

REVIEW ARTICLE

Evaluation of the Change in Recent Diagnostic Criteria of Chronic Rhinosinusitis: A Cross-sectional Study

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ABSTRACT

There is an enormous economic burden of patients suffering from chronic rhinosinusitis (CRS), there is also significant patient morbidity in terms of quality of life and decreased overall productivity caused by CRS. But, the criteria's to label a patient having CRS is not clearly defined. The definition of CRS is ever evolving. The purpose of this study was to evaluate the diagnosis of CRS according to recent clinical guideline set by the AAO-HNS and to determine the utility of nasal endoscopy for diagnosing the CRS.

Keywords: Chronic, Definition, Evaluation, Nasal endoscopy, Rhinosinusitis.

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INTRODUCTION

A study by the National Institute of Allergy and Infectious Diseases (NIAID) recently concluded that 134 million Indians suffer from chronic rhinosinusitis (CRS), which is more than double the number of diabetic patients in India. Beside the enormous economic burden of CRS, there is also significant patient morbidity in terms of quality of life and decreased overall productivity caused by CRS as measured by various studies.¹ How to diagnose the CRS without using computed tomography (CT) scan or remembering long list of 12 symptoms was always a controversial topic.²⁻⁴

Given the importance of the disease, an acceptable uniform definition of sinusitis was needed for many years. But, there was not a common consensus on it, when we look back little, In August 1996, the American Academy of Otolaryngology-Head and Neck Surgery

(AAO-HNS) convened a multidisciplinary rhinosinusitis task force (RSTF) to confront difficult issues related to defining, staging, and research of rhinosinusitis. The resulting article, 'Adult Rhinosinusitis' published in 1997 and was endorsed by the AAO-HNS, the American Academy of Otolaryngic Allergy (AAOA), and the American Rhinologic Society (ARS). These definitions were to be amended every few years and were to become a platform from which subsequent research and discussion of clinical issues would be recommended.¹

The 1997 RSTF working definition of chronic rhinosinusitis stated that any form of rhinosinusitis lasting for more than 12 weeks and having two or more major factors or one major and two minor factors out of 12 major and minor clinical factor. Five major criteria's were: (1) Facial pain or pressure, (2) Facial congestion or fullness, (3) Nasal obstruction or blockage, (4) Decrease sense of smell, (5) Discolored or purulent nasal or postnasal secretion. And seven minor criteria's were: (1) Headache, (2) Fever, (3) Halitosis, (4) Fatigue, (5) Dental pain, (6) Cough, (7) Ear pain or pressure or fullness.¹

In 2002, a new task force, the task force for defining adult chronic rhinosinusitis, was convened and underwritten by unrestricted funds from the sinus and allergy health partnership (SAHP).² The subjective diagnostic criteria created by RSTF (1997) was reviewed and amended by SAHP to include physical and nasal examination findings in addition to suggestive history of symptom criteria.²

But after evaluation of 1997, and then 2003 Task Force criteria by various reviewer like Kenny et al in 2001,⁵ Hwang et al in 2003,⁶ Benninger in 2004,⁷ Bhattacharyya et al in 2005,^{8,9} and many others, came with following observations:

- A very good clinical correlation of the degree of disease as measured by CT, with the severity of symptoms with which the patients present is not possible.
- As the diagnostic guidelines were primarily symptoms based, and as a result, many patients ultimately required CT scans to confirm and evaluate the status of disease, or risked an over diagnosis of CRS.

Other than above conclusion, practically combination of 12 major and minor symptoms was cumbersome to practice in daily clinical basis.

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To resolve above mentioned issues and for reaching toward the proper diagnosis and management of CRS, in 2007, new guidelines for rhinosinusitis, from a multidisciplinary panel commissioned by the AAO-HNS, were published. The 12 major and minor symptoms of CRS were narrowed to four specific symptoms, and documentation of middle meatal inflammation has added to the diagnostic criteria for CRS to improve the diagnostic accuracy.⁴

As per new guideline, 12 weeks or longer of two or more of the following signs and symptoms:

- Mucopurulent drainage (anterior, posterior, or both)
- Nasal obstruction (congestion)
- Facial pain-pressure-fullness
- Decreased sense of smell.

Furthermore, an objective measure is required for the diagnosis of, i.e. inflammation documented by one or more of the following findings:

- Purulent (not clear) mucus or edema in the middle meatus or ethmoid region
- Polyps in nasal cavity or the middle meatus
- Radiographic imaging demonstrating inflammation of the paranasal sinuses.

