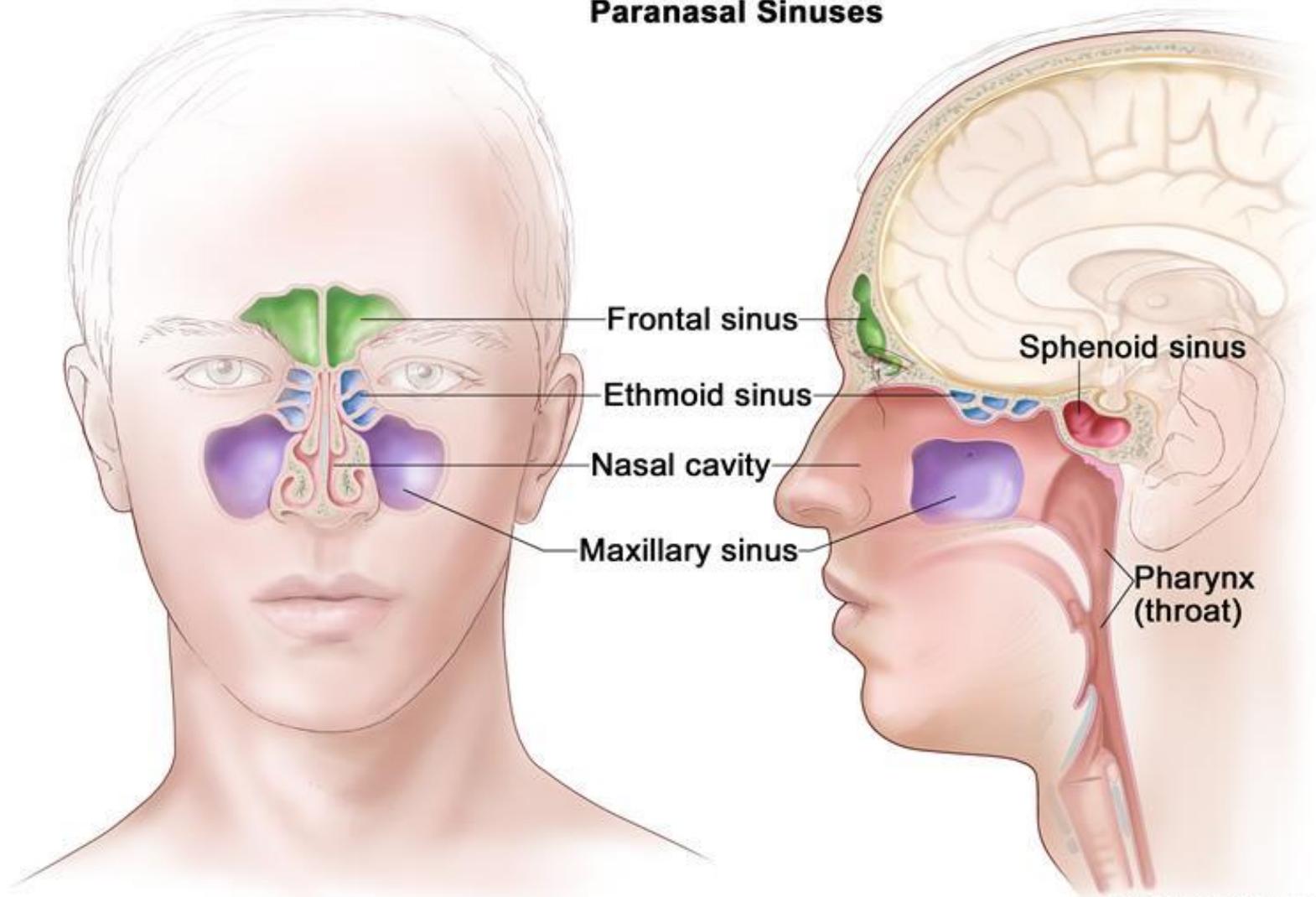
# Rhinosinusitis

# FUNCTIONS OF NOSE

- RESPIRATION
- OLFACTION
- FILTRATION & HUMIDIFICATION & WARMING OF AIR
- RECEPTION OF SECRETIONS

- Upper  $\frac{1}{3}$  is called olfactory area
- Lower  $\frac{2}{3}$  is called respiratory area
- Mucous membrane lines the entire nasal cavity except for the vestibule which lined with hairy skin called vibrissae
- This mucosa is continuous with cavities that nasal cavity communicates with (sinuses, nasopharynx & lacrimal sac) .
- Lining is respiratory epithelium (ciliated pseudostratified columnar epithelium).

## Paranasal Sinuses



# Functions of the paranasal sinuses

- resonating chambers for the voice.
- moisturizing and humidifying ambient air.
- lightening the weight of the facial skeleton & skull.

# Rhinosinusitis

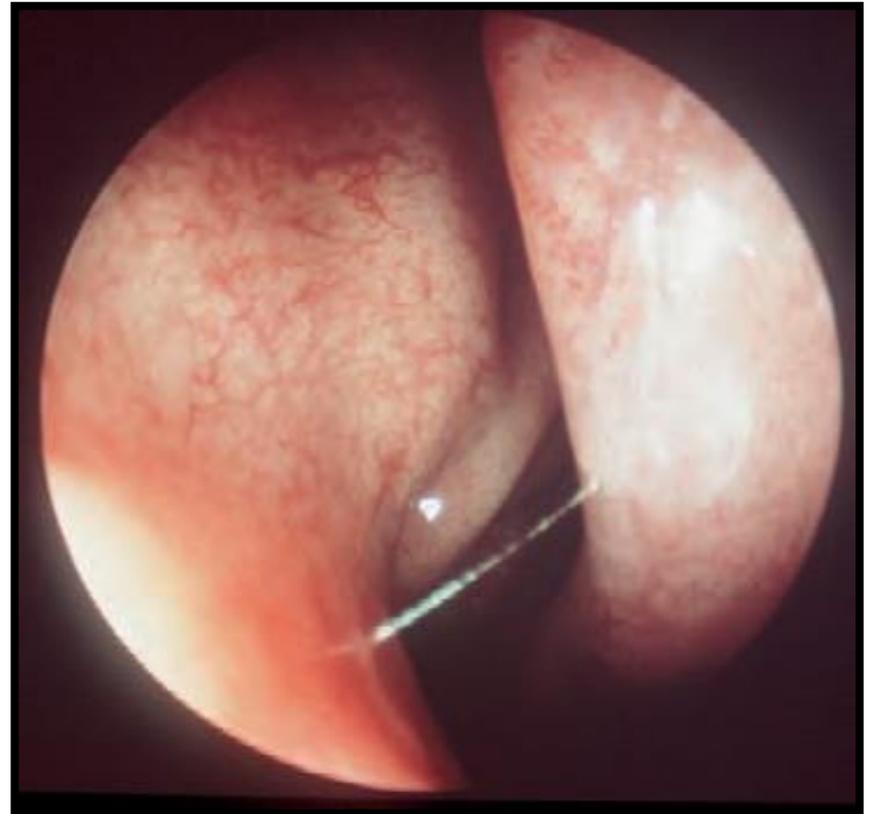
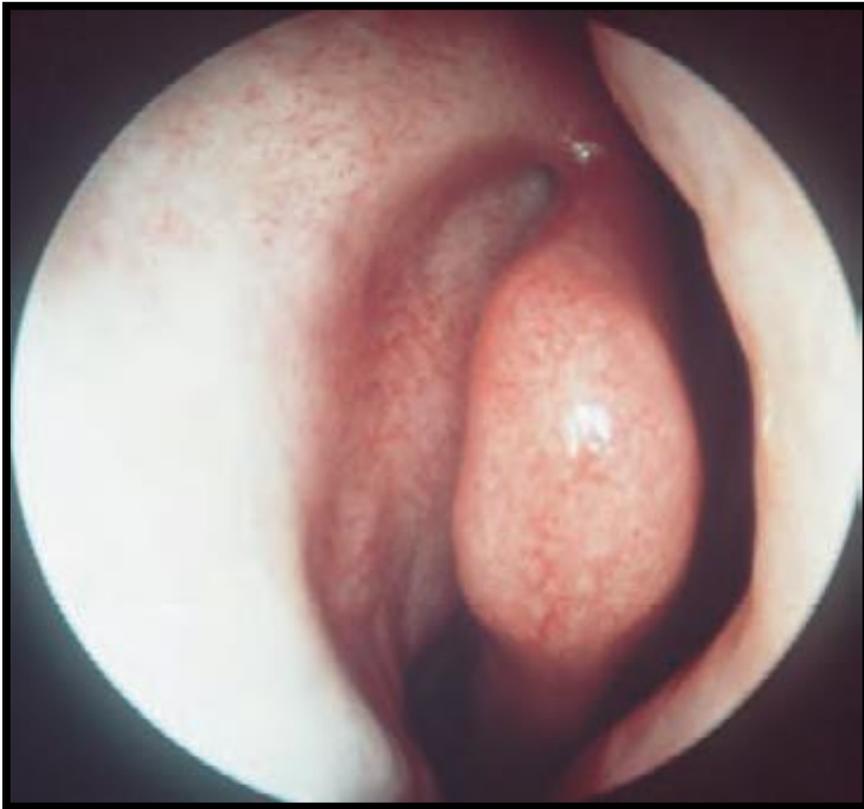
- Rhinosinusitis is irritation and inflammation of the mucous membrane inside the nose & paranasal sinuses.
- It is called rhino-sinusitis because:
  - 1- they are continuous cavities
  - 2- same mucosal lining

