
CLEARING THE AIR: NASAL OBSTRUCTION AND SINUSITIS

These two upper respiratory tract infections account for millions of doctor visits each year in Canada. A better knowledge of each infection will help physicians “clear the air” for future patients.

By Jack Shahin MD, FRCSC

The prevalence of respiratory infections is well known to all medical practitioners, yet it is still striking to see the sheer number of patients who present with them. In the United States, adults average three episodes annually, and children average six episodes annually.¹ About 0.5% of these upper respiratory tract infections (URTIs) lead to sinusitis. This last figure translates into about 30 million sinus infections treated annually in the U.S.,^{2,3} and presumably about three to four million in Canada. After adding the cost of treatment and time lost, the impact on the health care system is quite severe.

This article will discuss both the routine, nonpathologic causes of nasal obstruction and the diagnosis and management of sinusitis.

Definiton

The general term “nasal obstruction” is a broad-based, non-specific description of a sensation of decreased airflow through the nose. Being highly subjective, it may be accompanied by very few clinical findings. Conversely, it may not be the major complaint one would expect it to be, based on the findings of a nasal examination. In many patients, anxiety, particularly about nasal appearance, may present as a complaint of shortness of breath or blocked nose, yet may be accompanied by a completely normal nasal examination.

Sinusitis is an often abused term. Patients may say, “I get sinus headaches”, or give other completely nonspecific descriptions of facial or nasal pain. Sinusitis is correctly defined as an inflammation of the mucous membrane lining of

the paranasal sinuses, and is more properly called rhinosinusitis.

Anatomy

An understanding of nasal functional anatomy is critical to conceptualization of patients' symptoms. Simply put, the nose can be divided into fixed, structural framework components (bone and cartilage) and more metabolically and physiologically active and sensitive components (nasal mucosa and turbinates). The latter may be effected by neural, neuro-hormonal, or immunologic and environmental factors.

The paranasal sinuses exist as three paired, air-filled chambers (left and right maxillary ethmoid and frontal sinuses) lateral to and above the nose. As well, there is usually a single or bicompartimentalized sphenoid sinus in the mid-point area of the skull. These areas are lined by a modified respiratory epithelium that moves secretions, *via* mucociliary action, towards the respective ostia (Figures 1a and 1b).

The most important functional area in the nose affecting the sinuses is the middle meatus, or the recess between the inferior and middle turbinates on the lateral wall of the

nose. It is here that nearly all the natural ostia (or exits) from the sinuses meet to drain secretions into the nose. As such, any obstruction or edema of this osteo-meatal complex (OMC) is the primary factor leading to sinus disease.

Pathophysiology of Sinusitis

The primary cause of sinusitis is impaired drainage from the OMC. Normal mucociliary outflow to the natural ostium is obstructed, and continued mucous production results in a favorable culture medium for pathogens. Acute bacterial sinusitis differs little from an abscess, as it is a pus-filled, relatively anaerobic cavity. While the plethora of common respiratory pathogens and the normal flora of the nose are the usual suspects (Table 1), viral agents have been isolated, and fungal sinusitis is well described.

The spectrum of effective antibacterial agents is similar to those in other URTIs or otitis media. Remember the possibility of penicillin-resistant strains, or of undetected immune deficiencies in patients resistant to initial therapy. Any treatment of sinusitis is aimed at relieving obstruction of the OMC, whether it is caused by an underlying inflammatory, infectious, structural or other problem (Figure 2).

Nasal Obstruction

Common Causes: Common structural causes of nasal obstruction include: deviated nasal septum; collapsing nasal valve or other loss of nasal support; nasal polyps or other intranasal masses or tumors; and nasal septal perforation. Common nonstructural causes of nasal obstruction include: common



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cold/URTI; allergic rhinitis with or without polyps; nonallergic rhinitis (*i.e.*, vasomotor; nonallergic with eosinophilia [NARES]; gustatory [food-induced]); rhinitis medicamentosa (rebound congestion or dryness secondary to overuse of decongestants); atrophic rhinitis; and pregnancy related congestion.

The most common nasal sources of obstruction include: adenoid hypertrophy; cerebral spinal fluid (CSF) rhinorrhea; nasopharyngeal tumors; hypothyroidism; and cystic fibrosis (with or without polyps) or other mucociliary disorders.