And as we can see the objective measure of obtaining the finding in middle meatus or Ethmoid region, can be obtained by nasal endoscopy without the help of CT scan. That can also lead to saving of money and unnecessary radiation exposure in a large segment of the population which come for evaluation of CRS.⁴

But anything cannot be accepted without the evaluation and comparison, similarly the evaluation of newer guideline compare to gold standard CT scan and older RSTF symptom criteria is important to assess the impact of new symptoms criteria on reaching a correct diagnosis of CRS.

OBJECTIVES OF THE STUDY

- To evaluate the diagnosis of CRS according to recent clinical guideline set by the AAO-HNS
- To determine the utility of nasal endoscopy for diagnosing the CRS.

MATERIALS AND METHODS

The study was a cross-sectional study of 78 patients seen in a tertiary care center. The sample comprised of adult patients presenting for evaluation of CRS by using the rhinosinusitis symptom inventory (RSTF symptom criteria's), nasal endoscopy, and paranasal sinus CT. Patients were excluded from the study if they had a history of previous sinonasal surgeries, cystic fibrosis, autoimmune

or immune-compromised disorders, recurrent acute rhinosinusitis, or if they were younger than 18 years of age.

Method of collection of data: Cases selected for study were subjected to detailed history taking and clinical examination. Patients were then selected using the 1997 RSTF symptom criteria. If two major or one major and two minor symptoms were positive patient was considered for the study. Then they had to consequently go through diagnostic nasal endoscope, CT scan and then through the recent guideline diagnostic criteria (2007) evaluation.

Rhinosinusitis symptom inventory (RSTF symptom criteria): All patients completed the RSTF symptom criteria,¹ which tabulates the guideline symptoms of sinusitis on a six-point Likert scale ranging from zero (absent symptoms) to five (maximally severe symptoms). According to the guideline recommendation, the patient met symptom criteria for CRS if the subject had two or more major symptoms or one major and two or more minor symptoms minimum two-point on likert scale, that lasted for more than 12 weeks. A patient questionnaire was developed to identify the presence of sinusitis symptoms as specified by the RSTF symptom diagnostic criteria (Table 1).

The CT scan: Another diagnostic evidence of CRS was defined and compared by the gold standard CT scan. Each patient CT scan of the paranasal sinuses was obtained and staged using the Lund-Mackay CT scoring system.¹⁰ As shown in (Table 2) and (Fig. 1). This system is based on the appearance of each paranasal sinus on the CT scan. The reviewer was blinded to the RSTF symptom criteria scores and endoscopic findings.

Table 1: Questionnaire as per RSTF major and minor criteria

<i>Questionnaire</i>		
Beginning of symptoms for more than 12 weeks	Yes	No
Previous episode	Yes	No
Use of antibiotics	Yes	No
<i>Major criteria</i>		
Facial pain or facial pressure	Yes	No
Facial congestion/ fullness	Yes	No
Nasal obstruction/ blockage	Yes	No
Decrease sense of smell	Yes	No
Discolored or purulent nasal or postnasal secretion	Yes	No
<i>Minor criteria</i>		
Headache	Yes	No
Fever	Yes	No
Halitosis	Yes	No
Fatigue	Yes	No
Dental	Yes	No
Cough	Yes	No
Ear pain/ pressure/ fullness	Yes	No

Scoring of symptoms: 0-absent, very mild-1, mild-2, moderate-3, severe-4, very severe-5

Table 2: Lund-Mackay score of CT scan

Paranasal sinuses	Right	Left
Maxillary (0, 1, 2)		
Anterior Ethmoid (0, 1, 2)		
Posterior Ethmoid (0, 1, 2)		
Sphenoid (0, 1, 2)		
Frontal (0, 1, 2)		
Ostiomeatal complex (0, 1, 2)		
Total		

Note: 0-without abnormalities; 1-partial opacification; 2-total opacification

Table 3: Lund-Kennedy score of endoscopic assessment

Characteristics	Nasal cavity	
	Right	Left
Polyp (0, 1, 2)		
Edema (0, 1, 2)		
Secretion (0, 1, 2)		
Total		

Note: polyp: 0-absent; 1-limited to the middle meatus; 2-extending to the nasal cavity
Mucosa edema: 0-absent; 1-mild/moderate edema; 2-polypoid degeneration
Secretion: 0-absent; 1-hyaline; 2-thick and/or Mucopurulent

A rigid sinonasal endoscope: As per protocol, nasal endoscopy was performed under topical anesthesia with a 0° or /and 3° rigid 4 mm diameter endoscope and quantified using the Lund-Kennedy scoring system.¹¹ According to this system, the endoscopic appearance of the nose was quantified for the presence of polyps, discharge and edema. The scoring as shown in (Table 3) and (Fig. 2). The diagnostic evidence of CRS was defined by a Lund-Kennedy endoscopic score greater than or equal to two. The endoscopist was blinded to patient’s symptom scores.

