From Runny Noses to Orbital Infections

A Practical Guide to Pediatric Rhinology

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OTOLARYNGOLOGY
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No disclosures

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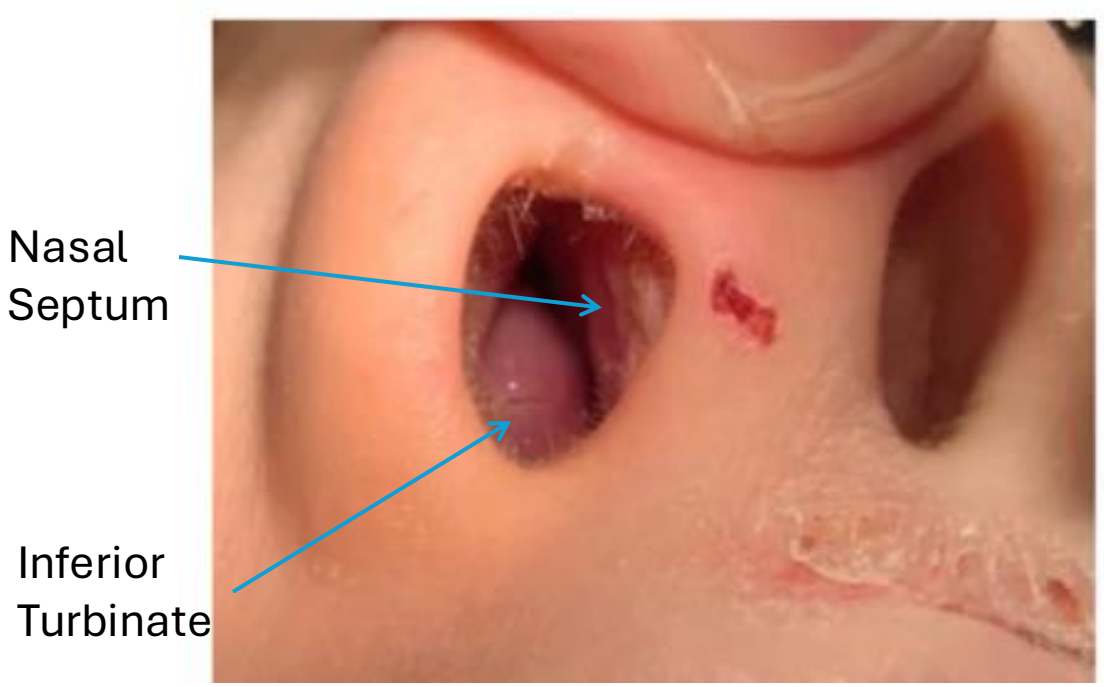
Outline

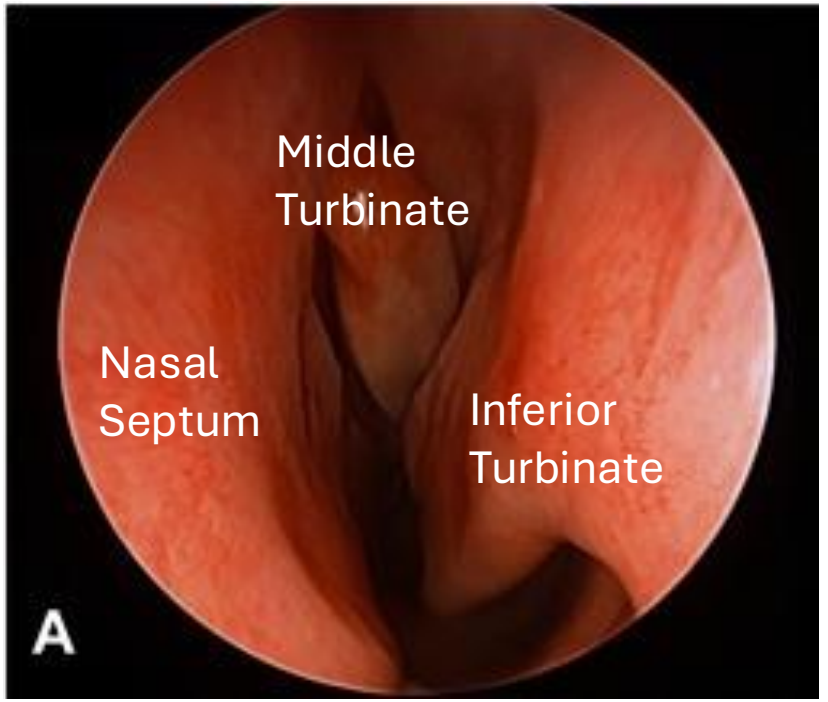
- Anatomy
- Development
- Evaluation
- Differential Diagnosis
- Common Clinical Scenarios

Why talk about the nose?