# ENDOSCOPIC VIEW



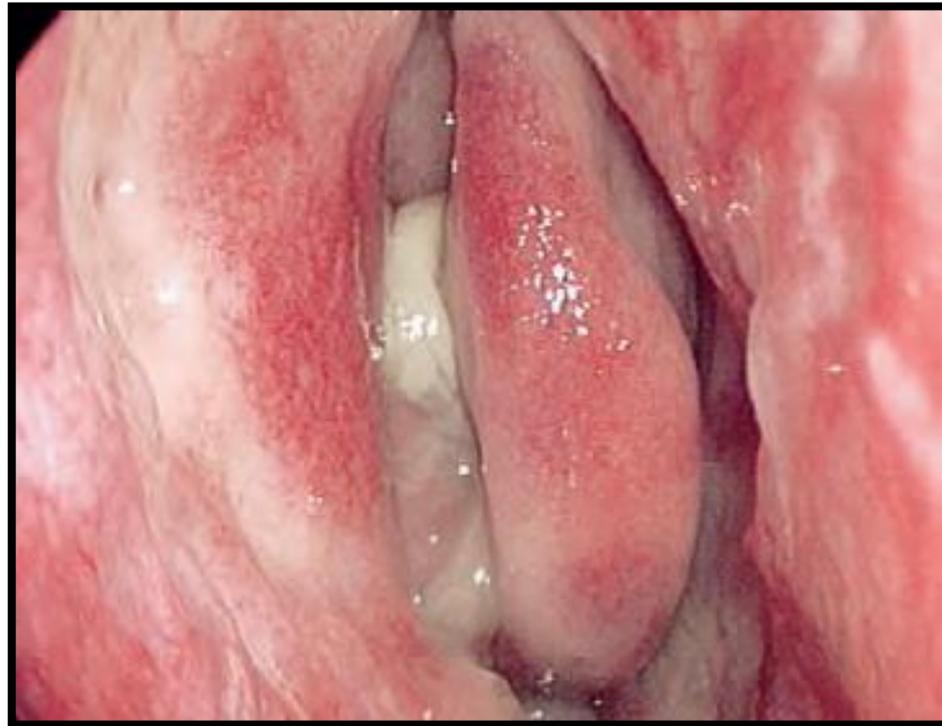
**INFERIOR TURBINATE**

# ENDOSCOPIC VIEW

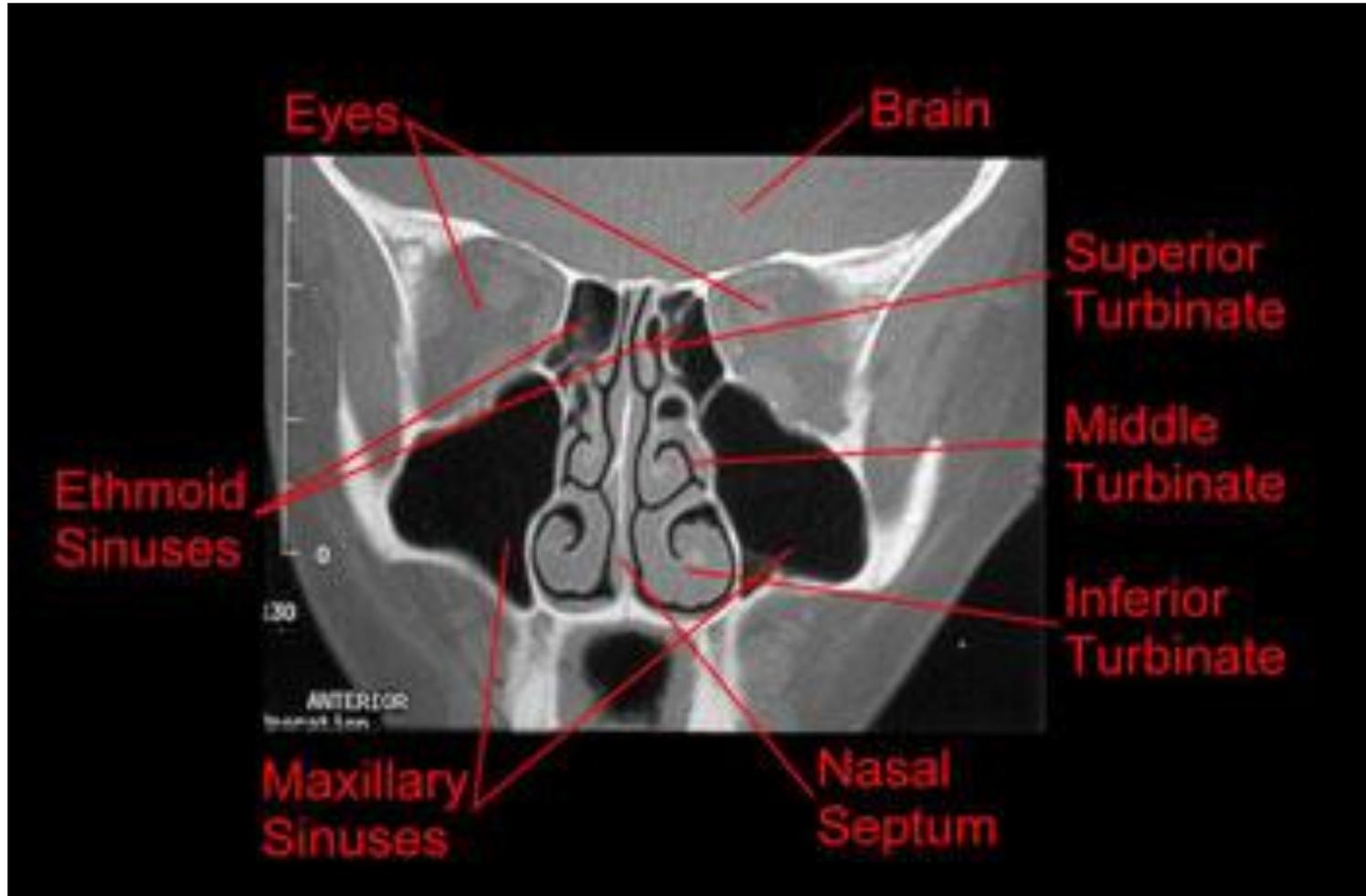


**MIDDLE TURBINATE & MEATUS**

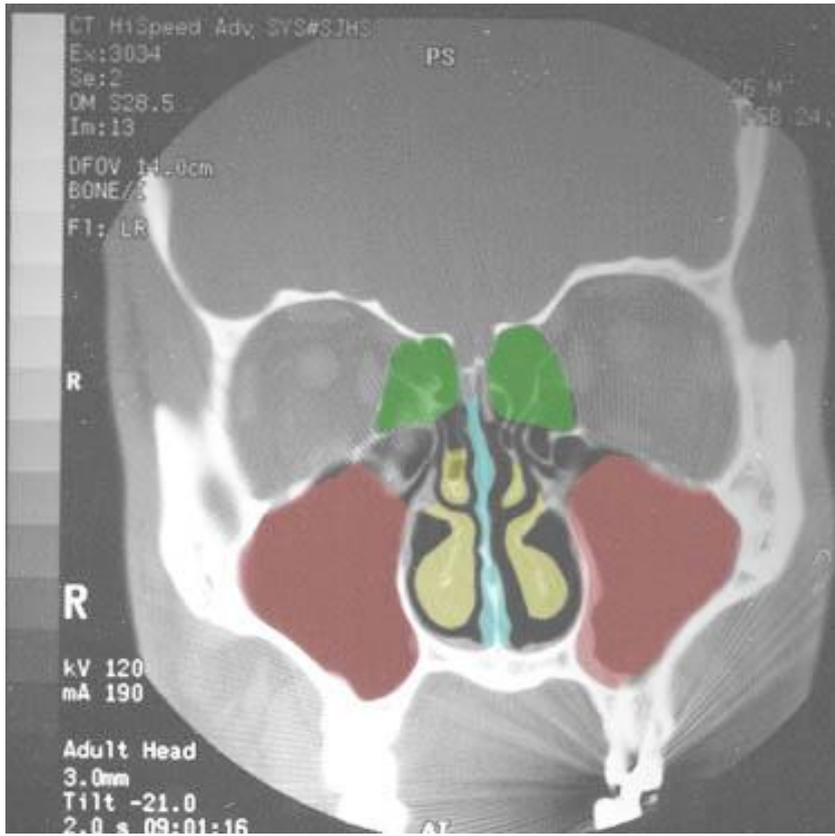
# ENDOSCOPIC VIEW



# CT SCAN

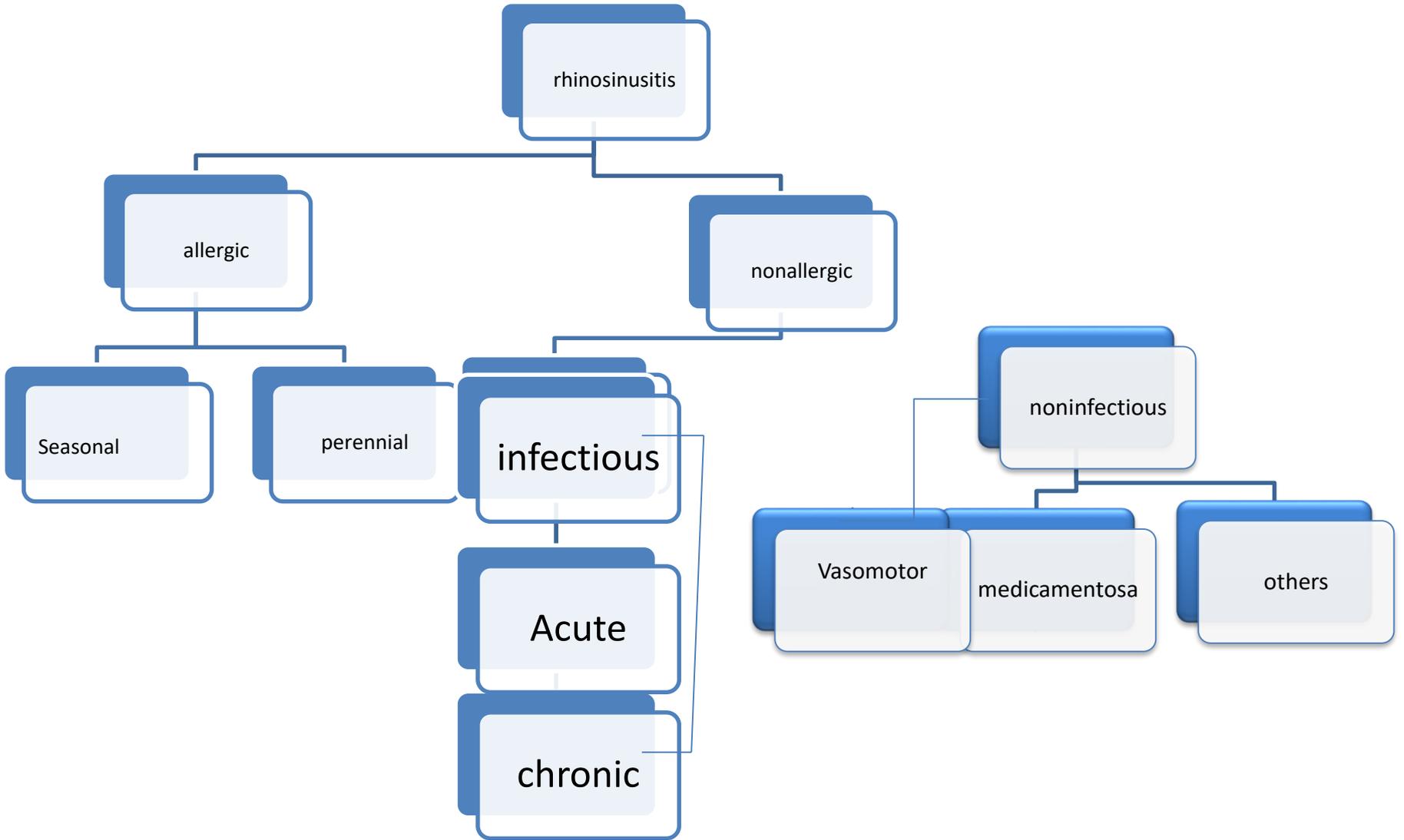


# CT SCAN



# SYMPTOMS

- NASAL OBSTRUCTION & MOUTH BREATHING.**
- RHINORRHEA.**
- SNEEZING.**
- NASAL ITCHING.**
- SNORING & SLEEP APNEA.**
- OLFACTORY PROBLEMS.**
- HEADACHE, FACIAL PAIN, & DENTAL PAIN.**
- POSTNASAL DRIP.**
- NASAL DEFORMITY.**
- HYPONASAL SPEECH.**



# Vasomotor (intrinsic) rhinosinusitis

- when there is no specific cause for the inflammation.
- certain nonspecific stimuli, including changes in environment (temperature, humidity, barometric pressure, or weather), airborne irritants (odors, fumes), dietary factors (spicy food, alcohol), sexual arousal, and emotional factors trigger rhinitis.
- it is thought that these non-allergic triggers cause dilation of the blood vessels in the lining of the nose, which results in swelling and drainage.
- Vasomotor rhinitis can coexist with allergic rhinitis, and this is called "mixed rhinitis."

# Cont.

- The pathology of vasomotor rhinitis appears to involve neurogenic inflammation and is as yet not very well understood. more common in women than men, leading some researchers to believe that hormones play a role. In general, age of onset occurs after 20 years of age, in contrast to allergic rhinitis which can be developed at any age. Individuals with vasomotor rhinitis typically experience symptoms year-round, though symptoms may be exacerbated in the spring and autumn when rapid weather changes are more common

# treatment

- The antihistamine azelastine (H1 blocker), applied as a nasal spray, may be effective for vasomotor rhinitis
- Anticholinergics

# RHINITIS MEDICAMENTOSA

- Nasal obstruction that worsen over years
- Due to over the counter drug abuse, specifically topical vasoconstrictive nasal sprays.
