Fungal Sinusitis

Morgan DelVecchio, MMS, PA-C

Disclosure

I have NO financial disclosure or conflicts of interest with the presentation material in this presentation.

Objectives

1. What is fungal sinusitis and the different types
2. Etiologies of fungal sinusitis
3. Symptoms of fungal sinusitis
4. How to identify fungal sinusitis
5. What tests are there for fungal sinusitis
6. How to treat/prevent fungal sinusitis
7. Example sinus CT scans

What is Fungal Sinusitis

- Fungal sinusitis is a sinus infection that results from a fungus. Most common causative agents are molds and yeast although attributed to molds more than to yeast. Aspergillus, Penicillium, Bipolaris, Curvularia, Mucor, and Rhizopus are the common molds that cause fungal sinusitis. Candida is rare cause of fungal sinusitis.
- There are several types of fungal sinus infections. Some types can cause serious health problems and death.
- People who have a condition that weakens their immune system have a higher risk of complications from fungal sinusitis.

Classification of Fungal Sinusitis

- Invasive
  - Presence of fungal hyphae within the mucosa, submucosa, bone, or blood vessels of the paranasal sinuses
    - Acute Invasive Fungal Sinusitis
    - Chronic Invasive Fungal Sinusitis
    - Chronic Granulomatous Invasive Fungal Sinusitis
- NonInvasive
  - Absence of fungal hyphae within the mucosa and other structures of the paranasal sinuses
    - Allergic Fungal RhinoSinusitis With or Without Nasal Polyps
    - Fungus Ball (fungus mycetoma)
    - Saprophytic fungal sinusitis

Acute Invasive Fungal Sinusitis

- This is where the fungi destroys the blood vessels inside the nose causing the tissue to die which can then cause the infection to spread quickly to the eyes and brain which in term can lead to blindness and death
- Most lethal form of fungal sinusitis (mortality 50-80%)
- Rare and more so seen in immunocompromised patients such as diabetics, AIDS patients, organ transplant patients, and cancer patients undergoing chemotherapy
    - In diabetics, the fungi to cause acute invasive fungal sinusitis are Rhizopus and Mucor
    - In AIDS, organ transplant, and cancer patients, the fungi that causes acute invasive fungal sinusitis is Aspergillus

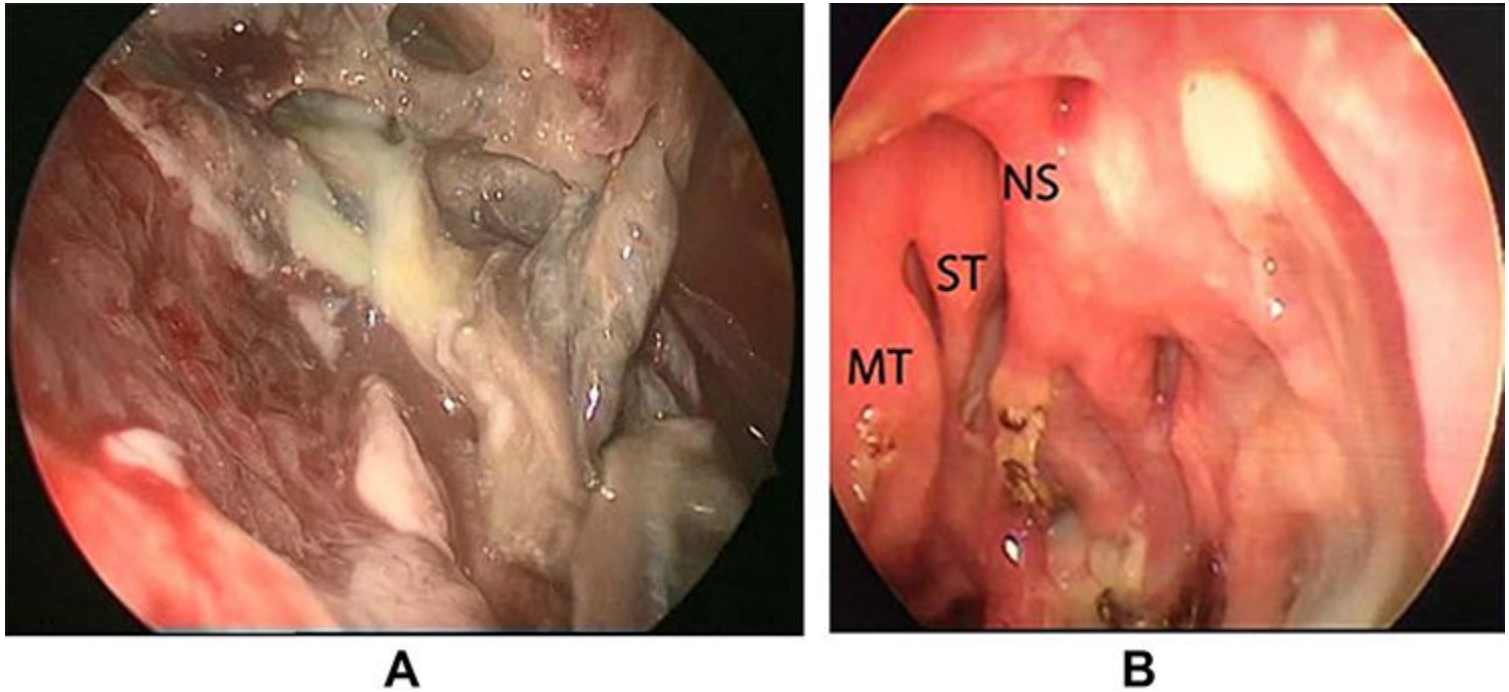
Acute Invasive Fungal Sinusitis-Clinical

