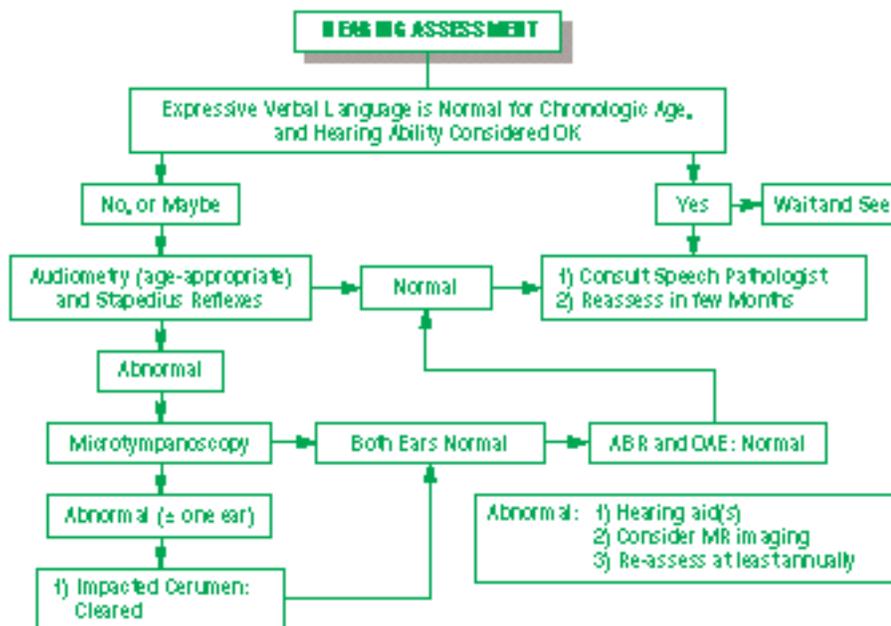


Surgical Therapy for Sinusitis and its Complications

Scott C. Manning, MD

DECISION TREE



HISTORICAL OVERVIEW

The concept of pediatric sinusitis as a distinct clinical entity is relatively new and some primary care givers still discount the notion that sinusitis can be distinguished from rhinitis in young children. Also, the rise in daycare attendance in young children over the past 15 years has probably increased both the real incidence of sinusitis and the social pressure for effective treatment.

For the last thirty years, the most common surgical procedures for chronic rhinosinusitis in young children have been adenoidectomy and maxillary sinus lavage or inferior meatus astrostomy, often performed in conjunction. Other practitioners continued to manage pediatric sinusitis largely without endoscopic sinus surgery leading to the present controversy concerning relative indications.

Both prospective controlled studies of treatment efficacy and radiographic studies of the incidence of sinus disease at different ages support the notion that most sinus disease in young children is self-resolving, probably due primarily to maturation of systemic

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immunity. Chronic sinusitis truly refractory to medical management and significantly affecting quality of life in otherwise healthy people is difficult to define and as yet there are no comparison studies proving improved efficacy of endoscopic sinus surgery over other treatment modalities in these patients.

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 **PATIENT ASSESSMENT**

H2

Informed Consent

Proper informed consent is important not only from a medio-legal standpoint but also from the standpoint of putting the option of surgical therapy into perspective. I also emphasize during informed consent that the goal of surgery is to reduce the frequency and severity of sinusitis and to provide a window of opportunity for better medical management but that it is not by itself a cure.

Preoperative Preparation

Patients with polyposis or significant polypoid mucosal degeneration are usually placed on a dose of oral prednisone or steroid equivalent at 1 to 2 mg/kg/day beginning 5 to 7 days prior to surgery. Patients with a history consistent with possible bleeding disorder, such as those with cystic fibrosis, are evaluated with preoperative coagulation screens.

Endoscopic Ethmoidectomy–Middle Meatus Antrostomy

Oxymetazoline soaked pledgets are placed into the nasal cavities for ten minutes prior to the procedure. Similarly, the posterior-inferior portion of the middle turbinate is removed if necessary for access to the sphenoid.

With the lamina papyracea well visualized, any remaining uncinate process is removed with a right angle ball seeker or back-biting forceps. Hypertrophic mucosa is removed from the inferior ostium with careful preservation of the nasolacrimal duct.

