

FROM THE FAMILY PRACTICE INQUIRIES NETWORK

# Do imaging studies aid diagnosis of acute sinusitis?

*Jacob M. Reider, MD*

*Department of Family and Community Medicine, Albany Medical College, Albany, NY*

**Joan Nashelsky, MLS**

*Family Practice Inquiries Network, Iowa City, Iowa*

## ■ EVIDENCE-BASED ANSWER

Accurate diagnosis of acute sinusitis in both children and adults depends on the history and clinical examination of the patient. While the clinical signs and symptoms of acute sinusitis are often difficult to distinguish from viral upper respiratory infection,<sup>1,2</sup> such an assessment remains the best approach to diagnosing acute sinusitis (strength of recommendation [SOR]: **A**). There is no role for imaging in the diagnosis of acute sinusitis. For patients who have persistent symptoms, or those for whom surgery is being considered, some guidelines suggest that coronal computed tomography (CT) scan of the paranasal sinuses be considered (SOR: **C**, expert opinion).

## ■ EVIDENCE SUMMARY

Three recent evidence-based guidelines<sup>3,4,5</sup> suggest that children and adults with acute sinusitis may benefit from treatment with antibiotics more than those with rhinitis. Clinicians must develop a strategy for accurately diagnosing sinusitis to make sound treatment decisions. In the absence of a clear diagnosis of acute sinusitis, antibiotics are very unlikely to improve symptoms and are, therefore, not indicated.

**Clinical evaluation.** Berg<sup>1</sup> studied 150 patients with clinical diagnoses of sinusitis and found that 85% of them had positive sinus puncture. In a review of the 11 studies that met evidence-based inclusion criteria, Varonen<sup>6</sup> concluded that clinical evaluation has a sensitivity of roughly 0.75, whereas radiographic methodologies have sensitivities >0.80. In a prospective trial and subsequent review of the literature, Lindbaek<sup>7,8,9</sup> suggests that several key clinical signs and symptoms can provide a level of sensitivity that approaches that of CT or magnetic resonance imaging (MRI), while enhancing specificity:

- Purulent secretion reported as a symptom or found in the nasal cavity by the doctor
- Pain in the teeth

- Pain on bending forward (inconsistent findings between studies)
- Two phases in the illness history
- Elevated erythrocyte sedimentation rate or increased C-reactive protein
- Symptoms for at least 7 days

Lau and colleagues<sup>5,10</sup> reviewed 14 studies that compared various imaging studies with clinical evaluation or sinus puncture and aspiration with culture or both. A positive aspirate for bacterial pathogens was defined as the gold standard for diagnosis of sinusitis (**Table**).

**X-ray vs sinus puncture.** Depending on the criteria used to define a diagnosis of sinusitis on plain radiograph, estimates of sensitivity in these studies ranged from 0.41 to 0.90, and specificity estimates ranged from 0.61 to 0.85. Imaging studies that included “mucous membrane thickening” as a criterion for sinusitis were more sensitive but less specific than studies defining positive radiographs as “opacification of sinus.”

**CT scan, MRI, ultrasound.** While a CT scan is more sensitive than plain x-ray film,<sup>11</sup> and MRI is more sensitive than a CT scan,<sup>12,13</sup> the specificity of these studies is unclear. For example, in children and adults without symptoms of sinusitis, the prevalence of sinusitis signs on CT and MRI is 45% and 42%, respectively.<sup>6,7,14</sup> In light of such findings, these imaging methodologies are better reserved for patients in whom surgery is being contemplated, or for whom chronic sinusitis is a concern. In the 1980s and 1990s, ultrasound was studied enthusiastically. Variability in test performance is great.<sup>6</sup> Since the cost of this procedure is similar to that of a sinus CT, ultrasound is not indicated in the diagnostic evaluation of the sinuses.

Though the sensitivity and specificity of a clinical evaluation possibly could be enhanced with the use of imaging studies, diagnostic accuracy of acute disease is not sufficiently improved to justify the cost or inconvenience of such interventions.

### Sensitivity and specificity of imaging modalities in sinusitis

Diagnostic technique	Sensitivity	Specificity
X-ray	Variable	Variable
CT scan	High	Poor
MRI	High	Poor
Sinus puncture	High	High
Clinical evaluation	High	Moderate

### ■ RECOMMENDATIONS FROM OTHERS

In a guideline on appropriate antibiotic use in sinusitis,<sup>4</sup> endorsed by the Centers for Disease Control and

Prevention, American Academy of Family Physicians, the American College of Physicians–American Society of Internal Medicine, and the Infectious Diseases Society of America, radiography is not recommended for the diagnosis of acute sinusitis. The guideline recommends that clinicians rely on duration of illness (at least 7 days) and severity of symptoms to make an accurate diagnosis of sinusitis.