- Leads to necrotic nasal septum ulcer, sinusitis, rapid orbital and intracranial spread resulting in death
- Pt will have fever, facial pain, nasal congestion, epistaxis, proptosis, visual disturbance, headache, mental status changes, and seizures
- Poor prognosis

Acute Invasive Fungal Sinusitis-Imaging

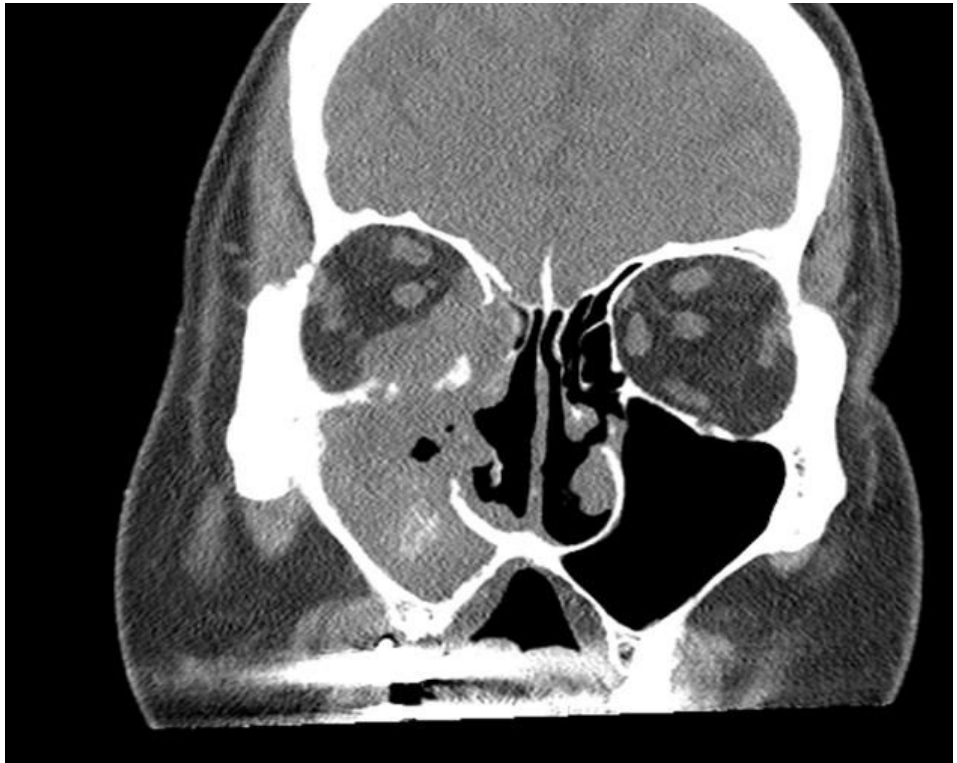
- Severe unilateral nasal cavity soft tissue thickening is most consistent early CT finding
- Hypoattenuating mucosal thickening within lumen of paranasal sinus with rapid aggressive bone destruction of sinus walls occurs as disease progresses
- Unilateral involvement of ethmoids and sphenoids
- Intracranial extension can result in cavernous sinus thrombosis, carotid artery invasion, occlusion, or pseudoaneurysm
- May need MRI for better evaluating intracranial and intraorbital extension