- Many times these patients need increasing doses of these sprays as tachyphylaxis occurs. The use of these sprays for prolonged periods leads to rebound rhinitis, in which the patient experiences severe obstruction as the effects of the topical agents subside.

# Allergic rhinosinusitis

## ESSENTIALS OF DIAGNOSIS

- *May be seasonal, perennial, or both.*
- *Characterized by sneezing, itching, rhinorrhea, and congestion.*
- *Can be associated with other chronic conditions, including asthma, otitis media with effusion rhinosinusitis, and nasal polyposis.*
- *Typical symptoms of sneezing, rhinorrhea, and nasal congestion can be associated with viral, bacterial, allergic, and nonallergic etiologies.*
- *Can have multiple triggers, both inhaled and ingested.*

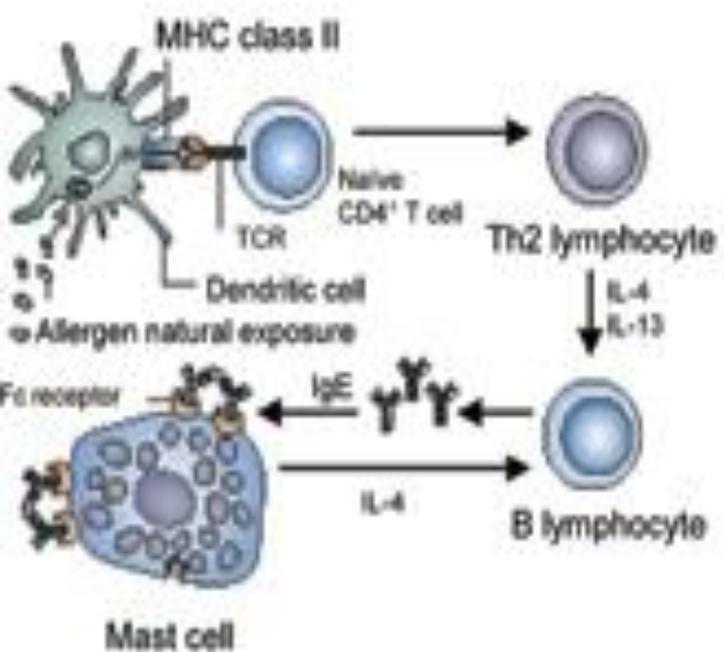
# Pathophysiology

- The allergic response is mediated primarily by a type I hypersensitivity reaction. This response involves the excess production of IgE antibodies and is termed an atopic reaction.
- In patients with an atopic disposition (a genetic trait), an allergic reaction begins with sensitization to a specific allergen (in allergic rhinitis, these are usually airborne), which induces IgE-antibody production.
- On subsequent exposure, the specific antigen attaches to two specific IgE antibodies attached to the surface of mast cells, which are prevalent in the submucosa of the respiratory and gastrointestinal tracts, the subconjunctiva of the eye, and the subcutaneous layer of the skin. Consequently, this IgE-mediated reaction causes degranulation of the mast cell, which then provokes an inflammatory response with the release of mediators such as histamine, leukotrienes, cytokines, prostaglandins, and platelet-activating factor. This is referred to as the **early-phase or humeral reaction** and occurs within 10–15 minutes of allergen exposure; the release of histamine causes the symptoms of sneezing, rhinorrhea, itching, vascular permeability, vasodilatation, and glandular secretion.

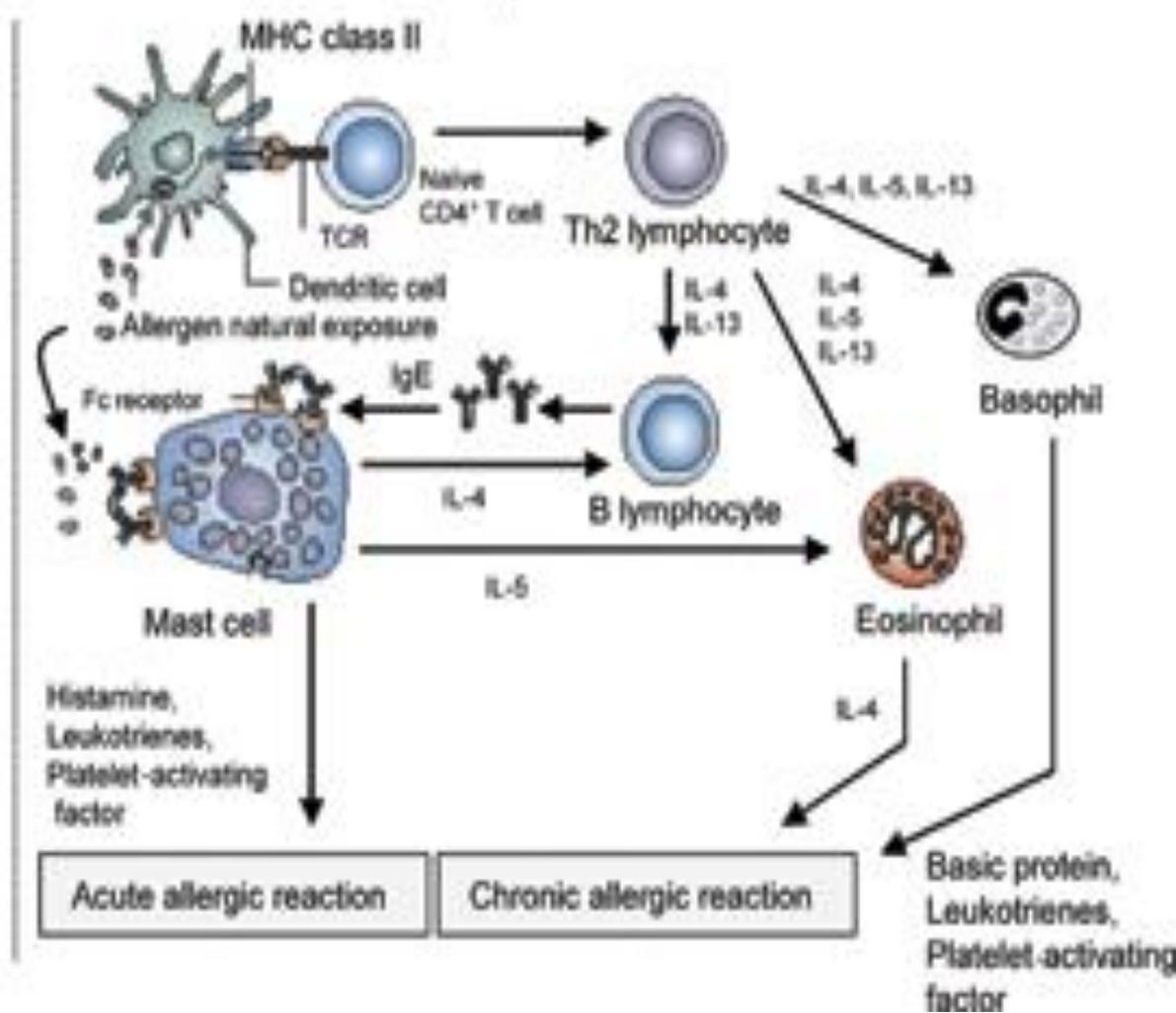
# Pathophysiology cont.