- Pediatric sinusitis complicates the common cold in 5-10 % of cases.
  - And kids get sick a lot!
- Children don’t often allow for instrumentation

Anatomy of the Nose

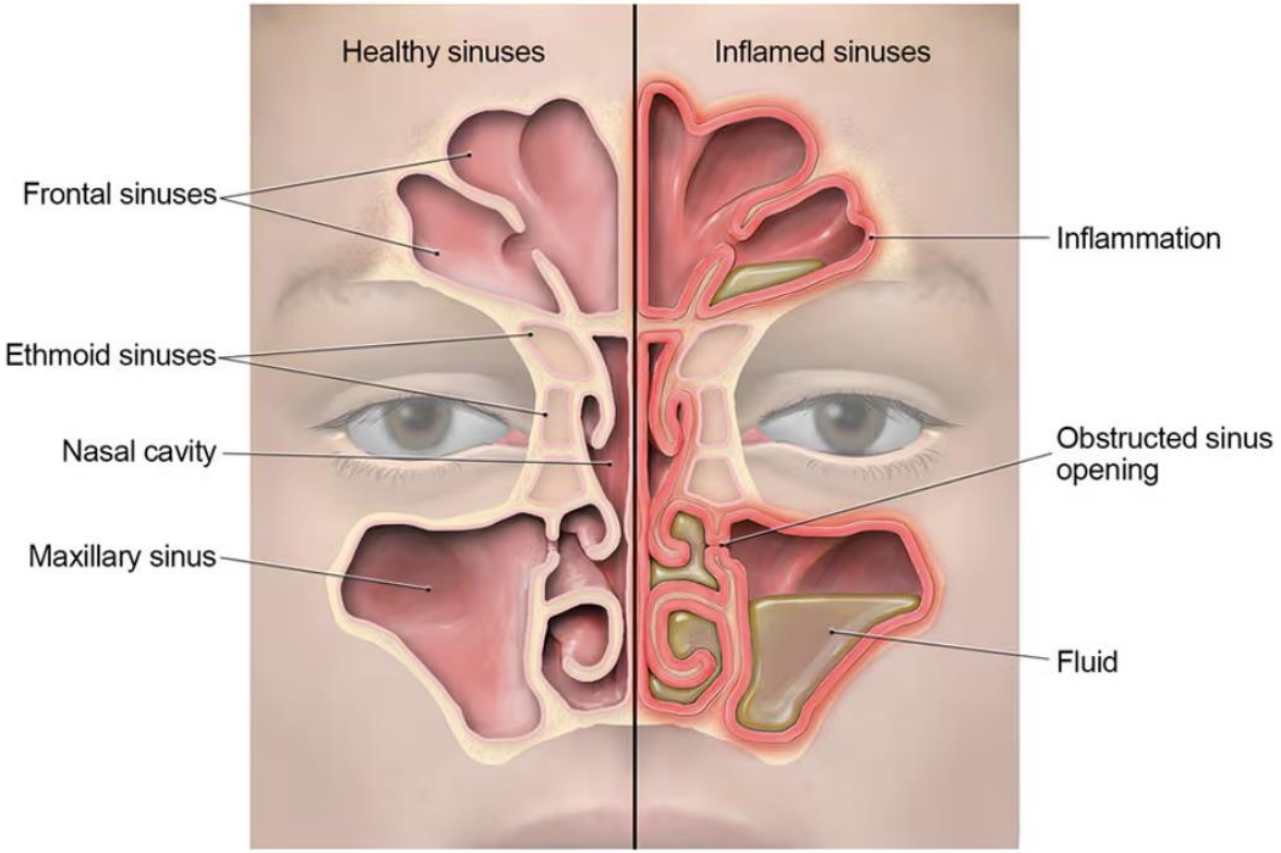




Di Cicco ME, Bizzoco F, Morelli E, Seccia V, Ragazzo V, Peroni DG, Comberiati P. Nasal Polyps in Children: The Early Origins of a Challenging Adulthood Condition. Children (Basel).