Acute Invasive Fungal Sinusitis-Nasal Endoscopy



"Intraoperative endoscopic view of the left side nasal cavity showing necrosed nasal mucosa (**B**) Endoscopic view of the nasal cavity six months postoperatively and after antifungal treatment showing the middle turbinate "MT", and the superior turbinate "ST" of the right nasal cavity. The nasal mucosa appears healthy and pinkish with the appearance of the right-side nasal cavity from the left-side nasal cavity after removal of the necrosed nasal septum during surgery."

Acute Invasive Fungal Sinusitis-Sinus CT Scan



Acute Invasive Fungal Sinusitis-Treatment

- Emergency surgery is necessary to confirm the diagnosis and to remove all dead tissue via surgical debridement
- Systemic antifungal treatment is provided (Amphotericin B (1-1.5 mg/kg/d) are recommended. Oral Itraconazole (400 mg/d) can replace Amphotericin B once acute stage has passed
- If possible, efforts to reverse the underlying immune suppression should be initiated

Chronic Invasive Fungal Sinusitis

- Similar to acute invasive fungal sinusitis but does not spread as quickly
- More common in patients with diabetes or immunosuppressed individuals
- The invasion of the sinus tissues occurs over a period of weeks to years rather than hours
- Involves mucosa, submucosa, blood vessels, and bony walls
- Most common fungal organisms are Aspergillus, Mucor, Rhizopus, Bipolairs, and Candida
- History of chronic rhinosinusitis

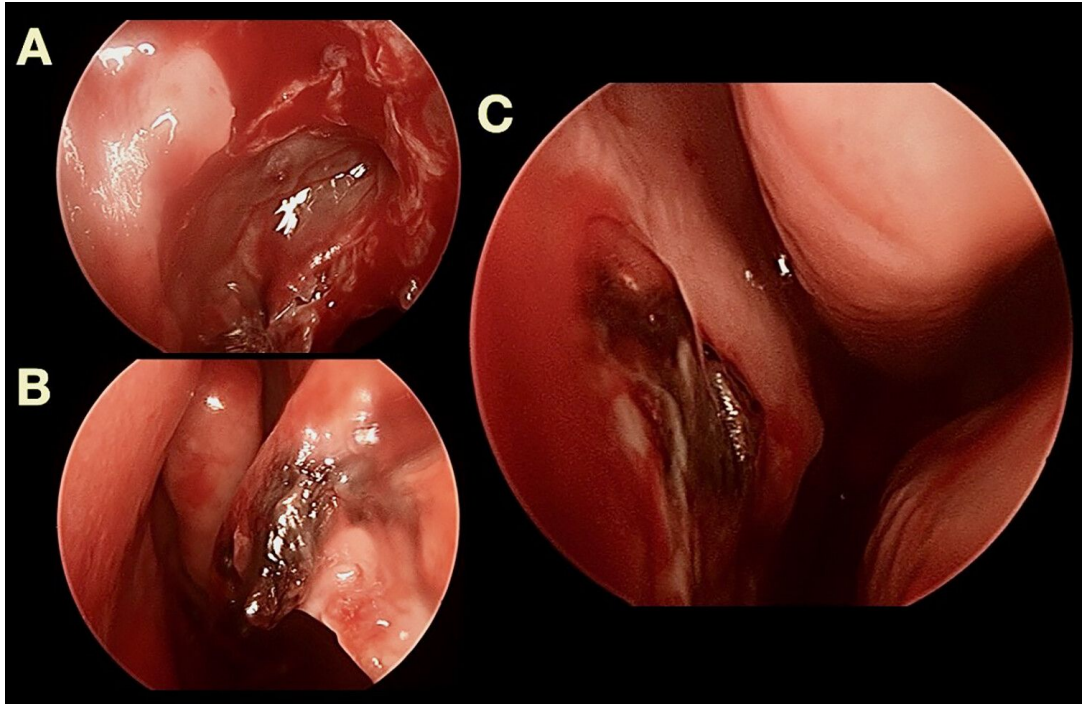
Chronic Invasive Fungal Sinusitis-Clinical