Remember that any of the causes of nasal obstruction can lead to sinusitis if they result in occlusion or blockage of the OMC. Conversely, sinusitis itself is usually associated with a feeling of nasal obstruction (Table 2).

Diagnosis

History. *Nasal Obstruction:*

Simple history-taking regarding the timing and severity of symptoms and concomitant symptoms experienced by the patient is essential. Associations with previous trauma, seasonal or perennial allergic symptoms, facial pain, headaches, purulent rhinorrhea, nose-bleeds or decreased sense of smell must be considered.

Sinusitis: This is usually accompanied by at least two major factors (*e.g.*, facial

pain, fever) or one major and two minor factors (*e.g.*, headache, fatigue) (Table 3). Other, less specific findings include: mouth-breathing; allergic salute; orbital pain or blurred vision (may be indicative of sinusitis complications); and loss of concentration

Physical Examination. Careful nasal and facial examination is extremely helpful in

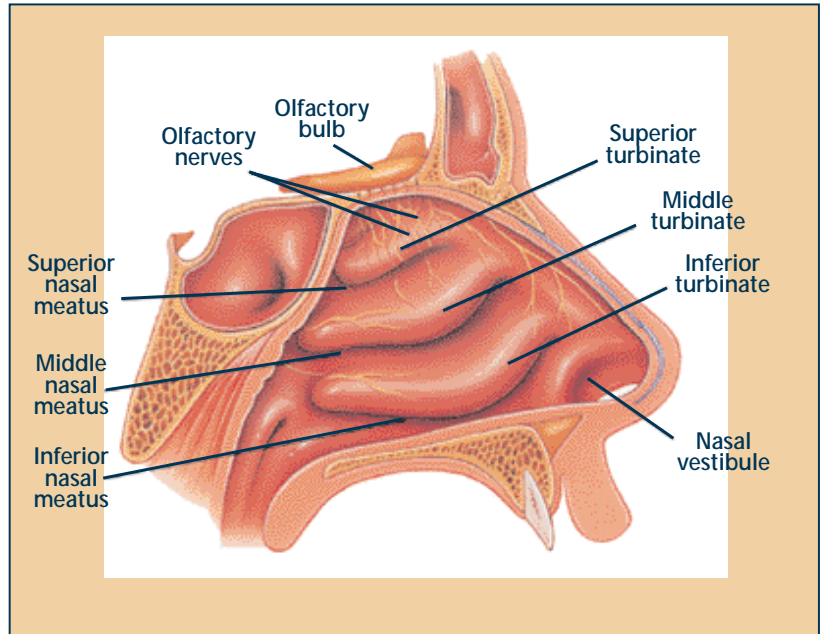


Figure 1a. Cross-section of nasal/sinus anatomy.

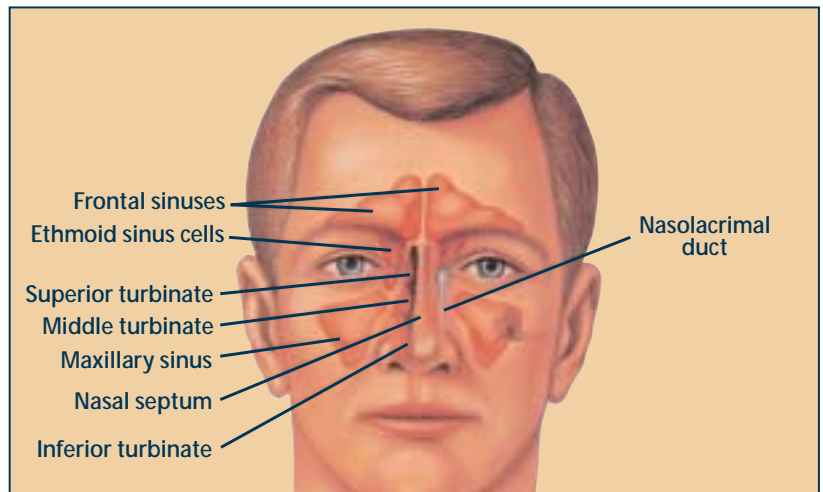


Figure 1b. Lateral wall of the nose.