Harvey RJ, Roland LT, Schlosser RJ, Pfaar O. Chief Complaint: Nasal Congestion. J Allergy Clin Immunol Pract. 2024 Jun;12(6):1462-1471

Anatomy of the Sinuses



Anatomy of the Sinuses

Sinus Development

- Maxillary Sinus: First sinus to develop
  - Growth from birth – 3 years
  - Growth from 7 – 12 years
- Ethmoid sinuses mature by 12 years old
- Frontal Sinus: develops from 5– 16 years old
- Sphenoid Sinus: develops from 3 -7 years old
  - First sinus to reach full development

Evaluation - History

- Unilateral versus bilateral symptoms (e.g. nasal obstruction or epistaxis)
- Time of the Day (worse at night, worse in the morning)
- Seasonality
- Family history
- Nasal specific symptoms: obstruction, rhinorrhea, epistaxis
- Concurrent symptoms: occasional fevers, cough, ocular findings

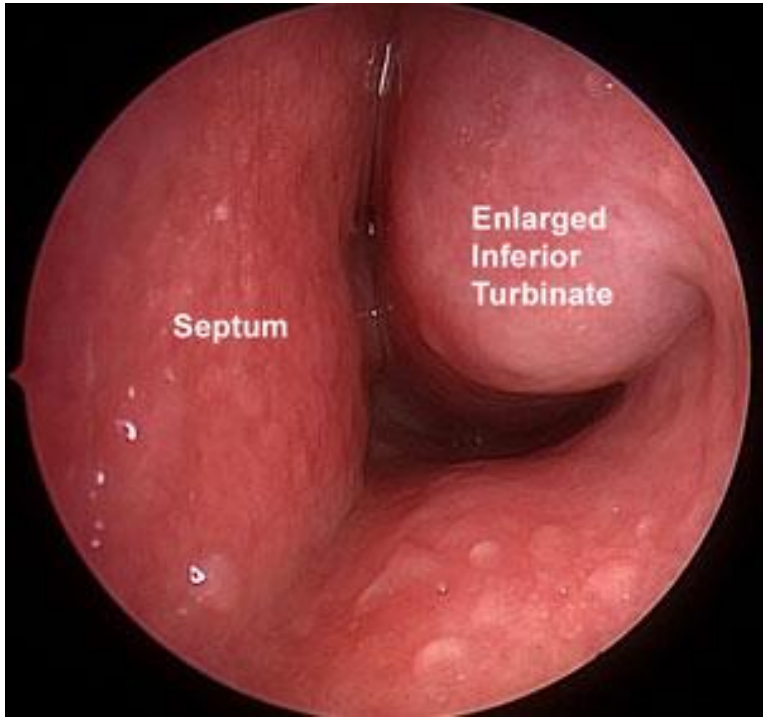
Evaluation – Syndromes

- CHARGE syndrome: Choanal atresia
- 22Q deletion: Choanal atresia
- Kallman syndrome: anosmia, hypogonadic hypogonadism
- Cystic Fibrosis: Recurrent Sinusitis/Pneumonias
- Primary Ciliary Dyskinesia: Recurrent Sinusitis/Pneumonias