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TABLE 1: Surgical Therapy for Pediatric Sinusitis

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TAB

Procedure	Pros	Cons
	Stronger	Weaker
Adenoidectomy	<ul style="list-style-type: none"> • ? Removes bacterial source • One prospective study showing efficacy 	<ul style="list-style-type: none"> • Not always beneficial
Antral lavage	<ul style="list-style-type: none"> • May provide culture material for treatment guidance in immunocompromised patients 	<ul style="list-style-type: none"> • No long term (6 months) benefit documented
Nasal Antral Window (Inferior Meatus)	<ul style="list-style-type: none"> • Relatively safe and easy • Animal studies show increased incidence of sinusitis with window through natural ostium 	<ul style="list-style-type: none"> • Potential injury to developing teeth • High rate of closure • Studies question long-term benefits
Caldwell-Luc	<ul style="list-style-type: none"> • Good visualization of maxillary sinus 	<ul style="list-style-type: none"> • May lead to permanent sinus hypoplasia with facial and dental abnormalities • ? Mucosal disease is rarely irreversible in children
Endoscopic Ethmoidectomy (Middle Meatus NAW)	<ul style="list-style-type: none"> • Concept of ostiomeatal unit as site of sinus obstruction • Better visualization of anatomy • More physiologic 	<ul style="list-style-type: none"> • No prospective controlled studies documenting efficacy • More difficult in children • May require second visit to OR

TFN

*Cystic fibrosis
 **Allergic fungal sinusitis
 +Computed tomography (CT)

Occasionally, older pediatric patients will have extremely hypertrophic inferior turbinates with a significant degree of fixed nasal obstruction. A limited turbinoplasty via cautery or conservative excision is sometimes necessary to allow for nasal breathing and for subsequent saline and topical steroid therapy.

Bleeding during surgery is managed with oxymetazoline soaked packs and with careful bipolar cauter. I try to avoid any post-operative packing of stenting by minimizing operative bleeding and by keeping the middle turbinate as stable as possible. In my experience, the difficulty in examining and suctioning pediatric patients is more than offset by their improved healing capacity compared with adults.

Trends in Endoscopic Sinus Surgery

In the early years of endoscopic sinus surgery, many surgeons emphasized aggressive opening of all sinuses and blamed recurrent disease on “missed” areas. These authors appear to be coming full circle to the point of no surgery (the ultimate in minimal conservative operating) for pediatric patients with chronic disease.

From a technical standpoint, the trend is towards sharper cleaner dissection with cutting forceps rather than extensive removal of mucosa with pulling instruments. Better nasal drills with slim profiles are being developed by several companies and will improve the ease of choanal atresia and endoscopic orbital procedures.

As surgeons become more comfortable within the tighter confines of the pediatric nose, horizons of endoscopic techniques will expand. Inverted papillomas and even nasopharyngeal angiofibromas are being excised endoscopically with increasing frequency.

PEARLS AND PERILS

1. Adequate informed consent puts surgery into perspective.
2. Perioperative steroids for patients with polyps.
3. Oxymetazoline for hemostasis.
4. Anterior ethmoid is narrow in children. Carefully deflect uncinata medially away from lamina and remove or start in bulla.
5. Sharp dissection. Preserve mucosa and middle turbinate stability. Avoid packing.
6. Microdebrider for hypertrophic mucosa and polyps.