- Patients can present with eye swelling and blindness
- Maxillofacial soft tissue swelling, orbital invasion with proptosis, cranial neuropathies, decreased vision, can cause headaches, seizures, and decreased mental status

Chronic Invasive Fungal Sinusitis-Imaging

- Hyperattenuating soft tissue mass in one or more of paranasal sinuses and bone involvement often gives mottled appearance with or without sclerosis
- May appear as a malignancy with masslike appearance and extension beyond sinus confines
- May need MRI as well

Chronic Invasive Fungal Sinusitis-Nasal Endoscopy



Necrosis shown

Chronic Invasive Fungal Sinusitis-Sinus CT Scan

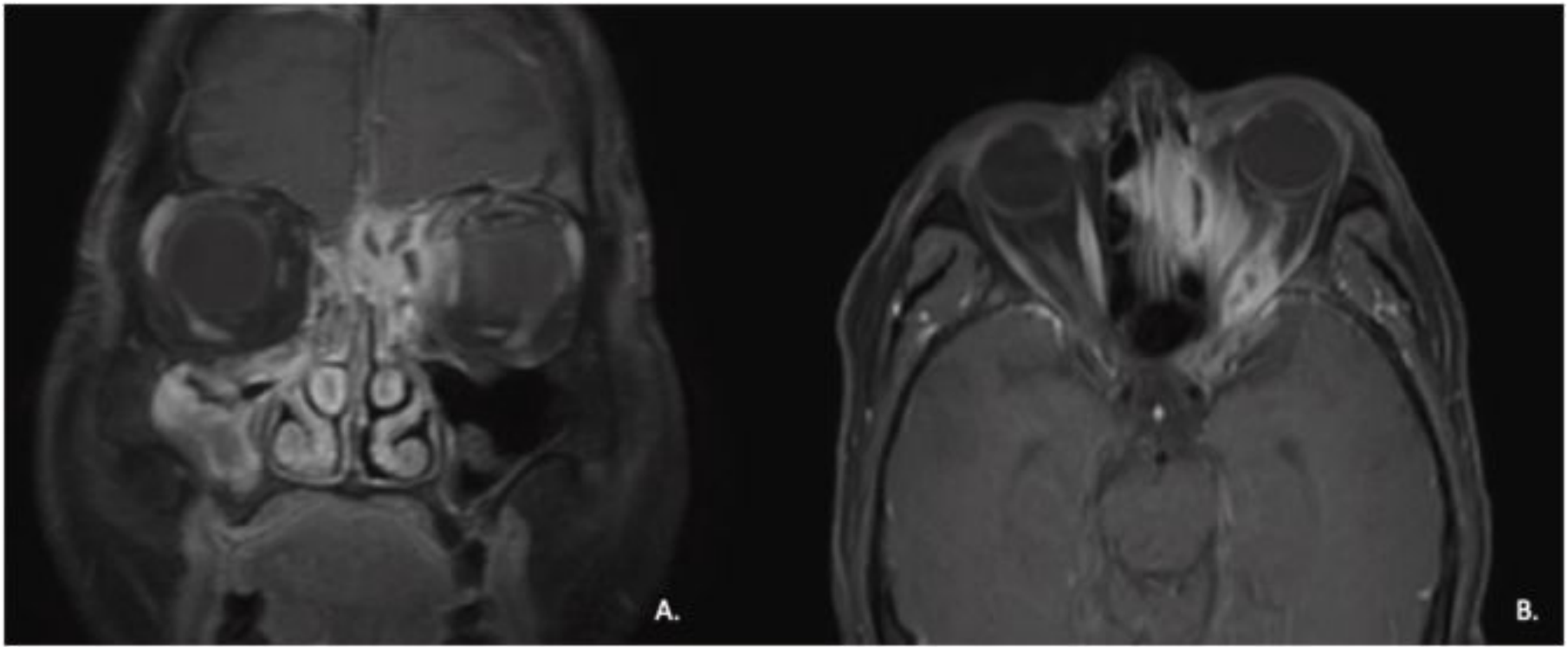
Chronic Invasive Fungal Sinusitis-Treatment