Evaluation – Physical Exam

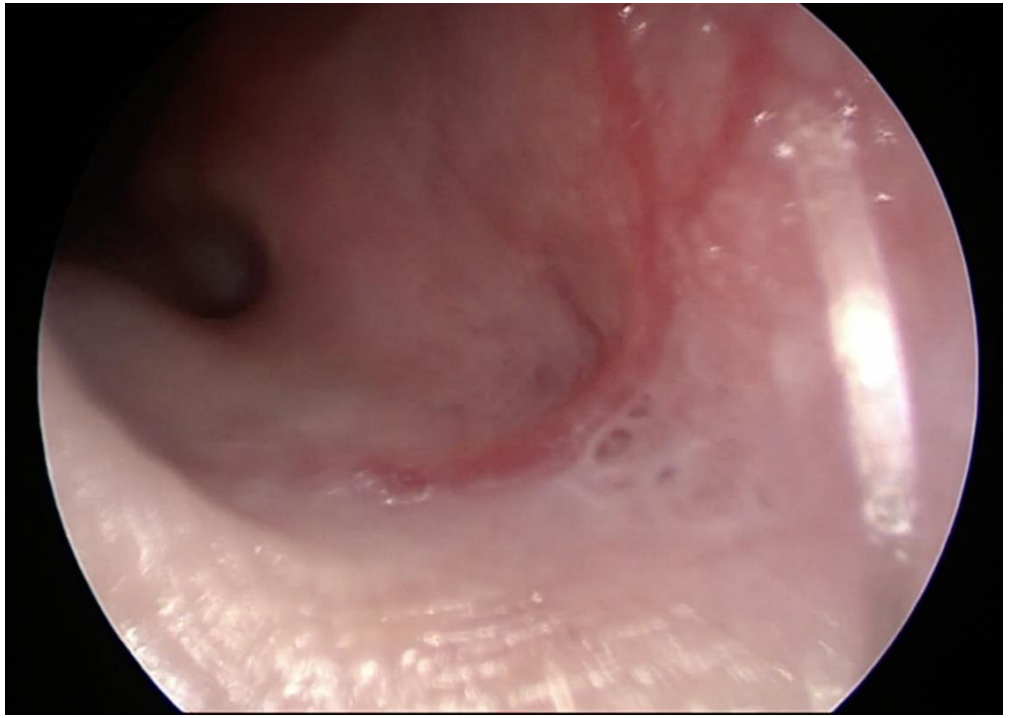
- General appearance
  - Open mouth posture
- Allergic Symptoms
  - Allergic crease
  - Allergic shiners (dark circles under eyes)
- Nose
  - Turbinate Size and Quality
  - Septum
  - Odor
- Voice
- Breathing
  - Cough/clearing

Things you can see on anterior rhinoscopy



Boggy Turbinates, Edematous Mucosa

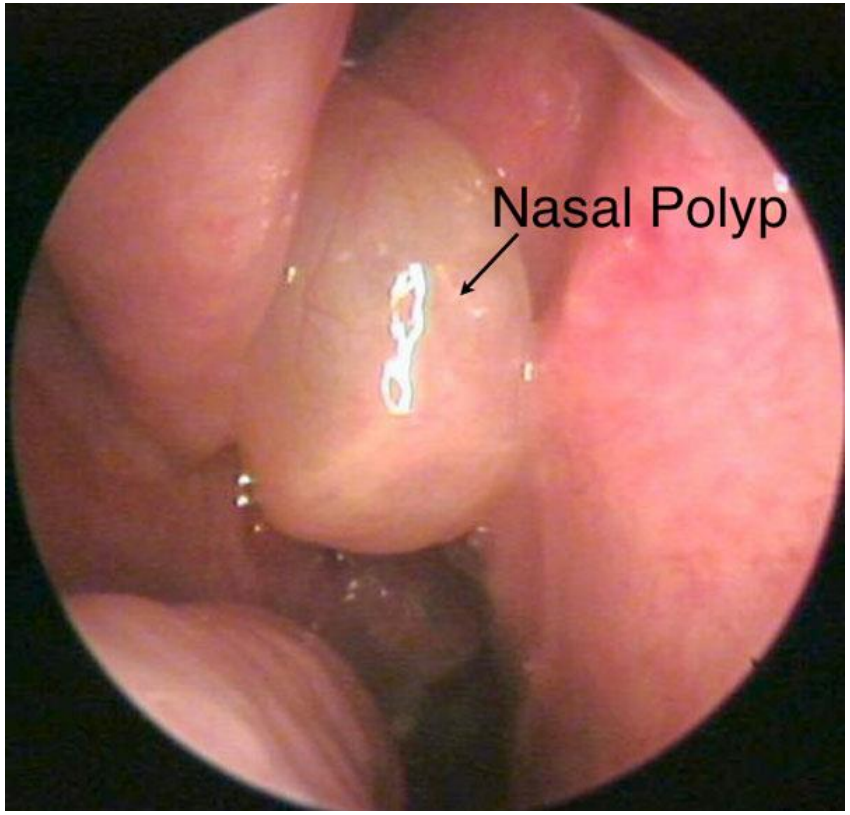
From Henry Ford Health Otolaryngology “Enlarged Turbinates”



