What is the Role of Nasal Endoscopy in the Diagnosis of Chronic Rhinosinusitis?

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BACKGROUND
Chronic rhinosinusitis (CRS) is one of the most common chronic conditions in the United States, but clinical diagnostic criteria remain controversial. Nasal endoscopy is frequently employed by otolaryngologists in cases of suspected CRS. Although endoscopy allows visualization of pathology that may provide objective evidence for the diagnosis of CRS in the posterior nasal cavity, nasopharynx, and the middle and superior meati that would not be visible on anterior rhinoscopy, its appropriate role in the evaluation of CRS has been the subject of controversy.

In 2007, the American Academy of Otolaryngology–Head and Neck Surgery (AAO-HNS) published guidelines for diagnosis of CRS that utilize a combination of symptom criteria and objective findings. A positive diagnosis was defined as 12 weeks or longer of two or more of the following signs and symptoms: mucopurulent drainage; nasal obstruction; facial pain, pressure, or fullness; or decreased sense of smell. In addition, an objective measure, such as evidence on nasal endoscopy of nasal polyps or purulent mucus in the middle meatus or ethmoid region, or radiographic evidence of paranasal sinus inflammation are also recommended. Given the high utilization rate and availability of computed tomography (CT) for CRS diagnosis, these guideline criteria designated nasal endoscopy as an optional diagnostic measure. Although endoscopic findings are frequently used to support a diagnosis of CRS, the true diagnostic value of nasal endoscopy in diagnosing CRS has not been clearly defined.

LITERATURE REVIEW
The diagnostic utility of nasal endoscopy, in relation to common clinical and radiologic criteria, has been assessed in relatively few clinical studies. A 1997 study by Benninger evaluated the role of nasal endoscopy in the diagnosis and treatment planning in 100 consecutive new clinic patients with sinonasal complaints. Of those, only 28 patients were diagnosed with CRS, and all diagnoses were made based on history and physical examination that included anterior rhinoscopy. The role of endoscopy in this study was to determine if the endoscopic findings contradict the established diagnosis. The study did not compare the results of endoscopy with CT scans. Although the addition of endoscopy did not change any of the diagnoses of CRS, the study concluded that it was useful in evaluating patients in whom anterior rhinoscopy is limited by anatomic abnormalities or in whom the diagnosis is otherwise unclear.

A 1998 study by Rosbe et al. prospectively compared results of nasal endoscopy, CT scanning, and a symptom questionnaire, with a goal of determining whether a combination of patient symptoms and nasal endoscopy could accurately predict CRS on CT in 92 consecutive patients referred for sinonasal symptoms. The study obtained CT scans on all patients with endoscopic findings positive or equivocal for CRS. They found that 91% of patients with positive findings on endoscopy had CT scans consistent with CRS. Of the patients with a chief complaint of nasal obstruction who had a positive finding on nasal endoscopy, 100% had CT findings consistent with CRS. This study did calculate positive predictive values (PPVs) or negative predictive values (NPVs) for endoscopy as compared with CT results. The study concluded that combined with a symptom history, nasal endoscopy can be a highly specific technique for predicting positive CT findings of CRS.

In a 2002 study of 78 patients meeting the current symptom-based definition of CRS, Stankiewicz and Chow evaluated the relationship between symptom history, nasal endoscopy, and CT findings. Nasal endoscopy was considered positive for CRS if it demonstrated purulence, nasal polyps, or watery congested...
mucosa. Of the 37 patients with positive CT findings, 17 had positive endoscopic results, and 20 had negative endoscopic results. The sensitivity of endoscopy as compared with CT results was 46%, specificity was 86%, PPV was 74%, and NPV was 64%. Negative endoscopy had a stronger association with CT findings, showing a 78% correlation with CT that was negative or showed minimal sinus disease. Although the study did not compare the combination of history and endoscopy with CT results, it did note the low correlation between subjective symptom-based criteria for CRS and findings on CT and endoscopy, as well as a high specificity of endoscopy as compared with CT results.