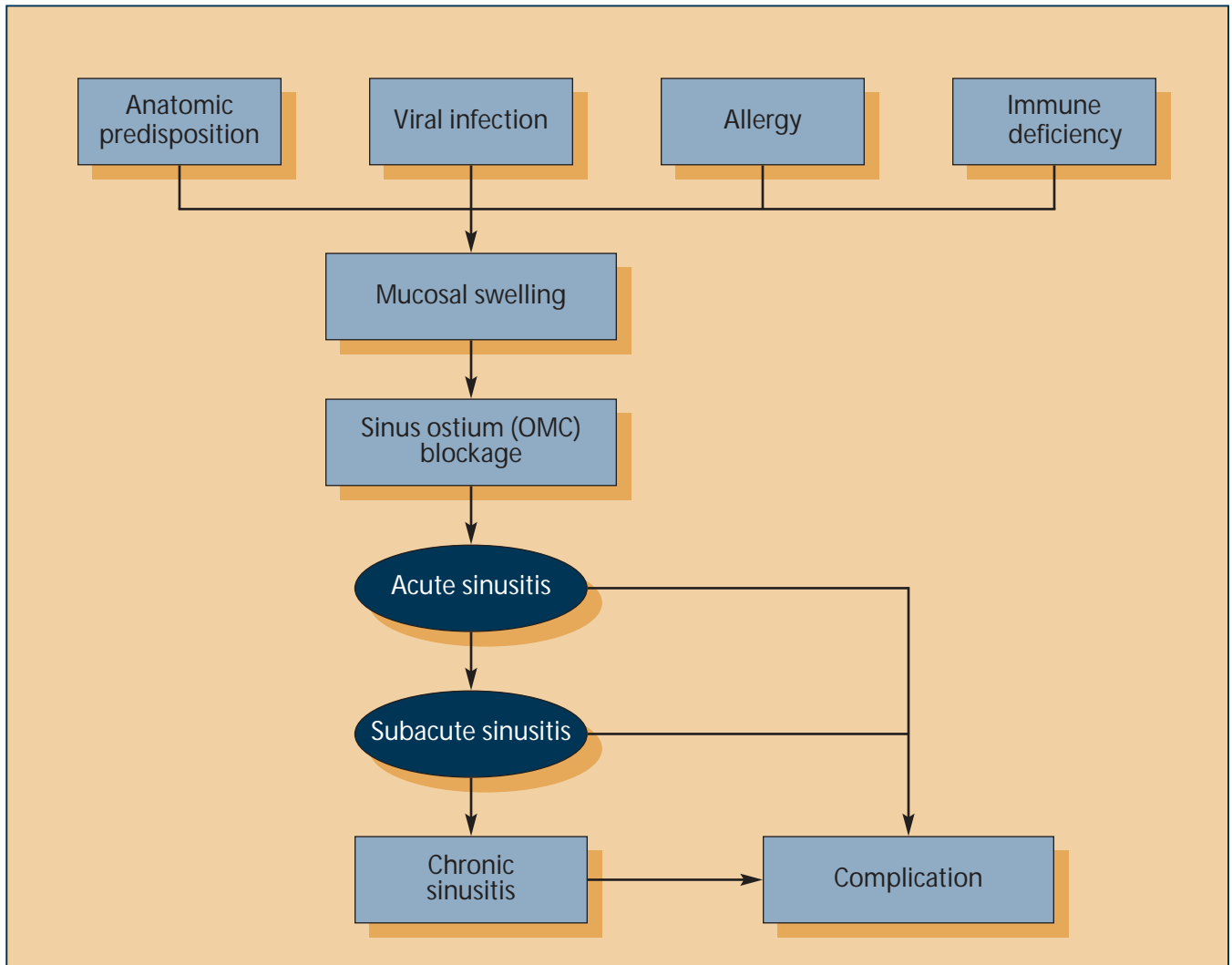


Figure 2. Development of sinusitis.

pinpointing the causes of nasal obstruction and possible presence of sinus disease. Some important questions to ask oneself are:

- Is the patient chronically mouth-breathing even while sitting during the interview?
- Is there any collapse or pinching of the nasal valve in the area above the nostril openings or below the nasal bones (during inspiration)?
- Does the patient's voice have a nasal quality?