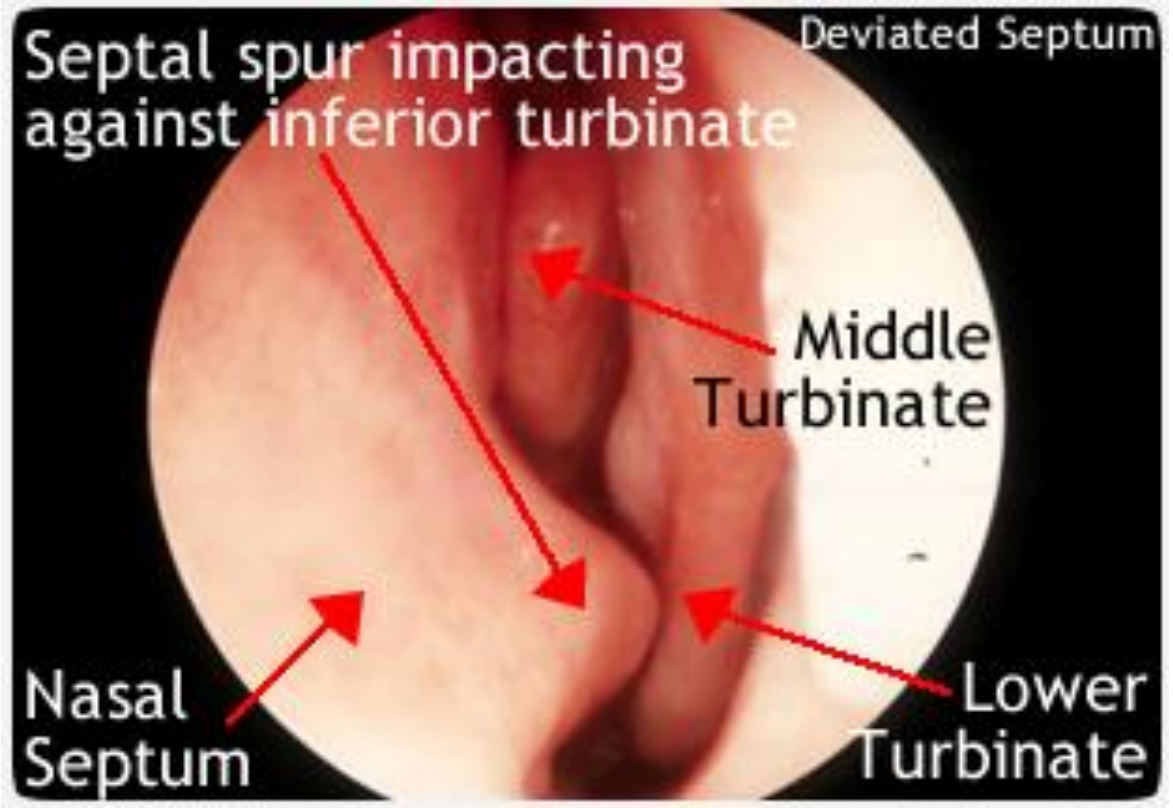
Enlarged Blood Vessel

Gudis DA, Soler ZM. Nasal Cauterization with Silver Nitrate for Recurrent Epistaxis. N Engl J Med. 2021

Things you can see on anterior rhinoscopy



From Fort Worth ENT



From Cleveland Nasal Sinus & Sleep Center

Clinical Scenario

- 3 year old child presenting to your clinic with mom saying that she feels that her nose is constantly dripping
- Differential diagnosis…

Considerations

- Adenoid hypertrophy
- Viral URI
- Rhinosinusitis (Acute and Recurrent)
- Allergic Rhinitis
- Nasal foreign body
- New CF diagnosis

- Very very rare, but if it is salty with h/o recurrent meningitis, consider CSF leak.

What if child were younger?