Testing the patient as per 2007 diagnostic symptom criteria.



Fig. 1: Computed tomography scan for Lund-Mackay scoring: 0: No abnormality, 1: Partial opacification, 2: Total opacification

After patient was selected as per RSTF, they subjected for diagnostic nasal endoscopy and paranasal sinus CT. Then the patient was tested on the newer symptom criteria set in 2007.⁴

In this group, 12 weeks or longer of two or more of the following symptoms (which are part of 1997 criteria too):

- Mucopurulent drainage (anterior, posterior, or both)
- Nasal obstruction (congestion)
- Facial pain-pressure-fullness
- By decreased sense of smell.

STATISTICAL ANALYSIS

Data for symptom criteria, endoscopic findings, and CT scores were tabulated in Excel and imported into SPSS software and then statistical analyses for sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), likelihood ratio was performed to evaluate the symptom criteria for CRS and the diagnostic value of endoscopy and comparing it with gold standard CT scan. Analyses was performed, initially by taking all positive RSTF patient and the comparing the CT scan group, new symptom group (2007) and endoscopy group with each other.

RESULTS

In our study, the age group ranged from 18 to 75 years. The mean age is 37.06 years, with standard deviation 15.22 years. There were 48 males and 30 females have participated in study.

New diagnostic criteria: After taking CT scan as gold standard for new symptom criteria alone, the sensitivity, specificity, positive predictive value, and negative predictive value were 83.63, 30.43, 74.9 and 43.75%, respectively, for CRS (p = 0.16).

Endoscopy: For endoscopy alone taking RSTF symptom criteria as gold standard, the sensitivity is 67.3%, after



Fig. 2: Sinonasal endoscopy



Table 4: Comparison of symptomatology of RSTF (1997) symptomatology with other studies

RSTF criteria	Prevalence (%), our study	Our ranking	Prevalence (%)
<i>Francis TK et al¹²</i>			
Facial pain/pressure	64.1	4	77.9
Facial congestion	51.3	6	79.9
Nasal obstruction	85.9	2	83.5
Purulentnasal/discharge	41	7	82.3
Hyposmia/anosmia	25.6	8	65.8
Fever	3.8	12	3.2
Headache	94.4	1	71.5
Halitosis	20.5	9	38.6
Fatigue	67.9	3	66.5
Dental pain	6.4	11	41.8
Cough	62.8	5	53.8
Ear pain	15.4	10	58.2

taking CT scan as gold standard, the sensitivity, specificity, positive predictive value, and negative predictive value are 92.7, 91.3, 96.2 and 84%.

Computed tomography scan: For CT scan alone taking RSTF symptom criteria as gold standard, the sensitivity is 70.5%. But after taking New symptom criteria as gold standard, the sensitivity is 79.5%, specificity is 43.8%, PPV is 83.6% and NPV is 30.4% with Pearson Chi-square 1.969 and $p = 0.161$.

New symptoms criteria and addition of endoscopy with it: For symptom criteria alone, the sensitivity, specificity, positive predictive value, and negative predictive value were 83.63, 30.43, 74.9, and 43.75%, respectively, for CRS ($p = 0.16$). The addition of endoscopic findings to new symptom criteria keeping RSTF symptom criteria as entry to study improved the value to 94.5, 30.4, 76.50 and 70.0% ($p < 0.003$) (Table 4).

DISCUSSION

From the beginning the diagnosis of chronic rhinosinusitis was controversial. The 1997 RSTF diagnostic guidelines for CRS were primarily symptom based, and then 2003 guideline have also kept the list of 12 symptoms,¹⁻³ because of which finally burden of diagnosis was on CT scan. And remembering a long list of 12 symptom criteria and using that list for CRS diagnosis was very cumbersome. Therefore, in the updated recent adult sinusitis clinical practice guideline in 2007, the 12 major and minor symptoms of CRS were narrowed to four specific symptoms.⁴ And documentation of middle meatal inflammation was kept the same as per 2003 guideline has proposed. Our study examines the diagnostic value of new symptom criteria, as well as the added value of endoscopy to document middle meatal inflammation for diagnosis of CRS.

Rhinosinusitis task force symptomatology criteria, In our study, we selected and analyzed the symptomatology

according to the 1997 RSTF recommendations 12 criteria. Our 12 symptom criteria evaluations are as following, which is comparable to the study done by Francis et al.¹²

The top symptoms are headache, nasal obstruction, fatigue, facial pain pressure.

