We are very reluctant to perform sinus surgery in children; children under 10 years of age account for less than 2% of our surgical cases. In contrast to adults, many other than just ethmoidal causes usually can be identified and treated in children's sinusitis (adenoids, allergies). Functional endoscopic surgery in children requires expert knowledge and experience and we strongly recommend that novices not start with pediatric cases.—Heinz Stammberger (1).

INTRODUCTION

Sinusitis as an acute process in children must be a frequent occurrence given the number of upper respiratory illnesses they are subject to in their early childhood, as well as the relative lack of immunity present. In most cases, these episodes of inflammation within the nose and paranasal sinuses probably resolve without any treatment or respond quickly and appropriately to antibiotic management. In rare cases, additional antibiotics may need to be administered for an infection that does not respond appropriately to initial management, and it is an exceptional event if chronic sinusitis develops, which is unresponsive to multiple-drug therapy. Those patients who do not respond to long-term courses of antibiotics and who persist in showing signs of inflammation or infection symptomatically and objectively present on a computer tomographic (CT) scan would seem to be candidates for surgical treatment. The place for functional endoscopic sinus surgery in children who have recurrent infections that clear in response to therapy is not clear.
Fig. 1. Absent uncinate and hypoplastic sinus.

In addition, the effect of adenoidectomy or limited drainage of the sinuses is not well documented. Despite these unknowns, selection of the appropriate patient who would benefit from endoscopic sinus surgery and adjunctive procedures, such as adenoidectomy, septoplasty, and turbinoplasty, is critical to a successful result.

ANATOMY

Neonates and infants are born with small, poorly developed ethmoid and maxillary sinuses, which gradually enlarge and extend to the frontal and sphenoid areas. The uncinate process begins as a hypoplastic ridge that gradually extends itself superiorly as the child grows gradually increasing the depth of the infundibular area (2). This development of the uncinate process may act as a protective device in older children and adults to shield the maxillary sinus from inflammation and secretions within the nose. In the process, once inflammation does occur, the infundibulum could act as a site of obstruction of adequate clearance of secretions from the maxillary sinus ostia and anterior ethmoid area. The vertical range and degree of complexity of the ethmoid sinuses also increases with advancing age (3). There are developmental anomalies of the sinuses that can lead to hypoplastic development, poor drainage, and abnormal function. These abnormalities should be searched for in any child who has persistent opacification or other abnormalities on routine radiographic evaluations (4). (See Fig. 1.)

Clearance of secretions naturally produced by glandular epithelium within the paranasal sinuses takes place via the action of ciliated epithelia. All secretions are directed through this mucociliary action to the natural ostia of the paranasal sinuses. Any factor that thickens secretions or impairs ciliary motility can alter effective transport, as can swelling or edema at the ostial site. Diminished partial pressure of oxygen within the sinus cavities can affect the qualities of glandular secretions, causing thicker and more viscid mucus to be formed (5).

A variety of factors can increase ciliary beat frequency. Theophylline, caffeine, Neo-Synephrine, and other drugs, as well as exercise, raise the frequency of ciliary activity, which, in combination with agents that thin mucus or may diminish edema at the ostial site, would facilitate clearance of secretions (6,7). Surgical treatment is also directed toward facilitating secretion, clearance, and ventilation of the paranasal sinuses through elimination of gross anatomic obstacles. (Diagnosis and treatment have been covered in other portions of the text and will not be mentioned here.)

It is important to note for appropriate surgical planning any underlying conditions, such as cystic fibrosis (CF), ciliary dyskinesia, immunologic deficiency, and so on. A CT scan is mandatory prior to the consideration of endoscopic sinus surgery for the treatment of sinusitis. Once a CT scan has been obtained, an assessment of the level of involvement of the sinuses can be made that would generally be relegated to one of four categories:

1. Normal;
2. Disease limited to the maxillary sinuses;
3. Ethmoid and varying degrees of maxillary involvement; and
4. Pan-sinusitis.

Assessment of disease extent is necessary for the surgical decision-making process as well as the prognosis postoperatively. Staging systems have been proposed by a variety of authors, which may be used prognostically to estimate long-term success rate. One such system uses four stages as follows (8):

Stage 1: Anatomic abnormalities, unilateral sinus disease, and bilateral ethmoid disease;
Stage 2: Bilateral ethmoid disease with one dependent sinus involved;
Stage 3: Bilateral ethmoid disease with two dependent sinuses involved; and
Stage 4: Diffuse sinus polyposis.