- 1- 2 years
  - More likely recurrent viral URI rather than allergic
  - Adenoid hypertrophy

- Congenital Considerations
  - Neonatal rhinitis
  - Choanal stenosis/atresia
  - Pyriform aperture stenosis
  - Tumors
  - Nasolacrimal duct cyst
  - Craniofacial abnormalities

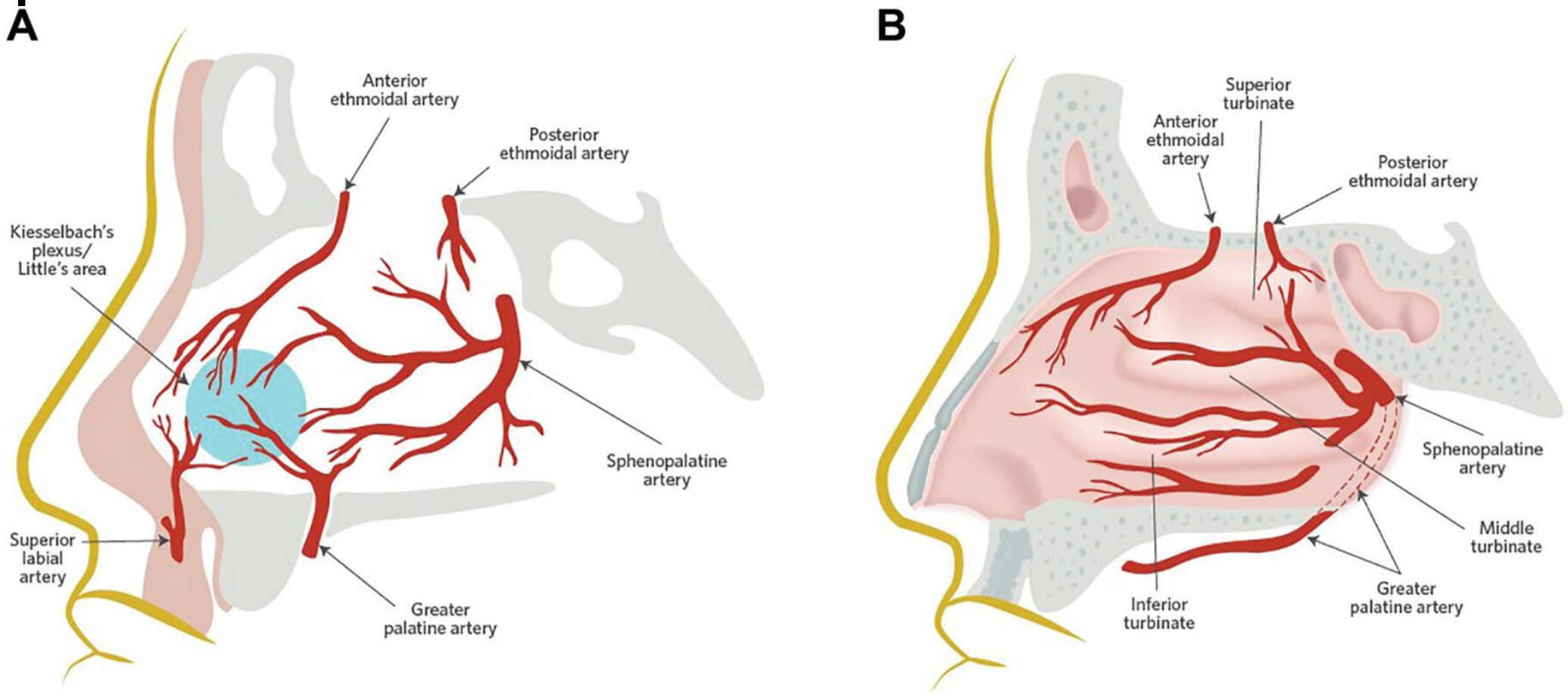
What if child is older?

- 5 – 12 years old
  - Septal Deviation
  - Septal Hematoma
  - Antrochoanal polyp
- 13 – 18 years old
  - Juvenile nasopharyngeal angiofibroma

Common Clinical Scenarios

- Epistaxis
- Allergic Rhinitis
- Sinusitis

Epistaxis



Tunkel DE, Anne S, Payne SC, Ishman SL, Rosenfeld RM, Abramson PJ, Alikhaani JD, Benoit MM, Bercovitz RS, Brown MD, Chernobilsky B, Feldstein DA, Hackell JM, Holbrook EH, Holdsworth SM, Lin KW, Lind MM, Poetker DM, Riley CA, Schneider JS, Seidman MD, Vadlamudi V, Valdez TA, Nnacheta LC, Monjur TM. Clinical Practice Guideline: Nosebleed (Epistaxis) Executive Summary. Otolaryngol Head Neck Surg. 2020

Prevention of Epistaxis

- Emollients
- Nasal Saline Humidification
- Prevent Trauma to Nose
- Humidifier at bedside.