- Urgent surgery is necessary to confirm the diagnosis and remove all involved tissues
- Systemic antifungal treatments are also critical to start such as Amphotericin B (2 g/d) but can be replaced by Ketoconazole or Itraconazole

Chronic Granulomatous Invasive Fungal Sinusitis

- Characterized by a specific long-term inflammatory response known as granulomatous inflammation to fungal organisms that have invaded the sinus tissues
- Individual's immune system attacks the lining of the nose and destroys the nasal tissue
- Onset is gradual
- Primarily found in Africa (Sudan) and Southeast Asia
- Occurs in immunocompetent individuals as well
- Caused by Aspergillus
- Similar to chronic invasive fungal sinusitis

Chronic Granulomatous Invasive Fungal Sinusitis-MRI



Chronic Granulomatous Invasive Fungal Sinusitis-Treatment

- Surgical debridement and systemic antifungals needed for treatment
- Similar to Chronic Invasive Fungal Sinusitis

Allergic Fungal RhinoSinusitis

- Subtype of chronic rhinosinusitis that can be associated with or without nasal polyps
- Accounts for 5-10% of chronic rhinosinusitis cases
- Chronic noninvasive condition
- Caused by a hypersensitivity reaction to fungi inside the nose resulting in chronic noninfectious inflammatory reaction-IgE type I immediate hypersensitivity and type III hypersensitivity are involved and type 2 inflammatory profile
- Most common form of fungal sinusitis
- Common in warm, humid climates
- Organisms that cause this are Aspergillus, Bipolairs, Curvularia, Alternaria, and Fusarium
- Often times mistaken for chronic rhinosinusitis and patients will most often receive multiple treatment such as steroids and antibiotics