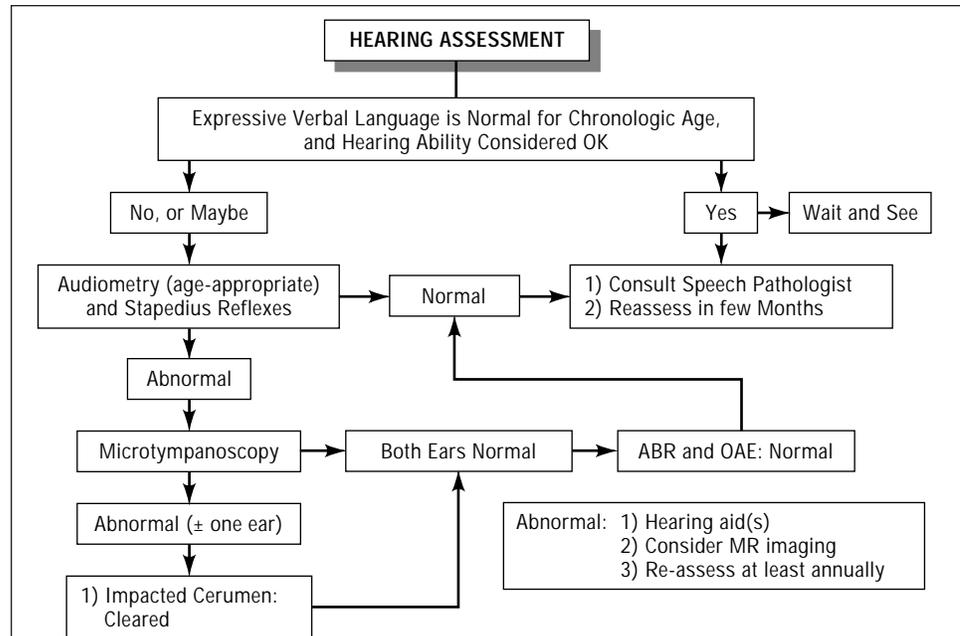
TREATMENT RECOMMENDATIONS

Radiographic Diagnosis

In general, sinus radiographs are indicated for documentation of presence or absence of suppurative complication, to confirm resolution or persistence of disease after medical therapy and to provide an anatomic road map for planned surgery. The unusual finding of central sinus signal absence on magnetic resonance imaging along with computed tomographic evidence of irregular central high signal and peripheral mucosal inflammation is diagnostic of allergic fungal sinusitis.

The fundamental principle underlying endoscopic sinus surgical technique is that mucosal or bony anatomic obstruction of sinus outflow tracts through the middle meatus or less commonly the sphenoethmoidal recess leads to upstream infection and to a cycle of continued inflammation and obstruction. Other imaging studies have shown that the overall incidence of sinus mucosal inflammation drops off significantly after age seven or eight again supporting the idea that most sinus disease in children is eventually self-resolving.

Image findings of mucosal inflammation at one point in time must be interpreted in light of physical findings and history and do not in themselves constitute an indication



FN / FL **FIGURE 2** Computed tomography demonstrating hypoplastic maxillary sinuses in a 9-year old with chronic maxillary sinusitis. Note the concavity of the lateral nasal walls in the middle meatus which makes surgical middle meatus antrostomy technically challenging.

for surgery. My view is that surgery cannot improve upon anatomically normal sinuses as evidenced by our most sensitive imaging techniques.

The issue of the potential effect of sinus surgery on facial growth is pertinent to the topic of radiographic diagnosis since radiographs have shown subsequent sinus hypoplasia in patients undergoing surgery at a young age. Since the anterior ethmoid region is a significant facial growth center, concerns remain about the potential impact of even limited surgery upon facial growth in very young patients.

Suppurative Complications of Sinusitis

Medial Subperiosteal Orbital Abscess

Suppurative complications are defined a spread of infection beyond the anatomic boundaries of the sinus and they constitute the strongest potential indication for surgery. In contrast to older series, a significant percentage of patients diagnosed with medial subperiosteal abscess at present are older than age 5, with a history consistent with allergic rhinitis and with surgical finding of ethmoid polyps which presumably act as a predisposing condition through ethmoid obstruction.

The diagnosis of medial subperiosteal orbital abscess is made when a child presents with periorbital cellulitis and orbital signs such as chemosis, proptosis and gaze restriction. Decreasing visual acuity or progressive orbital fixation are grave signs indicating possible intraconal (orbital or interperiosteal extension of infection and should trigger immediate radiographic evaluation and ophthalmologic consultation.

When computed tomography confirms a decial orbital inflammatory mass effect adjacent to ethmoid infection and with medial bowing of the periorbital layer in a patient unresponsive to medical therapy than surgical drainage indicated. The technique represents a natural broadening of pediatric endoscopic surgery but is appropriate only for experience pediatric sinus surgeons.

Intracranial Complications

Under age three, congenital heart disease is the most common predisposing condition in cases of brain abscess but in older children ear and sinus infection remains the principle source of intracranial suppurative process. Focal signs were rare.

Commuted tomography utilizing contrast and including axial views is the imaging modality of choice for suspected intracranial spread of inflammation. Unfortunately, our Dallas review showed that even after successful therapy, patients with intracranial suppurative complications of sinusitis may be left with permanent neurologic sequelae such as learning disabilities.