- The release of cytokines and leukotrienes subsequently causes an influx of inflammatory cells (mainly eosinophils) into the affected area (chemotaxis). This inflammatory response is called the **late-phase or cellular reaction, which** can begin 4–6 hours after the initial sensitization and may prolong and enhance the allergic cascade for as long as 48 hours. This response is the main cause of the symptoms of nasal congestion and postnasal drip in allergic rhinitis. In addition, these mediators produce a hyperreaction to both specific allergens and nonspecific irritants such as tobacco smoke and chemical fumes, referred to as the **priming effect.**

## Sensitization



## Re-exposure



## Particles in air (allergens)

Pollen



Dust mite  
debris



Animal  
dander



## Allergic symptoms

Watery  
eyes

Runny nose

Itchy throat



Two types

1- seasonal

2- perennial

# A. SEASONAL ALLERGIC RHINITIS

- The symptoms of seasonal allergic rhinitis, as its name implies, occur or are increased during certain seasons.
- usually depending on the pollination of plants to which the patient is allergic. Trees pollinate in the spring, grasses in the late spring and summer, and weeds in the fall. In addition, molds may cause symptoms in the fall.
- Characteristic symptoms of seasonal allergies include sneezing, watery rhinorrhea, itching of the nose, eyes, ears, and throat, red and watering eyes, and nasal congestion.
- Symptoms are usually worse in the morning and are aggravated by dry, windy conditions when higher concentrations of pollen are distributed over a wider area.

# B. PERENNIAL ALLERGIC RHINITIS

- The symptoms of perennial allergic rhinitis are usually constant, **with little seasonal variation**, although they may vary in intensity.
- Characteristic symptoms are predominantly:
  - nasal congestion and blockage
  - postnasal drip.
- **Rhinorrhea and sneezing are less common. Eye symptoms are less common**, except with animal allergies.
- Seasonal pollen may cause the exacerbation of any of these symptoms.
- Common allergens that cause perennial allergic rhinitis **are indoor inhalants, predominantly dust mites, animal dander, mold spores, and cockroaches (in inner cities)**. Certain occupational allergens may also cause perennial allergic rhinitis; these are not usually constant because they depend on workplace exposure.
- **Food allergens:**
  - may contribute to perennial allergic rhinitis.
  - often associated with other symptoms, including: gastrointestinal problems
    - urticaria
    - angioedema
    - anaphylaxis

# Diagnosis: Hx

- family history of allergies, eczema, or asthma increases this possibility.
- May be clear and watery nasal discharge, nasal congestion, postnasal drip, and itching of the nose, throat and eyes.
- Timing of symptoms i.e. (continuous or not)
- If not must know when
- history of an anaphylactic reaction following ingestion of a particular food or being stung by an insect usually indicates an atopic patient
- onset, duration, type, progression, and severity of their symptoms. A relationship to the seasons
- quality of his or her life.

# Diagnosis: physical examination

- inspection of the ears, throat, and nasal passages.
- bluish, pale, boggy turbinates; wet, swollen mucosa; and nasal congestion with nasal obstruction.
- With perennial allergies, nasal congestions the predominant sign, but the nasal examination may appear normal.

## Cont.

- In children, allergic “shiners” (dark circles under the eyes), facial grimacing, mouth breathing, and the “nasal salute” (constant rubbing of the tip of the nose with the hand) are common physical findings. In addition, in this age group, a concomitant otitis media with effusion is also a possibility.

# Specific tests

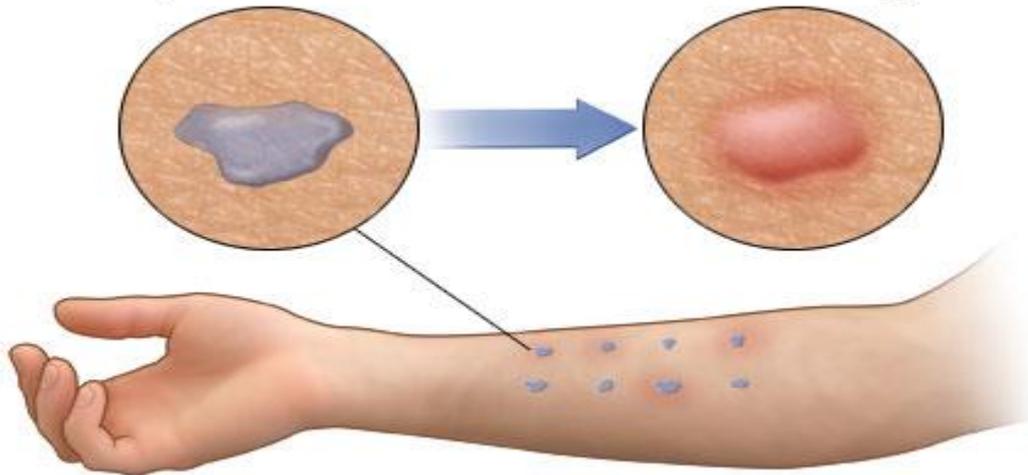
- 1. Allergy testing:** to establish objective evidence of atopic disease it can also determine the allergen.
- 2. Skin testing:**
  - a. Skin prick test
  - b. Intradermal testing
- 3. In vitro testing—Allergen-specific serum IgE testing**



Allergen solution is placed on skin



Positive test: Skin is red and itchy



# DDx

- Infectious rhinosinusitis
- Allergic rhinosinusitis
- Pollutants & irritants
- Hormonal rhinosinusitis (e.g., pregnancy or hypothyroidism)
- rhinitis medicamentosa
- anatomic deformity
- tumors or foreign bodies.

# Management

- In general, three options are available for the management of allergic rhinitis:
  - (1) avoidance and environmental controls
  - (2) pharmacotherapy
  - (3) immunotherapy

# Avoidance

- Avoidance of contact with the allergen may be possible, especially in the case of domestic pets.

# medical

- Antihistamines are useful in acute episodes but tolerance develops. The latest generation of antihistamines (H1 receptor antagonists) do not produce drowsiness. **rhinorrhea ,itching &sneezing**
- Vasoconstrictor nasal drops provide temporary relief but are not advisable, as prolonged use leads to chronic rhinitis medicamentosa.
- Sodium cromoglycate **mast cell stabilizer** (Rynacrom) applied to the nose 4–6 times daily as prophylaxis is particularly suitable for children.

# Cont.

- Topically applied steroid preparations (beclomethasone, flunisolide) are probably the most effective treatment of nasal allergy. Systemic effects of steroid therapy are usually absent but such treatment is not advisable in young children.
- **Desensitization by administration of increasing dosages of allergen is no longer widely practiced**, as it is of little benefit in most cases and carries the risk of anaphylaxis.
- **If gross hypertrophy of the nasal mucosa has occurred, surgical reduction** by diathermy or laser may be beneficial.
- Usually combination of corticosteroid & antihistamine

# immunotherapy

- attempts to increase the threshold level of the appearance of symptoms after aeroallergen exposure.
- The exact mechanism of how immunotherapy works is still unclear

# Idea

Most immunotherapy administered in the United States today is through a gradual increase in the dose of the antigen(s) given until either a mild systemic symptom or a large local reaction at the subcutaneous injection site occurs (optimal dose therapy). In some centers, sublingual immunotherapy is the method of choice. This is more common in Europe and tends to be easy and safe to administer at home by the patients themselves. There is no adequate test available to indicate to the patient how long immunotherapy must be continued. Therefore, a clinical response with a reduction in symptoms dictates the duration of specific treatment. A minimum of 2–3 years is usually given to avoid a rapid recurrence of symptoms in uncomplicated allergic rhinitis.

# Indications of immunotherapy

- long-term pharmacotherapy for prolonged periods of time
- the inadequacy or intolerability of drug therapy,
- significant allergen sensitivities.