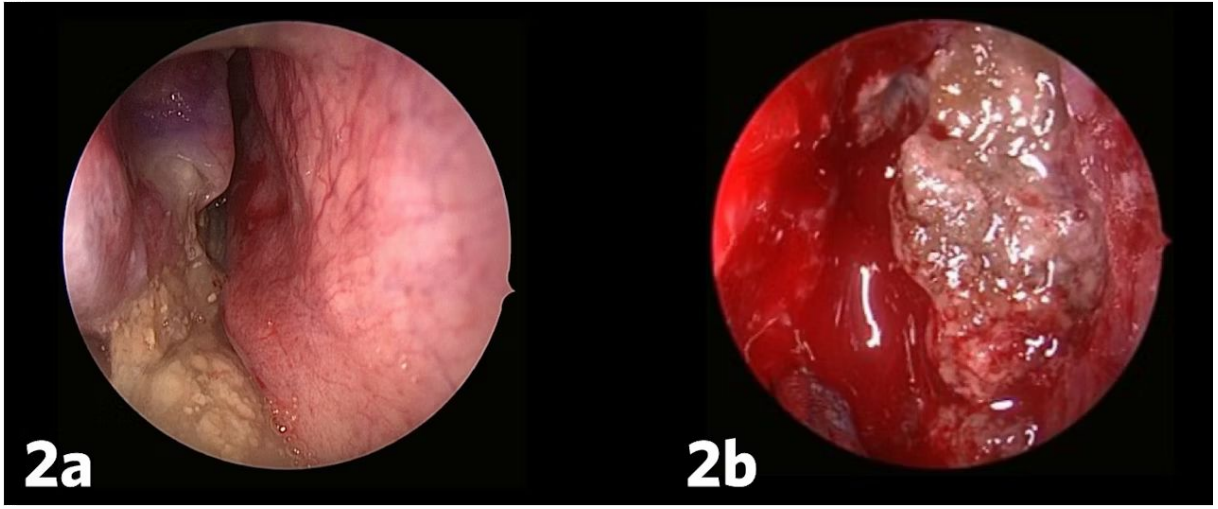
Allergic Fungal RhinoSinusitis-Clinical

- Younger individuals and immunocompetent
- More likely to present with unilateral findings
- Highly suspected in kids with diffuse pansinusitis
- Most patients will also have allergic rhinitis and/or asthma
- Symptoms consist of chronic headaches, nasal congestion, and chronic sinusitis for years
- Substantial polyp burden and dense eosinophilic mucin with a “peanut butter” consistency
- Characterized by thick sinus secretions, which have a characteristic golden-yellow color and have a consistency like rubber cement. Secretions contain proteins from degranulated eosinophils plus some fungal elements
- Bent and Kuhn’s initial diagnostic criteria for Allergic Fungal RhinoSinusitis includes fungal type 1 hypersensitivity, nasal polyposis, characteristic CT findings, eosinophilic mucus without fungal invasion, and a positive fungal stain of sinonasal contents. It is still clinically diagnosed at the time of surgery.

Allergic Fungal RhinoSinusitis-Imaging

- Often has a nasal component
- Sinus CT scan shows high attenuation allergic mucin within lumen of sinuses
- Demonstrates heterogeneous sinus opacification with areas of hyperattenuation and metallic-type “double densities” on soft tissue window. The disease process characteristically causes expansile changes to the paranasal sinuses, which can lead to expansion and erosion of the bony orbit, skull base, and facial skeleton
- May need MRI as well in cases of extensive orbital or skull base involvement

Allergic Fungal RhinoSinusitis-Nasal Endoscopy



Allergic Fungal RhinoSinusitis-Sinus CT Scan

Allergic Fungal RhinoSinusitis-Treatment

- The goal is surgical debridement to surgically remove the fungal laden eosinophilic mucin with restoration of normal sinus drainage
- Surgical management requires complete removal sinus bony partitions including concha bullosa, clearance of all fungal mucin, meticulous dissection, and wide osteoplasty to decrease risk of disease recurrence
- Often, fungal debris and inspissated mucus are tenacious, and complete intraoperative removal requires tedious debridement and irrigation. BSP and balloon-aided irrigation is typically insufficient to remove all fungal mucin, which is critical to minimize disease recurrence
- Most patients require multiple surgical therapies to obtain long term relief as it has a higher recurrence rate than CRSwNP
- Nasal saline rinses and topical nasal steroids to help suppress the immune response, control inflammation, and minimize recurrence
- Steroids for pre-op and post-op
- To date, there is insufficient evidence to recommend standard antifungal use whether topical or systemic

Allergic Fungal RhinoSinusitis-Treatment Continued

- Type 1 hypersensitivity to fungus is a Bent and Kuhn diagnostic criterion, yet the role of immunotherapy remains controversial without a clear benefit in decreasing disease recurrence or improving quality of life
- Potential role of biologic agents targeting type 2 inflammation
- There is limited data regarding the role of biologics specifically in Allergic Fungal RhinoSinusitis

Fungus Ball (Fungus Mycetoma)

- Fungi build up in the sinuses and form a clump or ball that fills the sinus with a ball of fungal debris
- Maxillary sinus is the most common site
- As it grows, it can block the sinus opening
- Occurs in older individuals usually female more than male
- Immunocompetent individuals too
- May have a history of trauma or injury to the sinus
- Fumigatus and dematiaceous fungi most commonly cause a fungal ball to form