Physical examination includes anterior rhinoscopy. Possible findings include: septal shift away from the midline; obvious septal perforation; unusual or excessive crusting; edematous, red or pale turbinates; atrophic or shrunken turbinates; purulent discharge or blood; and nasal polyps. One also should look for: facial, cheek, forehead or other head or dental tenderness (to palpation or gentle tapping); periorbital edema; and transillumination (may be non-specific or misleading).

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Table 1

THE USUAL SUSPECTS IN SINUSITIS

Type of sinusitis	% of isolates
Acute Sinusitis	
• <i>Streptococcus pneumoniae</i>	41%
• <i>Hemophilus influenzae</i>	35%
• Anaerobes	7%
• <i>Moraxella catarrhalis</i>	4%
Chronic Sinusitis	
• <i>Streptococcus pneumoniae</i>	2%
• <i>Hemophilus influenzae</i>	2%
• <i>Staphylococcus aureus</i>	4%
• Anaerobes	67%

Table 2

CAUSES AND CLASSIFICATION OF SINUSITIS

Causes
• Viral
• Bacterial
• Fungal
Classification
• Acute (less than four weeks duration)
• Subacute (12 weeks duration)
• Chronic (more than 12 weeks duration)

The advent of flexible fibre-optic nasopharyngo/laryngoscopes allows for a much more thorough examination. This is a vital tool in the correct diagnosis and management of most, if not all, nasal and sinus conditions. The presence of more than one source of pathology (*i.e.*, a deviated nasal septum with nasal polyps), the earlier detection of neoplasms, (*i.e.*, nasopharyngeal carcinoma) or the simple detection of infection (*i.e.*, purulent discharge at the middle meatus) have all benefitted considerably from this technology. Its use in ear, nose, and throat (ENT) offices is now commonplace and considered by most otolaryngologists as the standard of care in their management of nasal/sinus conditions.

Investigations. While a thorough history and physical is often sufficient, the patient with an ambivalent or unclear picture often benefits from having a "sinus series" (waters or occipito-mental views, Caldwell or postero-anterior views and lateral

views). The presence of air-fluid levels, mucoperiosteal or mucosal thickening or frank opacification can confirm the clinical impression of sinusitis.

Coronal computed tomography (CT) scans of the sinuses are more detailed in their view of the functional anatomy of the sinuses, regarding obstruction of the osteomeatal unit, degree of involvement, presence of bone destruction, tumors or other ominous findings (Figure 3a and 3b). They also serve as a guide to localizing problems during surgery. Magnetic resonance imaging (MRI) is an excellent tool, although it is generally less available and not highly superior to CT scanning in routine sinusitis.

It is important to note that in cases of simple viral URTI there may be mild sinus x-ray abnormalities, which may even persist for several weeks after a successfully treated sinus infection.

Nasal cytology, with the presence of eosinophils, is helpful in allergic conditions, while nasal swabs are too nonspecific to be helpful. Nasal airflow studies may be

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Figure 3a. Normal coronal CT scan of sinusitis.



Figure 3b. CT scan of patient with polyps and sinusitis. Note opacification in nasal cavity and along border of maxillary sinus and ethmoid system.

requested as an objective parameter of nasal airway obstruction.

Treatment of Nasal Obstruction

Structural causes, depending on the degree of patient discomfort are generally treated surgically. Specific correction or trimming of the deviated portion of the cartilaginous or bony septum (septoplasty or sub-mucous resection) or, less commonly, valve-stiffening procedures, are often helpful.

Nonstructural causes usually involve treatment of the turbinates and nasal mucosa, either by eliminating the offending factor (allergic desensitization) or by shrinking the size of the turbinate. Inhaled nasal steroids, aqueous or aerosol, are indicated in allergic rhinitis, or other causes of turbinate edema or sinusitis. They are effective if used correctly, but patients must be told that onset of action is slow, unlike nasal decongestants.

Typical dosing regimen of inhaled nasal steroid sprays:⁵

- Beclamethasone: twice daily from age 12, aqueous/aerosol
- Budesonide: once daily from age six, aerosol
- Flunisolide: twice daily from age six, aqueous
- Fluticasone: once daily from age 12, aqueous
- Mometasone: once daily from age 12, aqueous
- Triamcinolone: once daily from age six, aqueous

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- Mast-cell stabilizing agents may be used in certain cases of allergic rhinitis, usually as pre-seasonal prophylaxis

Correct use includes reminding patients to “aim straight back” when applying the spray. The spray is inhaled into one nostril while occluding the opposite nostril. It is at least as important to know how to use the sprays correctly as it is to choose the correct spray. Topical decongestants (phenylephrine hydrochloride or oxymetazoline hydrochloride) are indicated only for short-term use. They are helpful in relieving symptoms of nasal obstruction and helping with drainage through the OMC, or as a precursor to topical nasal steroids in cases of severe congestion.