The American Academy of Allergy, Asthma and Immunology<sup>15</sup> guideline makes the following recommendations regarding imaging:

- The use of imaging may be appropriate when there are vague symptoms, or poor response to initial management
- Standard radiographs are insensitive, but may be used for diagnosis of acute sinus disease
- CT is preferred for preoperative evaluation of the nose and paranasal sinuses
- MRI is very sensitive for diagnosis of soft tissue disease in the frontal, maxillary, and sphenoid sinuses
- Ultrasonography has limited utility but may be applicable in pregnant women and for determining the amount of retained secretions.

The Institute for Clinical Systems Improvement recommends that radiology be used only if initial treatment has failed, and notes that a primary goal of its guideline was to reduce the number of x-rays that physicians order for this diagnosis.<sup>16</sup>

The American College of Radiology's criteria for sinusitis in the pediatric population ranked several radiographic studies based on their appropriateness for given clinical conditions. This review<sup>17</sup> suggests that no imaging is appropriate if symptoms have persisted <10 days. For patients with symptoms lasting >10 days and with persistent fever, CT scan is recommended.

#### **CLINICAL COMMENTARY**

***Jon Neher, MD***

*Valley Medical Center Family Practice Residency, Renton, Wash*

In acute bacterial sinusitis, the history and physical have somewhat limited sensitivity and specificity. Unfortunately, imaging studies add little valuable information. Primary care physicians must therefore be reconciled to some degree of diagnostic error.

The risks associated with under-diagnosis are small, since most cases of mild sinusitis will resolve spontaneously without treatment. The risks of over-diagnosis include increased antibiotic costs, side effects, allergic reactions, and the development of resistant organisms. It is prudent, therefore, to make the diagnosis only when multiple suggestive historical and exam elements are present and to avoid giving antibiotics to patients with mild, nonspecific illnesses.

## REFERENCES

1. Berg O, Carenfelt C. Analysis of symptoms and clinical signs in the maxillary sinus empyema. *Acta Otolaryngol* 1988;105:343–349.
2. Williams JW Jr, Simel DL, Roberts L, Samsa GP. Clinical evaluation for sinusitis. Making the diagnosis by history and physical examination. *Ann Intern Med* 1992;117:705–710.
3. Clinical practice guideline: management of sinusitis. *Pediatrics* 2001;108:798–808.
4. Snow V, Mottur-Pilson C, Hickner JM. Principles of appropriate antibiotic use for acute sinusitis in adults. *Ann Intern Med* 2001;134:495–497.
5. Lau J. Diagnosis and treatment of acute bacterial rhinosinusitis. Evidence Report/Technology Assessment No. 9. Rockville, MD: Agency for Health Care Policy and Research; 1999.
6. Varonen H, Makela M, Savolainen S, Laara E, Hilden J. Comparison of ultrasound, radiography, and clinical examination in the diagnosis of acute maxillary sinusitis: a systematic review. *J Clin Epidemiol* 2000;53:940–948.
7. Lindbaek M, Hjortdahl P. The clinical diagnosis of acute purulent sinusitis in general practice: a review. *Br J Gen Pract* 2002;52:491–495.
8. Lindbaek M, Hjortdahl P, Johnsen UL. Use of symptoms, signs, and blood tests to diagnose acute sinus infections in primary care: comparison with computed tomography. *Fam Med* 1996;28:183–188.
9. Lindbaek M, Johnsen UL, Kaastad E, et al. CT findings in general practice patients with suspected acute sinusitis. *Acta Radiol* 1996;37:708–713.
10. Benninger MS, Sedory Holzer SE, Lau J. Diagnosis and treatment of uncomplicated acute bacterial rhinosinusitis: summary of the Agency for Health Care Policy and Research evidence-based report. *Otolaryngol Head Neck Surg* 2000;122:1–7.
11. Cotter CS, Stringer S, Rust KR, Mancuso A. The role of computed tomography scans in evaluating sinus disease in pediatric patients. *Int J Pediatr Otorhinolaryngol* 1999;50:63–68.
12. Gordts F, Clement PA, Destryker A, Desprechins B, Kaufman L. Prevalence of sinusitis signs on MRI in a non-ENT paediatric population. *Rhinology* 1997;35:154–157.
13. Chong VF, Fan YF. Comparison of CT and MRI features in sinusitis. *Eur J Radiol* 1998;29:47–54.
14. Patel K, Chavda SV, Violaris N, Pahor AL. Incidental paranasal sinus inflammatory changes in a British population. *J Laryngol Otol* 1996;110:649–651.
15. Joint Task Force on Practice Parameters in Allergy, Asthma and Immunology : Joint Task Force summary statements on diagnosis and management of sinusitis.
16. Acute Sinusitis in Adults. Bloomington, Minn: Institute for Clinical Systems Improvement (ICSI), 2002. Available at: [www.icsi.org](http://www.icsi.org). Accessed on June 17, 2003.

17. McAlister WH, Parker BR, Kushner DC , et al. Sinusitis in the pediatric population. American College of Radiology. ACR Appropriateness Criteria. *Radiology* 2000;215(Suppl):811–818.