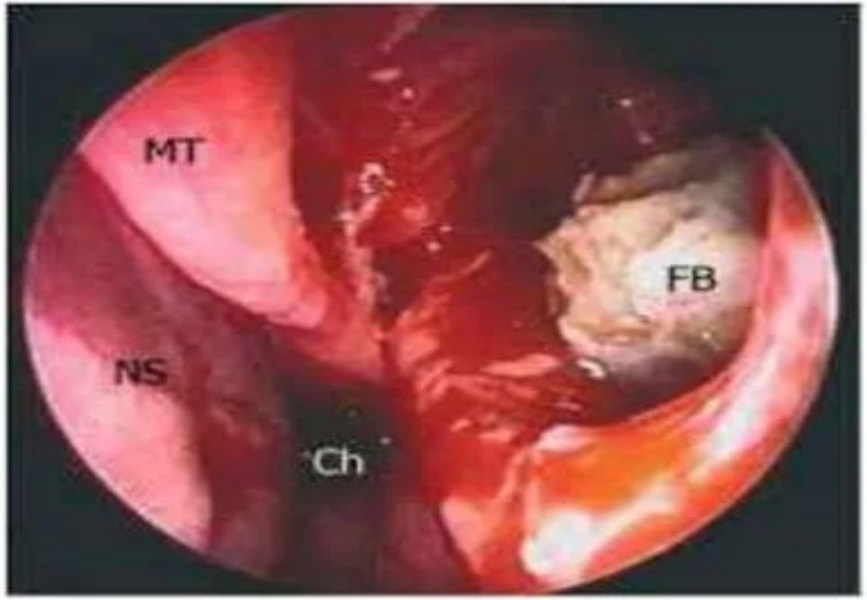
Fungus Ball (Fungus Mycetoma)-Clinical

- Asymptomatic or minimal symptoms with chronic pressure, sinus fullness, or nasal discharge
- May have Cacosmia which is the perception of foul odor when no such odor exists