Long-term use of topical decongestants results in rebound edema and possible rhinitis medicamentosa.

Steam and irrigation with homemade or commercial saline solutions are very helpful as a sort of nasal douche or lavage. By removing crusting and secretions, symptoms of both obstruction and facial pressure may be relieved. The importance of maintaining good ambient humidity (but not to the point of encouraging household mold overgrowth) should be stressed to patients.

Treatment of Sinusitis

While the majority of URTI and many cases of sinusitis are viral, the chronic obstruction of sinus drainage generally results in bacterial purulent inflammation. First-line treatment consists of re-establishment of drainage and eradication of bacterial infection by medical means. Combining the use of antibiotics (Table 4), taken for 10 to 21 days with nasal-inhaled steroids, and a short course (three to five days) of topical

decongestants and regular irrigation, is often sufficient.

The effectiveness of systemic steroids for sinusitis in allergic patients remains controversial.

Repeat acute episodes or first-time presentations of chronic disease are treated similarly. Despite our best efforts, however, a significant group of patients remains refractory to medical therapy. Treatment failure may be due to anatomic deformities, the presence of obstructing lesions (most commonly nasal polyps), or poor penetration of anti-microbials into the sinuses. Patients return to the doctor’s office, often frustrated and fed up with their symptoms. With failure of repeated medical treatment

Table 3

SYMPTOMS AND SIGNS OF SINUSITIS

Major Factors

Facial pain
Facial congestion or fullness
Nasal obstruction
Purulent nasal or post-nasal discharge
Decreased or lack of sense of smell
Fever (acute sinusitis)

Minor Factors

Headache
Fever (in non-acute sinusitis)
Halitosis
Fatigue
Dental pain
Ear pain or pressure
Cough

*From the Task Force on Rhinosinusitis, American Academy of Otolaryngology—Head and Neck Surgery

Table 4

EFFICACY OF ANTIBIOTICS IN THE THERAPY OF RESPIRATORY TRACT INFECTIONS (RTIs)⁴

Oral Antimicrobial	Efficacy of Antibiotics in					
	Acute RTI			Chronic RTI		
	<i>S. pyogenes</i>	<i>Hemophilus spp.</i>	<i>M. catarrhalis</i>	<i>S. aureus</i>	Anaerobes	Enterics
Penicillin/amoxicillin	+	—	—	—	—	—
Cephalosporins						
first-	+	o	o	+	—	—
second-	+	+	+	+	—	—
third-generation	o	+	+	—	—	+
Amoxicillin/clavulanate	+	+	+	+	+	+
Macrolides	o	o	o	+	—	—
Clindamycin	+	o	o	+	+	—
Imipenem*	+	+	+	+	+	+
Trimethoprim/ sulfamethoxazole	—	+	+	o	—	+
Quinolones or aminoglycosides	—	+	+	o	—	+

— = no activity; o = some activity; + = good activity

* Available in parenteral form only

in proven sinusitis, the patient may be a good candidate for functional endoscopic sinus surgery.

Functional Endoscopic Sinus Surgery (FESS). While it is not in the scope of this paper to detail the techniques, indications, benefits or drawbacks of surgery, it should be noted that fibre-optic technology has revolutionized the surgical treatment of sinus disease.

In the past, surgeons were forced to take a roundabout, often morbidity-laden, approach to the sinuses via the anterior maxillary wall. Incisions in the upper gums

(Caldwell-Luc) or external facial incisions were necessary.

Today, with endoscopic equipment and techniques, ENT surgeons are able to precisely locate and correct abnormalities and restore normal drainage with minimal invasiveness. Surgery is done almost exclusively intranasally, with no external incisions, as an outpatient technique, and with considerably less patient discomfort and fewer complications. Results of FESS are good, with a reported 80% to 90% success rate⁶ (success being defined as resolution or improvement of symptoms). Limitations

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and complications of surgical techniques exist. However, when compared to older techniques, there was a strong patient preference for FESS.⁷ The primary goal of surgical treatment is to re-establish sinus drainage with particular attention to removal of obstructive causes (polyps, deviated septum), and widening of the natural ostia of the sinuses.