Computed tomography scan: In our study, we have taken (Lund-Mackay score of equal or more than 4 for diagnosis the CRS) as out of various CT scoring system only Lund-Mackay score is accepted by task force.¹⁰ For CT scan alone taking RSI as gold standard, the sensitivity is 70.5%. But after taking new symptom criteria as gold standard, the sensitivity is 79.5%, specificity is 43.8%, positive predictive value is 83.6% and negative predictive value is 30.4% with $p = 0.16$. Hwang et al⁶ in their study assuming that RSTF symptoms are the gold standard diagnostic criteria, the positive predictive value (65%) and negative predictive value (10%) of CT scan findings were poor. Sensitivity (89%) was marginal, but specificity (2%) was very poor.

Diagnostic nasal endoscopy findings: For endoscopic evaluation we resorted to Lund-Kennedy DNE scoring system¹¹ parameters, with a minimum score 2 or more than 2 for diagnosing the CRS. In our study, for endoscopy alone taking RSI as gold standard, the sensitivity is 67.3% and after taking CT as gold standard, the sensitivity, specificity, positive predictive value, and negative predictive value are 92.7, 91.3, 96.2 and 84%. Levine, HL,¹³ study with nasal endoscopy revealed 58 (38.7%) patients with nasal pathology who had not been seen with traditional anterior and posterior rhinoscopic examination. Kasapoglu et al,¹⁴ found sensitivity of CT scan was 93% and overall correlation of diagnostic nasal endoscopy and CT findings were 87%. Stankiewicz and Chow,¹⁵ found out in their study that positive endoscopic results correlated well with CT, and negative endoscopic results correlated in 71% of patients with negative CT results.

Newer symptom criteria and added advantage of endoscopy, In 2007, new guidelines for rhinosinusitis, from a multidisciplinary panel commissioned by the AAO-HNS, were published.

Twelve weeks or longer of two or more of the following signs and symptoms:

- Mucopurulent drainage (anterior, posterior, or both)
- Nasal obstruction (congestion)
- Facial pain-pressure-fullness
- Decreased sense of smell.

Furthermore, an objective measure was required for the diagnosis of CRS:

Inflammation documented by one or more of the following findings:

- Purulent (not clear) mucus or edema in the middle meatus or ethmoidal region

- Polyps in nasal cavity or the middle meatus; and/or
- Radiographic imaging demonstrating inflammation of the paranasal sinuses.

For recent symptom criteria alone in our study, the sensitivity, specificity, positive predictive value, and negative predictive value were 83.63, 30.43, 74.9 and 43.75%, respectively, for CRS ($p = 0.16$). The addition of endoscopic findings to symptom criteria improved the value to 94.5, 30.4, 76.50 and 70.0% ($p < 0.003$). The likelihood ratio has improved from 1.87 to 8.18.

While Neil Bhattacharya and Linda N Lee found in same kind of there study that symptom criteria alone, the sensitivity, specificity, positive predictive value, and negative predictive value were 88.7, 12.3, 39.9 and 62.5%, respectively, for CRS ($p = 0.82$). The addition of endoscopic findings to symptom criteria significantly improved the specificity, predictive value, and negative predictive value to 84.1, 66.0, and 70.3% ($p = 0.0001$). The odds ratio of a true diagnosis of CRS improved from 1.1 to 4.6. But in their study they divided the symptom criteria in mild and moderate grade and then calculated with each.¹⁶

In 2007, new guidelines, the addition of objective criteria for diagnosis, namely documenting inflammation in the middle meatus as per guideline recommendations, if truly effective in improving diagnostic accuracy in CRS, would naturally be desirable. The addition of nasal endoscopy, a less expensive, easily accessible tool, may offer such an advantage in the diagnosis of CRS. In patients meeting symptom criteria, the addition of nasal endoscopy to document inflammation in the middle meatus also significantly increased the sensitivity, positive predictive value and negative predictive value for the inclusion and exclusion of CRS. The addition of endoscopy also demonstrated similar values for sensitivity, positive predictive value and negative predictive value, which were statistically significant.

CONCLUSION

The new guidelines symptom criteria 2007, for CRS, have 12 weeks or longer of two or more of the following signs and symptoms:⁴

- Mucopurulent drainage (anterior, posterior or both)
- Nasal obstruction (congestion)
- Facial pain, pressure or fullness
- Decreased sense of smell.

These four symptoms are good enough to make a diagnosis of CRS and that a complicated 12 symptom criteria like the RSTF is not required. The addition of nasal endoscopy improves diagnostic accuracy for CRS and should be emphasized as a diagnostic tool early in the clinical

evaluation. We can see introducing diagnostic nasal endoscopy early for diagnosis, can definitely reduces the CT utilization, reducing cost and radiation exposure for the people being evaluated for CRS.

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