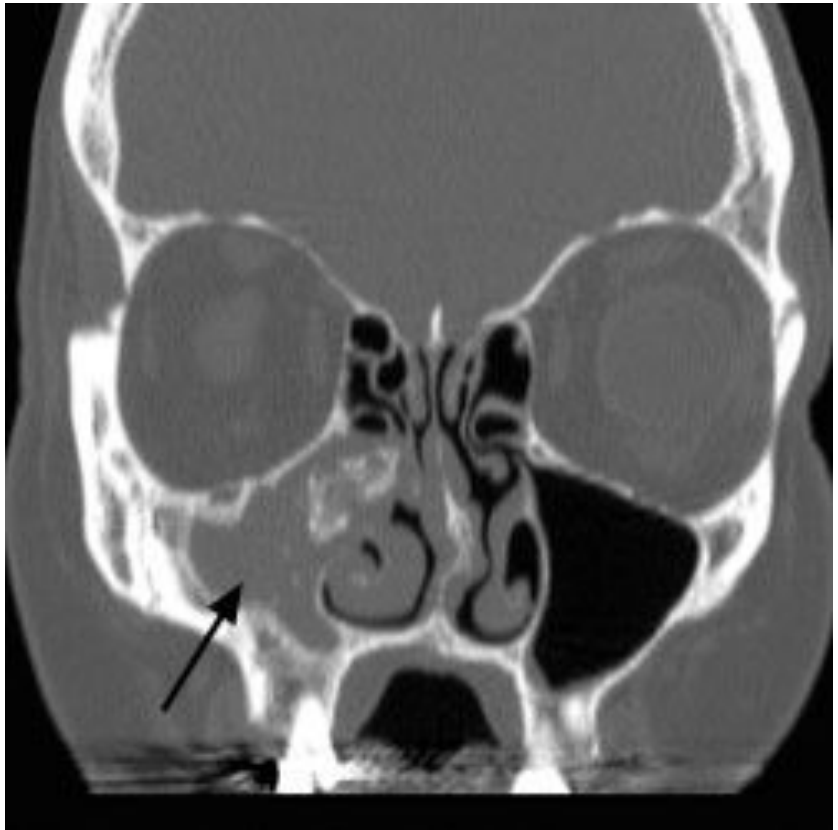
Fungus Ball-Imaging

- Mass within the lumen of paranasal sinus and is usually limited to one sinus
- Maxillary most common followed by frontal and then sphenoid sinus
- On sinus CT scan, appears as a hyperattenuating mass often with punctate calcifications
- May obtain MRI if needed

Fungus Ball-Nasal Endoscopy



Fungus Ball-Sinus CT Scan



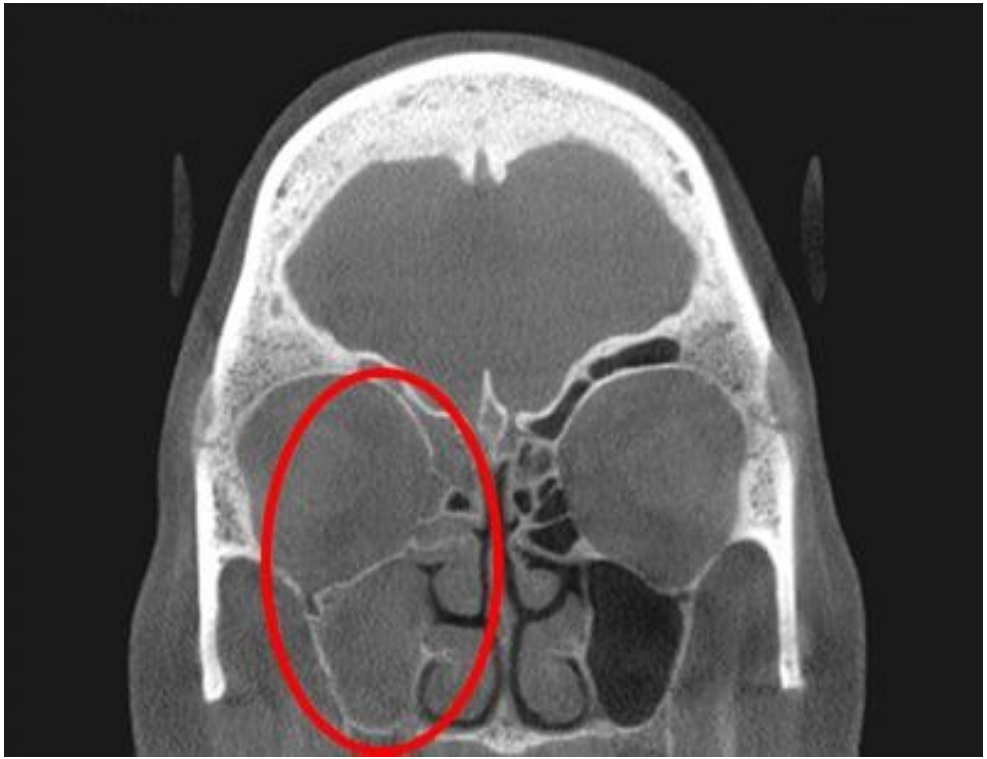
Fungus Ball-Treatment

- Surgical removal that then restores the drainage of the sinus
- Antifungal medications are usually not necessary
- Recurrence is rare
- Prognosis is good

Saprophytic Fungal Sinusitis

- Fungus grows on crusts of mucus inside the nose but does not infect the nasal tissues
- Usually asymptomatic and hard to detect
- The fungus is not infecting the nasal tissue but rather living off the mucus in the nose
- May not cause any additional symptoms that were not already present
- Often times occurs after patients have had previous sinus surgery

Saprophytic Fungal Sinusitis-Sinus CT Scan



Saprophytic Fungal Sinusitis-Treatment

- Removal of mucus crusts with nasal saline rinses and intranasal corticosteroid spray
- May need sinus surgery and surgical debridement

Resources Page

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