Occasionally, children undergoing computed tomographic evaluation because of severe or persistent headache will be found to have sphenoid or frontal sinus opacification without evidence of intracranial inflammation. These patients should be managed initially with intravenous broad-spectrum antibiotics but may require surgical drainage for refractory disease. Depending upon the age of the patient and the experience of the surgeon, endoscopic techniques can be utilized for direct sphenoidotomy or opening of the frontal recess in the unusual cases.

Polyposis

Nasal polyps represent epithelial proliferation secondary to inflammation. Persistent disease with nasal airway obstruction and/or recurrent sinusitis constitutes an indication for imaging and surgery. Tumors

Rhabdomyosarcoma originating from the nasopharynx or maxillary sinus is a rare origin of unilateral nasal mass in very young children. Recently, a few surgeons have reported successful endoscopic removal of small angiofibromas with decreased blood loss and reduced hospitalization times.

PEARLS AND PERILS

1. The natural history of chronic sinusitis in most young children is toward spontaneous resolution.
2. Imaging findings of sinus mucosal inflammation are extremely common in young children even without a history of sinusitis symptoms, and must be interpreted in light of clinical history and signs.
3. Sinus surgery at a young age may affect future facial growth.
4. The logical treatment approach is for a stepped protocol of medical therapy first, then less invasive surgical procedures such as adenoidectomy, with more invasive direct sinus drainage procedures reserved for the small minority of treatment failures with sinusitis affecting overall health.

MANAGEMENT OF COMPLICATIONS

In general, sinus radiographs are indicated for documentation of presence or absence of suppurative complication, to confirm resolution or persistence of disease after medical therapy and to provide an anatomic road map for planned surgery. The unusual finding of central sinus signal absence on magnetic resonance imaging along with computed tomographic evidence of irregular central high signal and peripheral mucosal inflammation is diagnostic of allergic fungal sinusitis.

General

The fundamental principle underlying endoscopic sinus surgical technique is that mucosal or bony anatomic obstruction of sinus outflow tracts through the middle meatus or less commonly the sphenoethmoidal recess leads to upstream infection and to a cycle of continued inflammation and obstruction. Other imaging studies have shown that the overall incidence of sinus mucosal inflammation drops off significantly after age seven or eight again supporting the idea that most sinus disease in children is eventually self-resolving.

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Orbit

Image findings of mucosal inflammation at one point in time must be interpreted in light of physical findings and history and do not in themselves constitute an indication for surgery. My view is that surgery cannot improve upon anatomically normal sinuses as evidenced by our most sensitive imaging techniques.

The issue of the potential effect of sinus surgery on facial growth is pertinent to the topic of radiographic diagnosis since radiographs have shown subsequent sinus hypoplasia in patients undergoing surgery at a young age. Since the anterior ethmoid region is a significant facial growth center, concerns remain about the potential impact of even limited surgery upon facial growth in very young patients.

Cerebral Spinal Fluid Leak

Suppurative complications are defined as a spread of infection beyond the anatomic boundaries of the sinus and they constitute the strongest potential indication for surgery. In contrast to older series, a significant percentage of patients diagnosed with medial subperiosteal abscess at present are older than age 5, with a history consistent with allergic rhinitis and with surgical finding of ethmoid polyps which presumably act as a predisposing condition through ethmoid obstruction.

PEARLS AND PERILS

1. Start with valid indication.
2. Complications are better avoided than treated.
3. Postoperative scarring can be minimized with atraumatic technique and avoidance of packing.

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SUM

SUMMARY

The strongest indication for sinus surgery in the pediatric age group are treatment of suppurative complication of sinusitis and of fixed obstruction such as polyps refractory to medical treatment. The most common indication in my practice is sinusitis refractory to medical therapy aggravating or triggering lung disease. Chronic sinusitis is a difficult entity to define in children and surgery may be a useful adjunct when medical therapy is unsuccessful and imaging demonstrates significant persistent mucosal disease. The realistic goal of surgery in these patients is to break a cycle of persistent disease and to reduce the frequency and severity of future episodes.