Special Topics

1) What is a nasal polyp? (Figure 4) Nasal polyps are outgrowths of chronically hypertrophied sinus mucosal lining. They may be slow-growing or more aggressive, and there is a strong association with concomitant environmental allergies.

The most common source is the ethmoid sinuses and patients usually present with nasal obstruction, anosmia or hyposmia and repeated sinus infection. The typical appearance is a clear semi-solid lump, somewhat similar to a peeled grape.

Diagnosis is often confirmed on clinical impression and plain x-ray or CT scan. Treatment is aimed at the allergic source and transient relief may be obtained with inhaled or systemic steroids. In symptomatic patients, surgical removal of the polyps with FESS often results in dramatic improvement and great patient satisfaction. Patients are to be warned that the polyps may recur despite best efforts.

There is an association of polyps with asthma and acetylsalicylic acid (ASA) sensitivity and often treatment of the nasal problem or sinusitis may decrease the severity or frequency of the asthma attacks.

2) Sinusitis in Children. There is a great similarity of findings in children with chronic ear and sinus problems. As in many

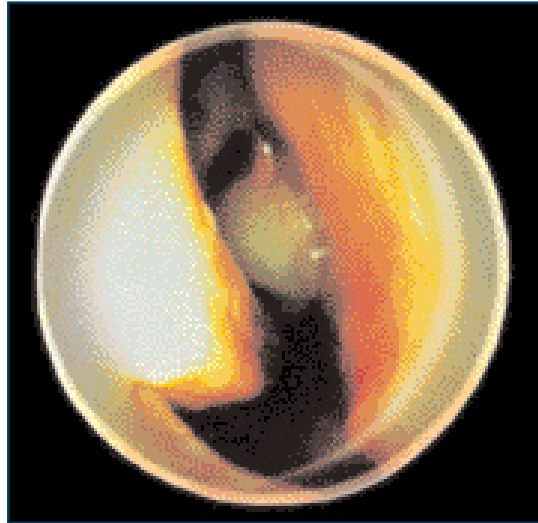


Figure 4. Nasal polyp.

adults, the common factor seems to be edema of the nasal mucosa and turbinates, often secondary to recurrent URTI or allergies. Risk factors also may include exposure to second-hand smoke or crowded day-care facilities.³ Seventy-seven per cent of children between age two and 16 who are examined due to chronic sinusitis had positive skin test responses to inhaled allergens, and 97% of these same patients also had positive evaluations for food allergies.⁸ How much of a role food allergens play in sinusitis is not known.

The work-up of pediatric sinusitis is similar to adult sinusitis, keeping in mind that younger children may have incompletely developed ethmoid or frontal sinuses. Nasal hygiene with saline irrigation is an excellent adjunct to antibiotics with or without nasal steroid sprays.

Surgical correction (FESS) is considered after complete work-up for underlying allergies, immune disorders and trial of maximal medical therapy. This latter term is a point of controversy in the ENT, pediatric and allergy literature. Pediatric patients

with sinusitis that is chronic or difficult to manage should be strongly considered for specialist referral.

Conclusion

Nasal obstruction is a broadly defined subjective complaint caused by a variety of real or imagined problems. It can be treated with a variety of nasal sprays aimed at cleaning, decongesting or decreasing swelling in the nose. Fixed structural problems should be treated surgically if symptomatic.

Sinusitis is an extremely prevalent condition, though often mislabelled. The primary cause is obstruction of the natural ostia, usually in the middle meatus area of the nose. Work-up includes careful history-taking as to concomitant nasal or allergic problems, and thorough nasal and facial examination, which may include office endoscopy or radiologic studies. Treatment involves the combined use of antibiotics with or without nasal sprays similar to those used in nasal obstruction. Failure of medical therapy, or

the presence of obvious obstructive lesions (most commonly polyps), is a good indication for surgical referral.

FESS has allowed a precise, more minimalist approach. This has made treatment more convenient and less complicated for patients, with generally excellent success rates. **Dx**

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