Treatment of Epistaxis

- Oxymethazoline or vasoconstrictor
  - Be careful with chronic use not to cause rhinitis medicamentosa
- Application of 5 minutes of pressure while leaning forward
- Cauterization with silver nitrate

What about frequent unilateral epistaxis and nasal obstruction in a teenage boy?

Think about juvenile nasopharyngeal angiofibroma.

Pediatric Allergic Rhinitis

- Definition: inflammatory, IgE mediated disease with symptoms:
  - Congestion
  - Rhinorrhea
  - **Sneezing**
  - **Nasal Itching**
- Differentiated from chronic rhinosinusitis by frequency and change in symptoms.

Seidman, Michael D., Richard K. Gurgel, Sandra Y. Lin, Seth R. Schwartz, Fuad M. Baroody, James R. Bonner, Douglas E. Dawson, et al. 2015. “Clinical Practice Guideline: Allergic Rhinitis Executive Summary.” Otolaryngology--Head and Neck Surgery: Official Journal of American Academy of Otolaryngology-Head and Neck Surgery 152 (2): 197–206.

Evaluation

- Consider referring for blood/skin testing of allergens
- Consensus guidelines recommend against CT imaging
- Other portions to assess:
  - Otitis Media
  - Presence of CRS
  - Sleep disordered breathing
  - Other atopic conditions

Environmental Treatment

- Removal of pets
- Changing bed covers
- Acaricides to treat dust mites
- Air filtration systems

Medical Treatment

- Nasal corticosteroids
- Oral anti-histamines
  - Consider fexofenadine if sedation is a consideration
- Nasal anti-histamine (e.g. Azelastine)
  - Has been shown to benefit rhinorrhea
- Referral for turbinate reduction

Pediatric Chronic Rhinosinusitis

- Time Course > 12 weeks
- Subjective: purulent rhinorrhea, nasal obstruction, facial pressure/pain, or cough
  - At least 2 symptoms
- Objective: Radiographic or Endoscopic Evidence

Brietzke SE, Shin JJ, Choi S, Lee JT, Parikh SR, Pena M, Prager JD, Ramadan H, Veling M, Corrigan M, Rosenfeld RM. Clinical consensus statement: pediatric chronic rhinosinusitis. Otolaryngol Head Neck Surg. 2014

Considerations - Polyps

- Consider cystic fibrosis
- Consider primary ciliary dyskinesia
- Especially in ages < 12 years old

Fokkens WJ, Lund VJ, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020. Rhinology. 2020

Considerations - Allergy

- ~1/4 of pediatric patients with chronic sinusitis have allergic rhinitis.
- Consensus guideline recommends consideration of allergy testing

Sedaghat AR, Phipatanakul W, Cunningham MJ. Prevalence of and associations with allergic rhinitis in children with chronic rhinosinusitis. *Int J Pediatr Otorhinolaryngol*. 2014

Considerations - GERD

- Controversial
- Lack of evidence to support a strong relationship
- Consensus guidelines recommend against empiric therapy.

El-Serag HB, Gilger M, Kuebeler M, et al. Extraesophageal associations of gastroesophageal reflux disease in children without neurologic defects. *Gastroenterology*. 2001

Medical Therapy

- Nasal Corticosteroids
  - Mainstay of medical therapy in adults
  - Evidence in children is more limited but over indicates improvement
- Nasal Saline Irrigations
  - Significant demonstrated improvement in observational studies

Fiocchi A, Sarratud T, Bouygue GR, Ghiglioni D, Bernardo L, Terracciano L. Topical treatment of rhinosinusitis. Pediatr Allergy Immunol. 2007

Magit A. Pediatric rhinosinusitis. Otolaryngol Clin North Am. 2014

Medical Therapy

- Antibiotics
  - Controversial
    - European Position Statement recommends against
    - American Consensus Statement recommends Trial
  - Duration of 3-6 weeks
- Systemic anti-histamines
  - Symptomatic improvement
  - Overall duration of disease is not reduced

Fokkens WJ, Lund VJ, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020. Rhinology. 2020

Brietzke SE, Shin JJ, Choi S, Lee JT, Parikh SR, Pena M, Prager JD, Ramadan H, Veling M, Corrigan M, Rosenfeld RM. Clinical consensus statement: pediatric chronic rhinosinusitis. Otolaryngol Head Neck Surg. 2014