\*\*\* to use immunotherapy we must be sure of the diagnosis & the allergen\*\*\*

# Acute Rhinosinusitis

- bacterial
- typically begins as a viral upper respiratory infection that persists longer than 10 days or become worse after 5-7 days.
- Might be due to ostial blocking & mucosal edema resulting in mucos stasis & suitable site for bacterial growth

- The most common organisms responsible for acute sinusitis include:
- 1: *Streptococcus pneumoniae*,
- 2: *Haemophilus influenzae B*,
- 3: and *Moraxella catarrhalis*.

# Major and minor factors in the diagnosis of acute sinusitis

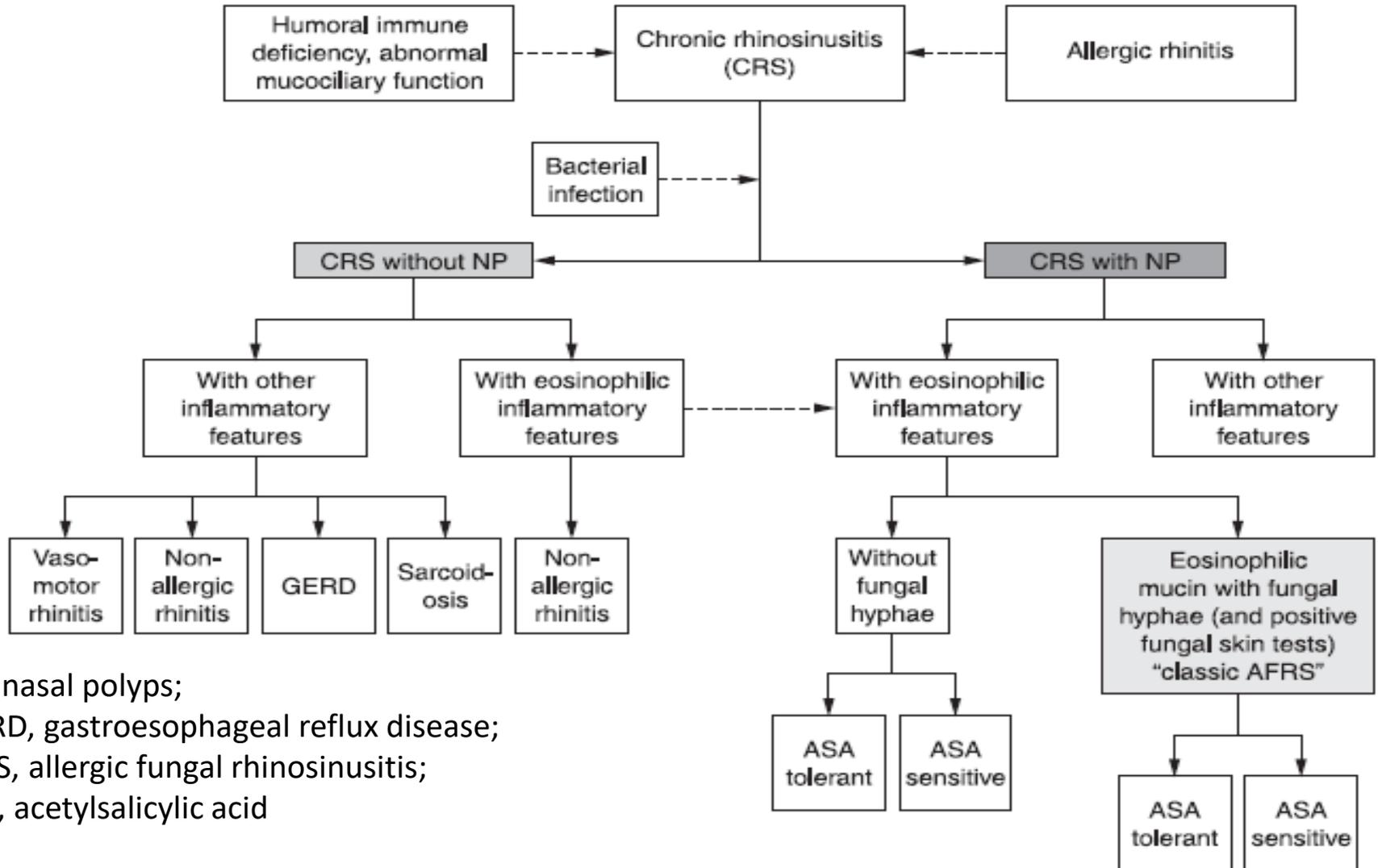
- **Major Factors**
- Facial pain or pressure
- Facial congestion or fullness
- Nasal obstruction or blockage
- Nasal discharge, purulence, or discolored postnasal drainage
- Hyposmia or anosmia
- Purulence in nasal cavity
- **Fever (in acute rhinosinusitis only)**
- **Minor Factors**
- Headache
- Fever (in chronic sinusitis)
- Halitosis
- Fatigue
- Dental pain
- Cough
- Ear pain, pressure, or fullness

# Chronic Rhinosinusitis

- Pathophysiology not well understood
- Commonest symptoms are
  - nasal discharge,
  - nasal obstruction,
  - facial congestion,
  - and facial pain/pressure
- Pts with nasal polyps more often to have hyposmia and less pain/pressure complaints

# Chronic Rhinosinusitis

## Clinical classification of CRS



NP, nasal polyps;

GERD, gastroesophageal reflux disease;

AFRS, allergic fungal rhinosinusitis;

ASA, acetylsalicylic acid

# bacterial

- COMMNEST :
- MIXED BACTERIAL INF.
- role of bacteria in the pathogenesis of chronic rhinosinusitis is controversial
- controversial, although antibiotics are frequently prescribed.
- The most common organisms isolated in chronic rhinosinusitis subjects include *Staphylococcus aureus*, anaerobes, and gram-negative enterics such as *Pseudomonas aeruginosa*.

# Fungal rhinosinusitis

- **1. Invasive fungal sinusitis—**
- **Invasive fungal sinusitis** :is usually a complication of diabetes or an immunocompromised state
- it is characterized by a fulminant invasive infection
- black necrotic debris that is often seen intranasally demonstrates arterial and venous thrombosis due to direct fungal invasion.
- The typical
- fungal pathogens are *Aspergillus*, *Mucor*, and *Rhizopus*

- The treatment consists of
- (1) debriding all involved structures, including the orbital contents,
- if necessary; (2) aggressive intravenous
- antifungal therapy;
- (3) normalizing the underlying immunocompromised state (usually neutropenia);
- and (4) stabilizing the diabetes.

- **2. Fungal ball—Fungal ball is the development of a**
- noninvasive conglomeration of fungal hyphae into a mass. *Aspergillus is the most common pathogen, and* chronic rhinosinusitis results from paranasal sinus obstruction. Treatment is complete extirpation of the fungal mass.

- **3. Allergic fungal rhinosinusitis (AFRS)—  
Fungus**
- can also stimulate an immune response from the sinonasal mucosa, resulting in allergic fungal sinusitis.
- Sinus expansion and bony remodeling are hallmark features of this process.
- the treatment is primarily surgical with postoperative topical nasal steroids.