A more recent study specifically evaluated the relationship between the combination of patient-reported symptoms of CRS and specific findings on nasal endoscopy—middle meatal purulence and/or polyps—with CT findings. The 2010 study by Bhattacharyya et al. prospectively evaluated 202 patients presenting to a clinic for CRS evaluation. CT results were used as the gold standard basis for comparison for the other modalities. The study found that the addition of endoscopy to symptom criteria based on the AAO-HNS guidelines significantly improved the overall accuracy from 42.8% to 69.1%, and the odds ratio from 1.1 to 4.6, as compared with CT results. Endoscopy also increased the PPV from 39.9% to 66.0%, and NPV from 62.5% to 70.3%. The most dramatic improvement was in specificity, which increased from 12.3% to 84.1% after the addition of endoscopy. The study determined that, in patients who met symptom criteria for CRS, the addition of nasal endoscopy significantly improved diagnostic accuracy for CRS. It concluded that in select patients, endoscopy may help reduce CT utilization in making the diagnosis of CRS.

An additional recently published study by Ferguson et al. evaluated associations between symptom-based criteria as well as specific findings of mucopurulence and CT results. The study found that the overall accuracy of subjective symptoms for predicting CRS on CT was low. However, the endoscopic finding of mucopurulence was only present in patients with positive CRS on CT, and never seen in those with negative CT results. While the study did not the PPV or NPV of endoscopy compared with CT, the specificity of endoscopy was 100%. The sensitivity was only 24%, which is consistent with the low sensitivity demonstrated in prior studies. Therefore, the conclusion of the study was that endoscopy can confirm a CRS diagnosis, but cannot rule it out, and that CT should be performed in cases of suspected CRS even if mucopurulence is not noted on endoscopy. The comparative results of these studies are summarized in Table I.

### BEST PRACTICE

Nasal endoscopy enhances the sinonasal evaluation by allowing visualization of anatomy that is not possible with anterior rhinoscopy. It produces a closer inspection of the involved areas, as well as the opportunity for directed culture or biopsy. When compared with CT results, nasal endoscopy alone does not have a high enough sensitivity to rule out CRS. However, even though the definition of CRS on endoscopy has varied in different studies, the modality has demonstrated a high specificity in identifying CRS. Endoscopy is especially valuable in individuals with symptoms consistent with CRS, and the combination of symptom criteria and positive findings on nasal endoscopy has a high diagnostic accuracy. Although the evidence is somewhat limited, in select individuals with positive symptom criteria combined with an endoscopic confirmation of CRS, a confident diagnosis of CRS may be made without additional imaging. This may then allow for initiation of medical management of CRS for example, thereby sparing patients the cost and radiation exposure of CT, particularly for those who respond therapeutically. Future studies are needed to further investigate the accuracy of endoscopy in combination with symptom-based criteria in diagnosing CRS.

### TABLE I.

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Statistical Measure</th>
<th>No.</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benninger</td>
<td>1997</td>
<td>Proportion (11%)*</td>
<td>100</td>
<td>Endoscopy useful only when diagnosis unclear</td>
</tr>
<tr>
<td>Rosbe</td>
<td>1998</td>
<td>Proportion (91)%†</td>
<td>92</td>
<td>High specificity of endoscopy</td>
</tr>
<tr>
<td>Stankiewicz</td>
<td>2002</td>
<td>Sensitivity (46%), specificity (86%), PPV (74%), NPV (64%)</td>
<td>78</td>
<td>Low correlation with subjective symptoms, high specificity of endoscopy</td>
</tr>
<tr>
<td>Bhattacharyya</td>
<td>2010</td>
<td>PPV (66.0), NPV (70.3), OR (4.6)‡</td>
<td>202</td>
<td>Addition of endoscopy to subjective symptoms greatly improved the diagnostic accuracy</td>
</tr>
<tr>
<td>Ferguson</td>
<td>2012</td>
<td>Sensitivity (24%), specificity (100%)</td>
<td>125</td>
<td>High specificity and low sensitivity of endoscopy make it useful for confirming CRS diagnosis but not for ruling it out</td>
</tr>
</tbody>
</table>

*Proportion of participants in whom nasal endoscopy played an important role in the evaluation when added to history and physical examination with anterior rhinoscopy.

†Proportion of participants with positive endoscopy findings who also had computed tomography positive for CRS.

‡Association between the combination of symptom-based criteria and endoscopy and computed tomography findings.

PPV = positive predictive value; NPV = negative predictive value; OR = odds ratio; CRS = chronic rhinosinusitis.
LEVEL OF EVIDENCE
In this review, one of the studies is diagnostic level 3b,1 one study is diagnostic level 2b,2 and three of the studies are diagnostic level 1b.3–5

BIBLIOGRAPHY