My Practice

- Nasal Corticosteroid (e.g. Flonase or Nasocort)
- Nasal Saline Washes 1x/day
- If purulence, consider antibiotic therapy
  - < 12 years old, more likely to recommend 3 weeks of antibiotic therapy

Brief Comment on Surgical Management

- 12 years old is cut-off surgical management differences
- < 12
  - Will proceed with adenoidectomy
  - 50-80% of kids improve after adenoidectomy
- 12 or older
  - Consider sinus CT
  - Consider functional endoscopic sinus surgery

Acute Sinusitis

- AAP Definition
- Persistent illness or daytime cough > 10 days without improvement OR
- Worsening course after initial improvement OR
- Severe onset
  - Concurrent fever and purulent nasal drainage for at least 3 days

Wald ER, Applegate KE, Bordley C, Darrow DH, Glode MP, Marcy SM, Nelson CE, Rosenfeld RM, Shaikh N, Smith MJ, Williams PV, Weinberg ST; American Academy of Pediatrics. Clinical practice guideline for the diagnosis and management of acute bacterial sinusitis in children aged 1 to 18 years. Pediatrics. 2013 Jul;132(1):e262-80.

Evaluation

- Based on clinical history
- AAP guidelines recommend no CT/MRI/XR unless complicated
  - More on this later…

Several Drug Dosages

- Low Dose
  - Amoxicillin 45 mg/kg/day divided into 2 doses
- High Dose
  - Amoxicillin 80-90 mg/kg/day divided into 2 doses
  - Amoxicillin-Clavulanate 90 mg/kg/day divided into 2 doses

When to use lower dose?

- Age 2 or older
- Mild – moderate symptoms
- No daycare
- No previous antibiotic use in 4 weeks
- No community S. pneumo resistance

When to use lower dose?

- Age 2 or older
- Mild – moderate symptoms
- **No daycare**
- No previous antibiotic use in 4 weeks
- **No community S. pneumo resistance**
  - **10.5% resistant based on 2001 study**

Amoxicillin 45 mg/kg/day divided into 2 doses

Jernigan DB, Kargacin L, Poole A, Kobayashi J. Sentinel surveillance as an alternative approach for monitoring antibiotic-resistant invasive pneumococcal disease in Washington State. Am J Public Health. 2001

When to use higher dose?

- < 2 years old
- High S. Pneumo resistance (> 10%)
- Moderate – Severe Sinus Symptoms
- Recent antibiotic use within 4 weeks

Amoxicillin 80-90 mg/kg/day divided into 2 doses
Amoxicillin-Clavulanate 90 mg/kg/day divided into 2 doses

Penicillin Allergy?

- If not type 1 reaction:
  - Single 50 mg/kg dose of IM/IV dose of CTX.
  - Cefdinir
  - Cefixime
  - Cefpodoxime
- Consider + 3rd gen cephalosporin with clindamycin or linezolid
  - 3rd gen Cephalosporin work well against H. Flu
  - Clindamycin and Linezolid work well for S. pneumoniae
- Otherwise, would have to consider levofloxacin with associated risks.

Length of Treatment

- All over the map.
- Anywhere from 10 – 28 days
- Sometimes 7 days after resolution.
- IDSA recommends 10-14 days.

Chow AW, Benninger MS, Brook I, Brozek JL, Goldstein EJ, Hicks LA, Pankey GA, Seleznick M, Volturo G, Wald ER, File TM Jr; Infectious Diseases Society of America. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. Clin Infect Dis. 2012 Apr;54(8):e72-e112.

Complicated Sinusitis

- Cranial Nerve Deficits
- Orbital Complications

Source: Lueder GT: *Pediatric Practice Ophthalmology:*
www.accesspediatrics.com

Reasons to Refer

- Recurrent epistaxis that is unresponsive to 12-week trial of medical therapy
- Persistent recurrent unilateral epistaxis especially in teenagers
- Allergic rhinitis unrelieved by 12-week medical therapy
  - Consider referral to allergy first
- Chronic sinusitis unrelieved by 12-week medical trial
  - If you see polyps, consider referral for CF testing especially < 12 yo
- For complicated sinusitis, refer to emergency room

Thank You!