Paranasal sinuses are most frequently involved by inflammatory conditions both in the pediatric and adult patients. However, there are numerous differences between the two groups of patients. During childhood, the paranasal sinuses are in the process of development and are continuously changing. Particularly in the younger pediatric patients, often opacification of the paranasal sinuses is not related to disease and is asymptomatic. The proposed explanation for this is that there is redundancy of mucosa in the developing sinus and that the presence of fluid may be due to crying or drinking from a bottle in supine position. Also, changes in the sinus may last for weeks after a child has recovered from a cold. Additionally, there are specific considerations in the work-up of pediatric paranasal disease because sedation is usually necessary in imaging of very young children and also CT involves radiation and, therefore, should be utilized judiciously.

The American Academy of Otolaryngology and Head & Neck Surgery in its statement (Clinical Consensus Statement on Appropriate Use of CT in Pediatric Sinusitis) lists the following indications for CT use in pediatric sinusitis:

1. When medical management with or without adenoidectomy has failed;
2. In the immunocompromised patient if there is concern for invasive fungal sinusitis. In this situation both CT and MRI are indicated;
3. In case of complicated sinusitis;
4. Prior to sinus surgery.

The Statement also lists situations when CT is not indicated, such as:

1. Acute uncomplicated sinusitis (unless prior appropriate medical therapy is given);
2. Routine uncomplicated upper respiratory infection, colds lasting less than 10 days.

At birth the ethmoid sinuses are the most developed of the paranasal sinuses with the other sinuses being absent or represented by tiny mucosal sacs. During the first 3-4 years of life, the ethmoid and maxillary sinuses pneumatize rapidly, while the sphenoid and frontal sinuses show slow pneumatization. All of the sinuses continue to enlarge as the facial skeleton grows. This progressive development continues into the early teenage years and some paranasal sinuses continue to show growth into adulthood.

Because the ethmoid sinuses are most developed in the very young, they are the site of paranasal sinus infection in this age group. Infection with accumulation of pus within the ethmoid sinuses can spread through thin lamina papyracea into the orbit. The infection can also spread intracranially. It should be noted that up to 2 years of age the central anterior cranial base is unossified. Thus, in infants the cartilaginous midline cranial base should not be misinterpreted for absence or destruction of bone. A child suspected to have complicated ethmoid sinusitis requires CT imaging to characterize the type and define the extent of intraorbital inflammation. This information is most important because it influences management of the patient, medical therapy alone or medical therapy combined with surgery. Contrast-enhanced CT reveals extent of inflammatory changes including presence and size of subperiosteal abscess. Combination of CT information with clinical findings may indicate the need for further evaluation with MRI to detect and characterize intracranial complications and extent. The spectrum of complications from paranasal sinusitis includes preseptal and post septal cellulitis, subperiosteal abscess, superior ophthalmic vein and cavernous sinus thrombosis, epidural and subdural empyema, meningitis and infarction. Prompt diagnosis of intracranial extent of infection is of utmost
importance and leads to proper therapy ensuring better outcome. Therefore, MRI is the procedure of choice in the case of suspected intracranial extent. Subdural empyema often constitutes a neurosurgical emergency. Early developing subdural empyema may be difficult to diagnose with CT because the changes may be subtle. MRI with diffusion imaging will make the specific diagnosis.

Oncologic and immunocompromised pediatric patients may need imaging of their paranasal sinuses prior to procedures such as bone marrow transplantation or they may have fever of unknown origin and be suspected to have fungal sinusitis. If invasive fungal sinusitis is chronic and progressing slowly over a period of several weeks, it can produce subtle changes. In these patients particular care should be given in interpretation of the CT images (both soft tissue and bone window images). The bone window images should be viewed carefully to detect early osseous demineralization or destruction particularly at sites of nodular soft tissues along the sinus and nasal cavity walls.

When symptoms and signs of sinonasal inflammation persist for three months or more, the sinus disease is considered to represent chronic rhinosinusitis. CT of pediatric paranasal sinuses without clinical correlation may not be specific for chronic rhinosinusitis unless there are polyps identified with associated bony changes. The presence of paranasal sinus mucosal thickening and opacification is nonspecific. Very young children, under five years of age, can have nonspecific asymptomatic opacification of paranasal sinuses. Also, children that have had a cold (which frequently happens in childhood) may show mucosal changes and fluid that lasts for many weeks after the symptoms of a cold have resolved.

In the category of chronic rhinosinusitis there are specific diseases often
associated with polyps that result in chronic rhinosinusitis. Such diseases are difficult to treat. The presence of paranasal polyps in pediatric patients raises the possibility of entities such as cystic fibrosis, allergic fungal rhinosinusitis, aspirin exacerbated respiratory disease and primary ciliary dyskinesia. Cystic fibrosis, an autosomal recessive hereditary disorder due to mutation in CFTR gene, very frequently involves the paranasal sinuses, causing marked expansion due to polyps and thick secretions.

References