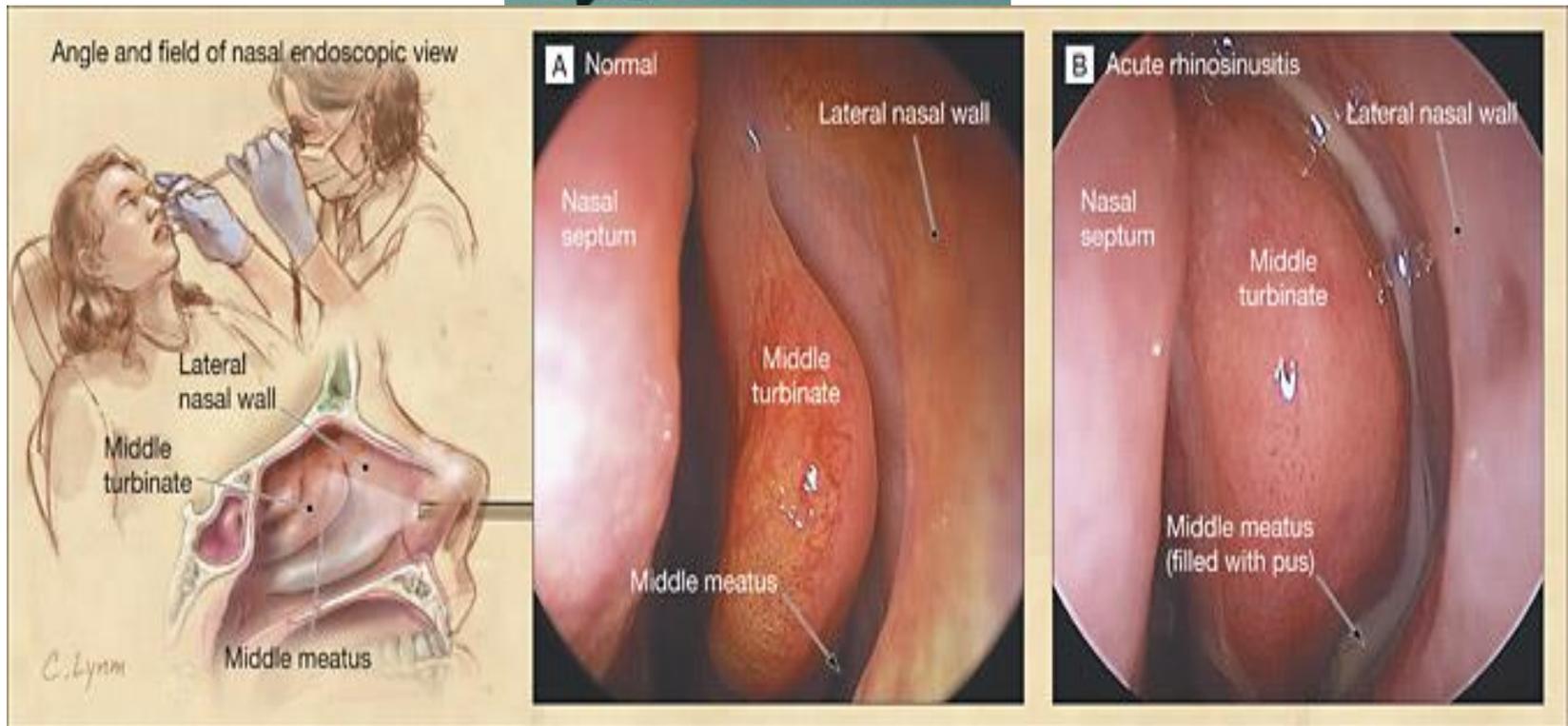
# Diagnosing Infective Rhinosinusitis

## 1- History & Examination:

- Complete Head & Neck Examination
- Anterior Rhinoscopy



## 2- Rigid or Flexible Nasal Endoscopy



### 3- Imaging Studies :

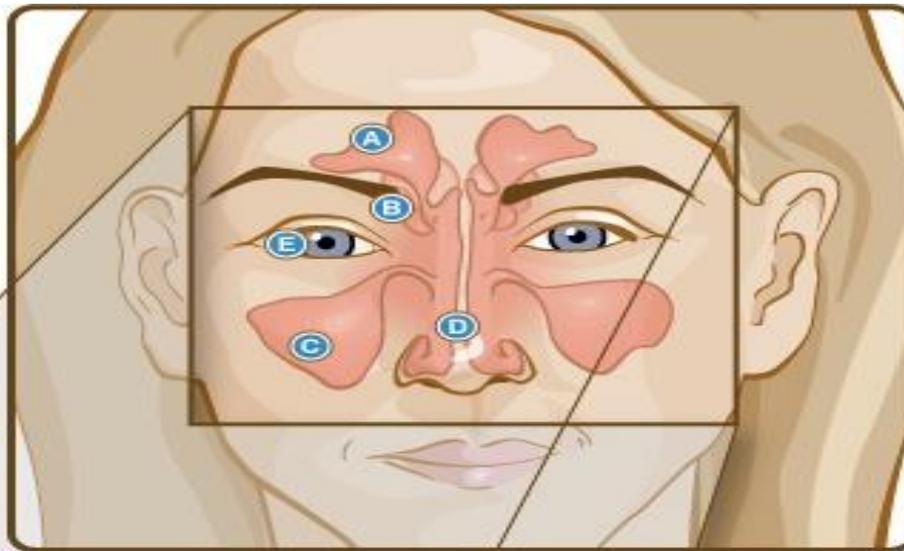
#### Computed tomography(CT)

-the method of choice for sinus imaging.

**WHY ???**

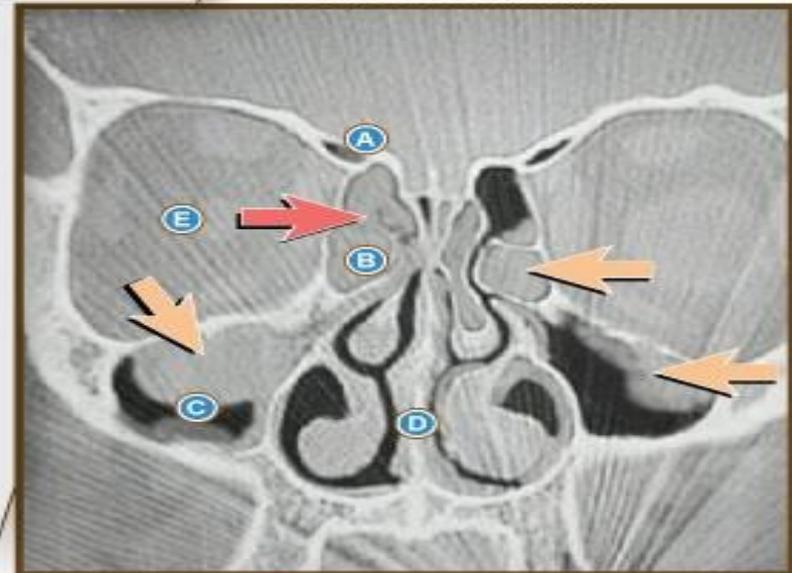
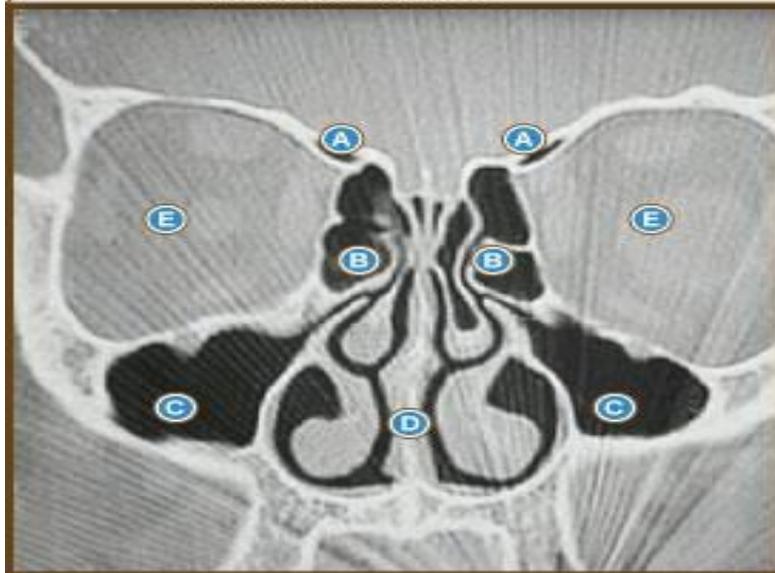
providing excellent visualization of **mucosal thickening, air fluid levels, and bony structures,**

**coronal scans give optimal visualization of the osteomeatal complex** and are conveniently oriented for the surgeon in terms of surgical planning.



**Normal Sinuses**

**Chronic Sinusitis**



A Frontal Sinus    
 B Ethmoid Sinuses    
 C Maxillary Sinus    
 D Nasal Septum    
 E Eye Socket

Black = air  
 Gray = soft or swollen tissue, or thick secretions  
 White = bone

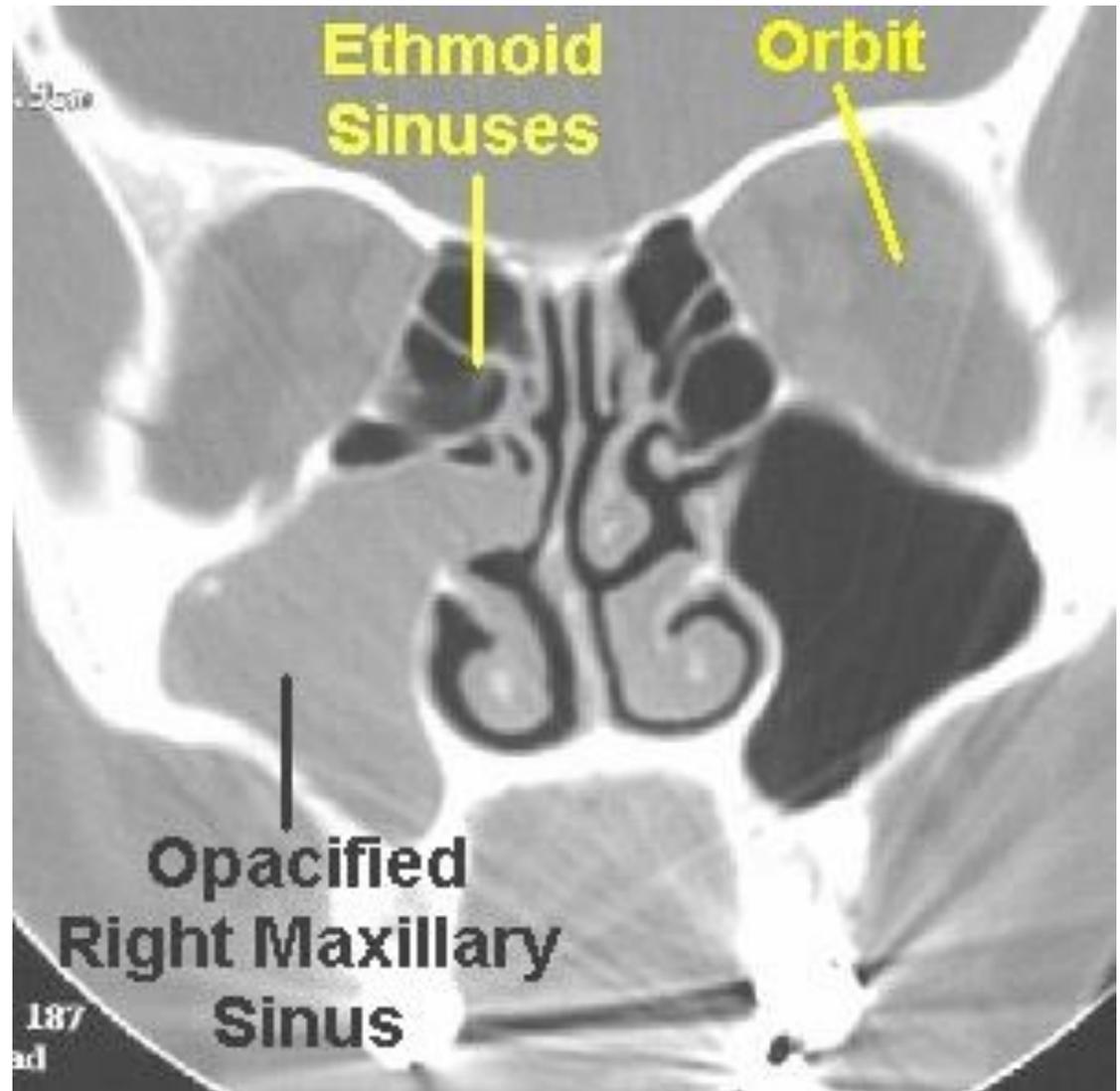
Thickening of the mucosa  
 Complete blockage of the ethmoid sinuses

Coronal CT

showing right maxillary sinus opacification.