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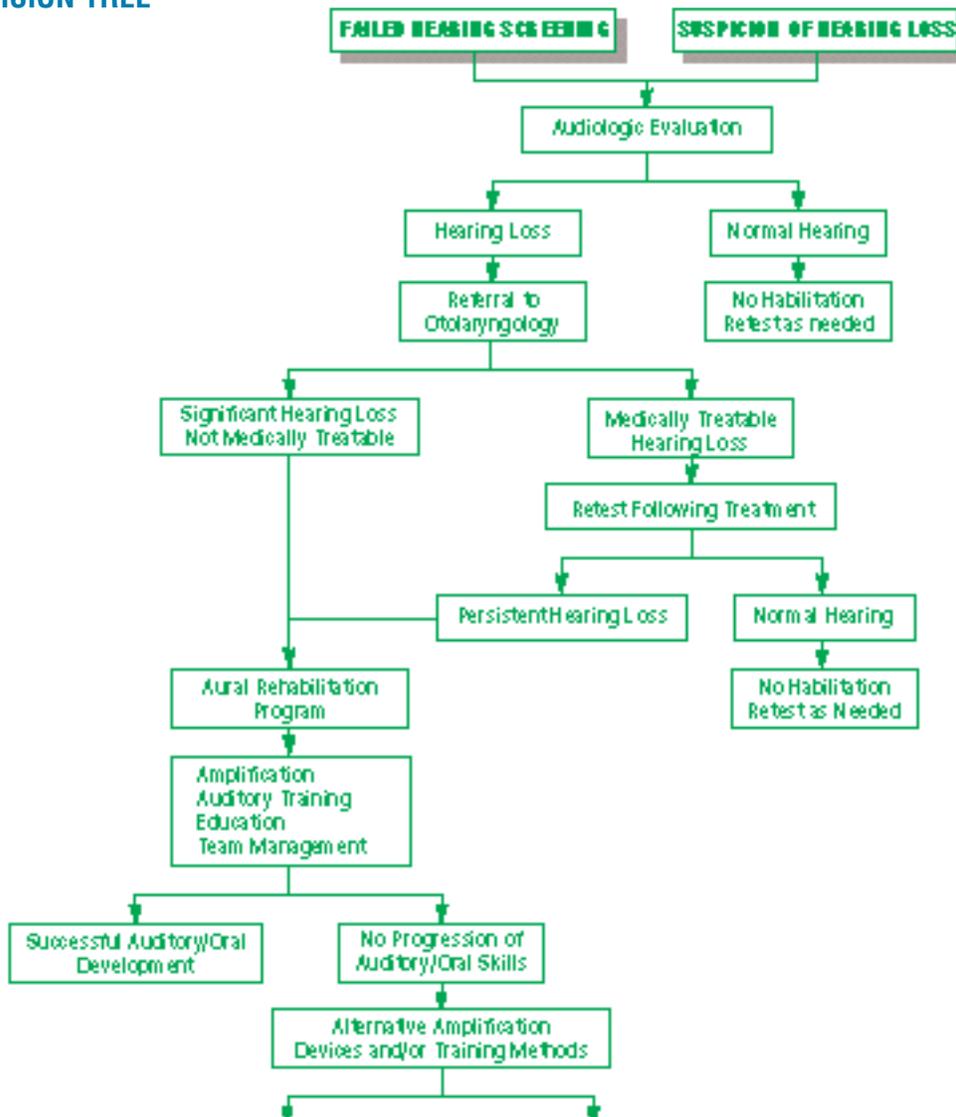
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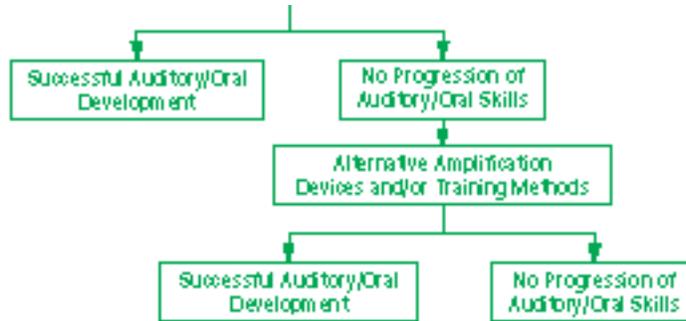
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Controversies in Cochlear Implantation, Technical Considerations

Robin T. Cotton, MD & Dr. Phillippe Contencin

DECISION TREE





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