Also, note the septal deviation to the right

and the hypertrophy of the left inferior turbinate.



Coronal CT scan  
of the sinuses

Showing bilateral  
maxillary  
sinusitis.

The opacification  
is more prominent  
on the left side.

The septum is  
also deviated to  
the left.



- Magnetic resonance imaging (MRI) of the sinuses is much **less** commonly performed than CT scanning largely because this modality **does not image bone well**. therefore, MRI can be very helpful in differentiating a sinus completely filled with **tumor from one partially filled with retained secretions**.
- MRI is also a helpful modality with suspected orbital or intracranial extension

Laboratory tests are rarely helpful in the evaluation of sinusitis.

If there is any question of an immunocompromised state, testing for HIV and IgG levels should be performed.

# Differential Diagnosis

- 1- viral rhinnitis
- 2- TMJ pain
- 3- headache and migrane
- 4- tooth , nasal and trigeminal pain
- 5- sinus neoplasm

# Treatment

## ❖ Treatment Goals:

- ✓ Correct the predisposing cause
- ✓ Ventilate the sinus
- ✓ Restore normal mucosal lining in the sinus
- ✓ Prevent complications .

## ❖ Treatment:

- 1- Medical
- 2- Surgical

## A. Antibiotics

- Current guidelines for antibiotic choice in acute bacterial rhinosinusitis are dependent on:
  1. severity of the disease
  2. whether the patient has received antibiotics in the past 4–6 weeks .
- Duration of treatment should be 10–14 days

- With **mild** disease and **no recent antibiotic use**, recommendations include **amoxicillin/clavulanate** or **cefepodoxime, cefuroxime**.
- **With recent antibiotic** use or **in moderate disease**, initial drug selection should include a respiratory **quinolone, amoxicillin/clavulanate, ceftriaxone**, or a combination to provide broad-spectrum coverage in adults and **amoxicillin/clavulanate** or **ceftriaxone** in children

- Failure to respond to treatment within 72 hours should lead to a reevaluation and change of therapies to provide broader coverage.
- In this circumstance, CT scan, nasal endoscopy, or culture should be considered.

- In chronic RS, demands an antibiotic with a spectrum that includes gram-negative organisms, **S.aureus**, and anaerobes
- longer courses of antibiotics, typically 3–6 weeks, are often recommended
- Culture-directed therapy is highly recommended
- amoxicillin/clavulanate are recommended
- Clindamycin and imipenem are also used .

## B. NASAL SPRAYS AND IRRIGATION

Nasal steroid sprays reduce mucosal inflammation and the size of polyps, thereby limiting postoperative recurrence.

nasal saline sprays help to keep the mucosa moist and to facilitate mucociliary clearance in both acute bacterial rhinosinusitis and chronic rhinosinusitis.

Nasal saline irrigation is an important component in the treatment of chronic rhinosinusitis.

Frequent rinsing prevents the accumulation of nasal crusts and promotes mucociliary clearance.

## C. SYSTEMIC STEROIDS, DECONGESTANTS

Systemic steroids are highly effective at reducing mucosal inflammation and nasal polyp bulk in chronic rhinosinusitis because of their anti-inflammatory effects.

Systemic decongestants and mucolytic agents such as guaifenesin may provide some symptomatic relief.

## **D. Allergy Management**

**For patients with documented allergic disease, ongoing allergy management is beneficial.**

**Environmental controls, topical steroids, and immunotherapy may prevent exacerbations of rhinitis, therefore preventing the progression to sinusitis.**

# Surgical

## sinus surgery

- Maximal medical therapy, typically defined as 4–6 weeks of appropriate antibiotics, nasal steroids, and generally systemic steroid therapy, is prescribed prior to the consideration of surgical management.
- Surgical therapy may be necessary if evidence of mucosal disease or ostiomeatal unit obstruction—as determined by either CT scan or endoscopic evaluation—**persists in spite of aggressive medical treatment**. Patients with clear anatomic abnormalities or sinonasal polyps may be more likely to respond to surgical therapy.

## 1- Functional Endoscopic Sinus Surgery:

### **Indications:**

- (1) widely patent antrostomies may fail to drain sinuses
- (2) the ostiomeatal unit is anatomically constricted
- (3) the stripping of sinus mucosa leads to delayed healing and the loss of normal ciliary function.

Improvement in symptoms expected in > 90% pt.

FESS only one component of a total sinusitis treatment plan.

The complications are related to the close anatomic proximity of the paranasal sinuses to the brain and orbits.

## 2- Open sinus surgery

If irreversible changes have occurred to the sinus mucosa then some surgeons would consider it necessary to remove it.

### Examples:

- *Chronic maxillary sinusitis*: Caldwell-Luc procedure.
- *Chronic ethmoid sinusitis*: intranasal ethmoidectomy, external ethmoidectomy (Patterson's operation), transantral (Horgan's operation).
- *Chronic frontal sinusitis*: external frontoethmoidectomy (Howarth's operation), osteoplastic flap procedure (MacBeth's operation).
- *Chronic sphenoiditis*: via an intranasal ethmoidectomy, transantral to the posterior ethmoids then to the sphenoid sinus, via an external frontoethmoidectomy.

# Complications

	<i>Complication</i>	<i>Management</i>
ethmoid	Orbital Complications: Lid Edema Orbital Cellulitis Orbital Abscess	→ Oral Ab → IV Ab → Surgical Drainage
	Meningitis	IV Ab & Drainage of Sinus
Frontal	Epidural Abscess	Abscess + Sinus Drainage & Long term Ab
	Cavernous Sinus Thrombosis	IV Ab (if needed Sinus Drainage)
	Pott Puffy Tumor	Surgical drainage and débridement

If infection in the frontal sinus spreads to the marrow of the frontal bone, localized osteomyelitis with bone destruction can result in a doughy swelling of the forehead classically described as Pott puffy tumor. Surgical drainage and débridement must be undertaken.

# Lid edema





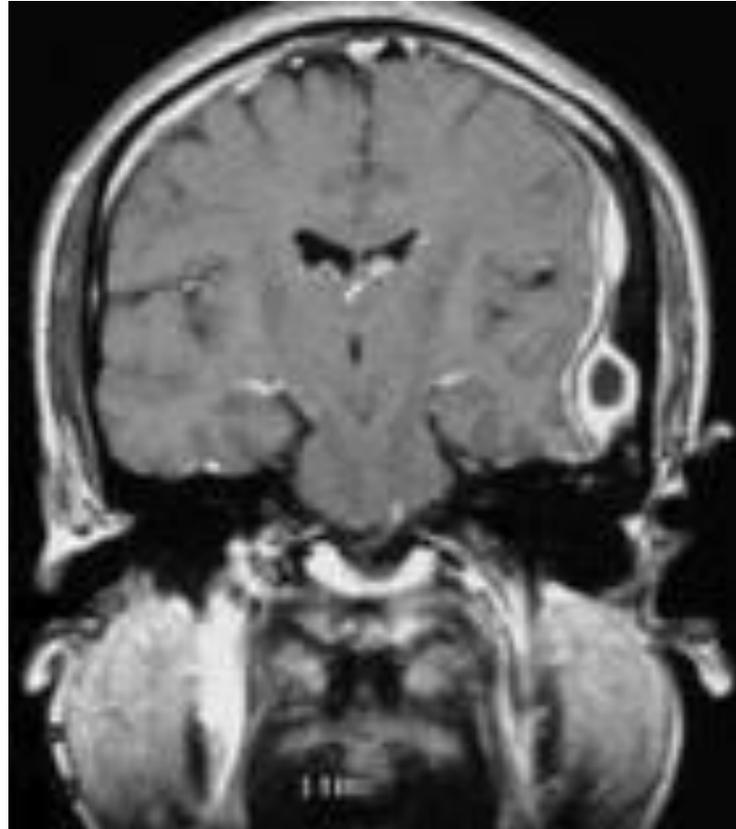
**Figure 14-4.** Brain abscess due to frontal sinusitis. This contrast-enhanced axial CT scan shows a left frontal brain abscess caused by frontal sinusitis.

# Orbital cellulitis

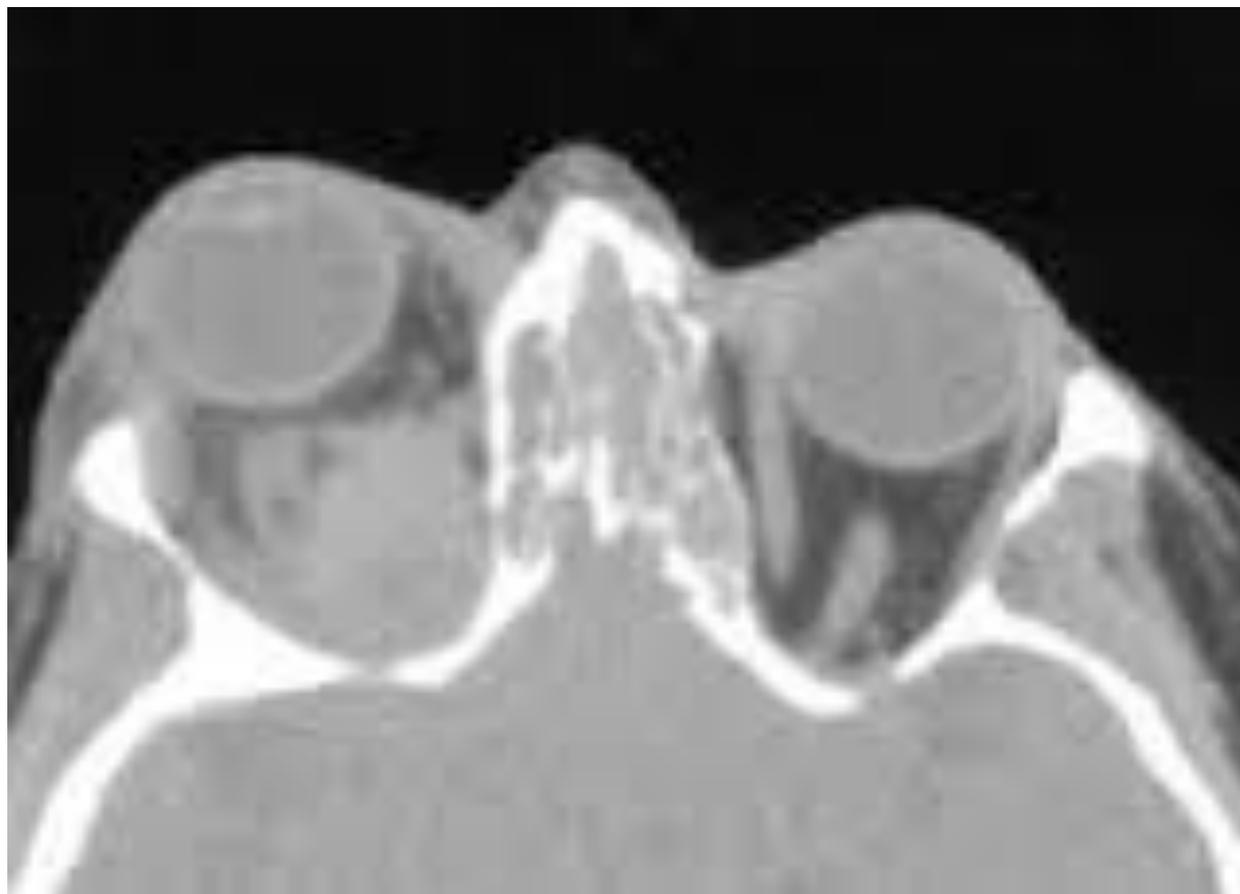




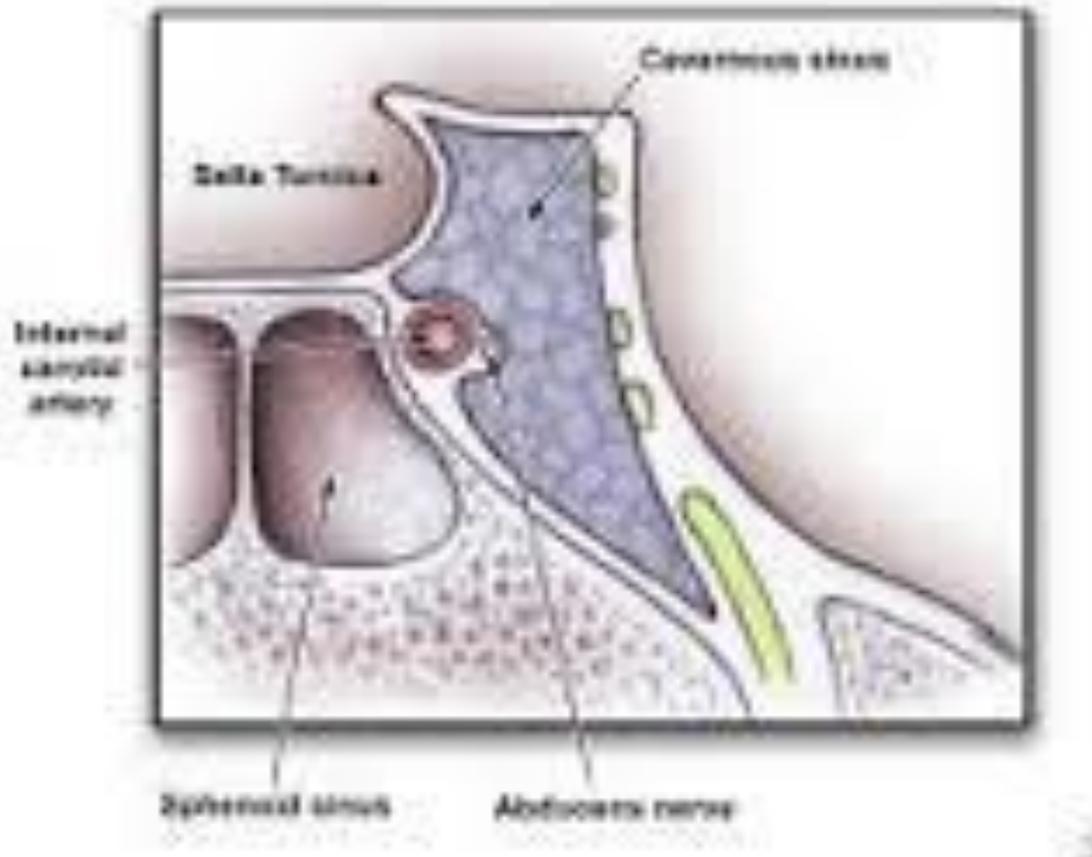
# Epidural abcess



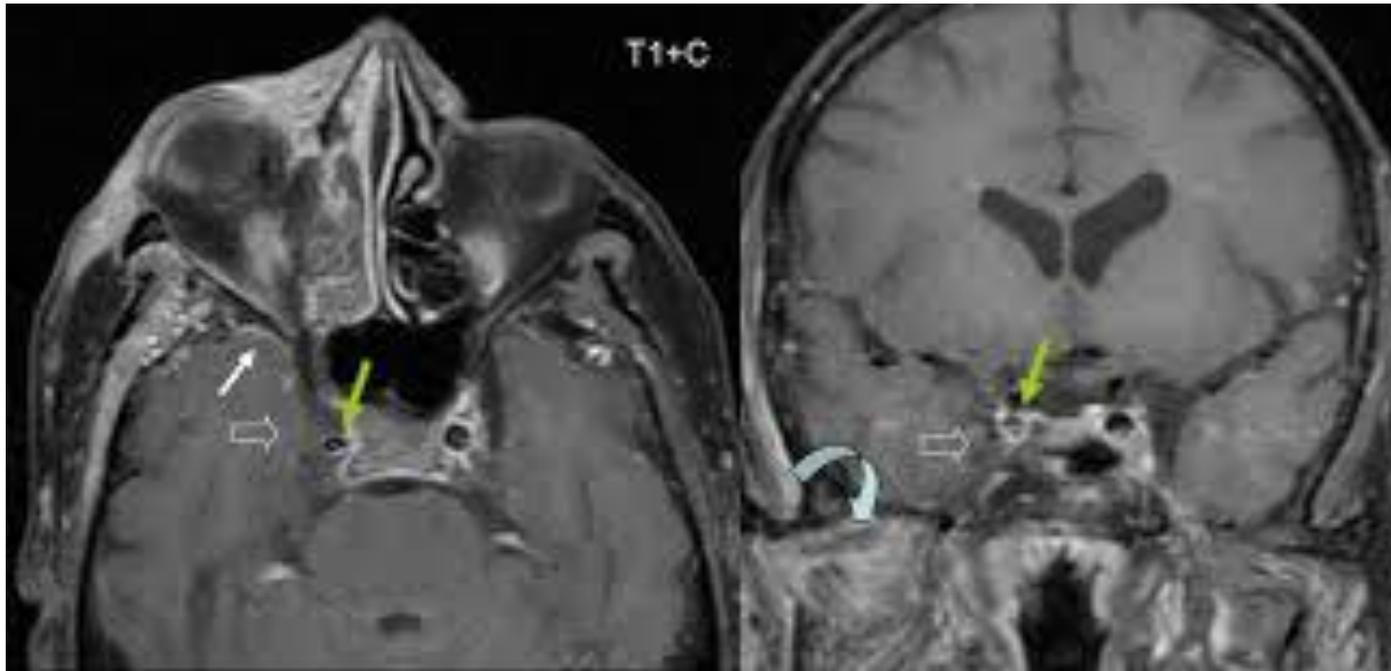
# Orbital abscess



# Cavernous sinus



thrombosed



# Pott Puffy Tumor



Fever, altered sensorium

# Pott Puffy Tumor



# NASAL POLYPS



# NASAL POLYPS

**MAY PESENT AS:**

**NASAL OBSTRUCTION.**

**RHINORRHEA.**

**OLFACTORY DYSFUNCTION.**

**POSTNASAL DRIP.**

**HYPONASAL SPEECH.**

**OTOLOGIC SYMPTOMS.**



# NASAL POLYPS

**MAY BE ASSOCIATED WITH OTHER DISEASES  
LIKE:**

**CHRONIC RHINOSINUSITIS**

**ALLERGY**

**BRONCHIAL ASTHMA**

**ASPIRIN SENSITIVITY**

**FUNGAL INFECTION**

**CYSTIC FIBROSIS**



