Diagnosing Chronic Rhinosinusitis: A Literature update

by

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Summary:

Diagnosing chronic rhinosinusitis has undergone significant changes since the advent of sensitive but costly diagnostic aids like endoscopy, computed tomography scanning and magnetic resonance imaging. Other new conditions like migraine without aura, mid-segment facial pain and atypical facial pain can present with similar features. Patients who have failed treatment from general practitioners or other specialists are subsequently referred to Otolaryngologists.
This article reviews the current literature on the subject matter, in order to make the best use of current resources in the management of CRS.

Key words: Rhinosinusitis, sinusitis, endoscopy, computed tomography (CT), magnetic resonance imaging (MRI)

Introduction

Chronic rhinosinusitis (CRS) is a common but treatable condition with a 70-80% cure rate if diagnosed correctly and treated with a one-month course of antibiotics, nasal douches and nasal steroid sprays - with surgery being reserved for medical treatment failures[1-4.] In the pre-antibiotic era the diagnosis was obvious on history and examination alone. Watson William's textbook of Rhinology [5] published in 1910 describes CRS as synonymous with an empyema of a paranasal sinus, usually the maxillary or frontal. Patients presented with nasal discharge, obstruction and occasionally pain in the case of the maxillary sinus and with central or frontal headache or supraorbital neuralgia in the case of the frontal sinus. They could also present vague symptoms such as mental depression, giddiness, insomnia, drowsiness, dragging pain at the back of the eye, fetor, cacosmia, perverted taste, defective vision, and lachrymation. Examination revealed pus under the middle turbinate, foetor, redness and swelling of the mucosa and sometimes polyps. Surgery was to avoid life- threatening complications such as brain and orbital abscesses or for chronic ill health.

Following the discovery of antibiotics, the incidence of complications dramatically decreased and CRS became a condition presenting with vague symptoms and signs, the diagnosis being made with plain X- Rays, and proof puncture of the sinus [6,7]. The introduction of computed tomography (CT) showed that plain X Rays in comparison were far less sensitive. However, to refer every patient with the numerous symptoms attributed to CRS and in particular facial pain for CT would put a large burden on the health resources. In the last decade, it also dawned that CRS may be mimicked by migraine without aura or atypical facial pain, a type of tension headache.

Materials and Methods:

Our literature search strategy included electronic searches of 'Medline' and 'Cochrane' databases with retrieval and scrutiny of the original articles, cross referencing textbooks, reviews and trials.

What the current literatures say:

1. Chronic rhinosinusitis cannot be diagnosed by symptoms alone as earlier suggested, but rather by history, examination and imaging considered together.

In 1997, a Task Force of the American Academy of Otolaryngology on Rhinosinusitis suggested criteria whereby practitioners other than ENT surgeons, could make a diagnosis in order to start treatment. The diagnosis was based on symptoms alone and although suggestive findings were also mentioned, they were not required to make a diagnosis as positive symptoms were expected to be associated with positive physical findings. The symptoms are divided into major and minor factors. Two major factors or one major and two minor factors should be present to make the diagnosis(Box 1). Symptoms should have been present for at least 12 weeks. This was a consensus of expert opinion rather than being based on evidence-based evaluations. Anosmia and complete loss of sense of taste is more indicative of diffuse rhinosinusitis (including nasal polyposis) whereas cacosmia is more indicative of localized anterior sinusitis and severe facial pain of localized sinusitis [8].

Subsequent research showed that such a symptom based diagnosis may be inaccurate. Stankiewicz found that in 78 patients with a symptom based diagnosis of CRS only 37 patients had a positive same day CT scan . Orlandi reviewed 57 patients who had been selected for functional endoscopic sinus surgery based on purulence on anterior rhinoscopic examination, positive CT scan findings and post operative histopathological confirmation of CRS. In this group, only 50 patients met the 1997 Task Force diagnostic criteria for CRS based on symptoms alone. Again, Hwang reviewed 125 patients who underwent a CT scan of the paranasal sinuses for CRS. 115 of these patients met the 1997 criteria for CRS but of these 40 had negative CT scans (Lund Mackay score of less than 1) and the 10 patients with a negative diagnosis with the 1997 criteria had positive scans.

Facial pain *alone* as a symptom is not considered a *presenting* feature of CRS and although it is common in CRS, patients with facial pain who do not have CRS are frequently referred for ENT consultation . West and al in 2001 reviewed the notes of 973 patients who presented with symptoms of rhinosinusitis or facial pain. Of these, 679 patients with evidence of sinonasal disease on anterior rhinoscopy, endoscopy and CT scan, only 76 patients had facial pain and diagnosis of sinusitis was made in 98 patients[12]. Also, 80 of 101 of these 973 patients who had no evidence of sinonasal disease responded well to neurological treatment for midfacial segment pain, atypical facial pain, tension

Box 1 : Symptoms of Chronic rhinosinusitis.

Major symptoms	**Minor symptoms**
Facial pressure or pain	headache
Facial congestion or fullness Fatigue	fever
Nasal obstruction or blockage	halitosis
Nasal discharge, purulence or discoloured	dental pain
post nasal discharge	
hyposmaia or anosmia	cough
	ear pain, pressure or fullness

Lanza DC, Kennedy DW. Adult rhinosinusitis defined. Otolaryngol Head Neck Surg 1997;117(3):S1-7.

tension headaches and migraine. Twenty one of these 101 patients had undergone surgery on the nose or paranasal sinuses with no long term relief. Rebeiz reviewed 207 patients who had undergone endoscopic sinus surgery and were followed up for a mean of 12 months[13]. Of these, in 142 patients was facial pain one of the main presenting symptoms. The pain disappeared in 105 patients and improved in 15. In 5 of the 15 patients in whom the pain persisted, the aetiology was subsequently ascribed to migraine and in another 7 to persistence of sinus disease. Seven patients were lost to follow up in that series.

The International Headache Society, founded in 1981, lists their criteria for sinonasal pain, revised in 2004 as shown in Box 2:

tension headaches, migraine or atypical facial pain. As referral to a neurologist may take several months, otolaryngologists should be able to diagnose these conditions and start treatment (Box 3.)

Nasal symptoms frequently accompany migraine attacks. The American Migraine Study II, a population based survey that involved more than 20,000 US households conducted in 1999 indicated that only 48% of patients who met International Headache Society (IHS) criteria for migraine reported a physician diagnosis of migraine. Follow-up data from the American Migraine Study II suggest that 42% of patients with migraine as defined by IHS criteria had received a diagnosis of sinus headache from a physician [15,16].

Box 2 : Diagnostic criteria for sinus headache by the International Headache Society.
A: Frontal headache accompanied by pain in one or more regions of the face, ears or teeth and fulfilling criteria C and D

B: Clinical(nasal purulence, nasal endoscopic, computed tomography and/ or MRI and/or laboratory evidence of acute or acute on chronic rhinosinusitis.

C: Headache and facial pain developing simultaneously with the onset of acute exacerbation of rhinosinusitis.

D: Headache and facial pain resolves within 7 days after remission or successful treatment of acute or acute on chronic rhinosinusitis.

I*nterestingly, the IHS considers that chronic sinusitis is "not validated as a cause of headache or facial pain unless relapsing into an acute stage".*

In 2005 an interdisciplinary committee of otolaryngologists, neurologists, internists and allergy specialists convened at Dallas, Texas in the USA and forwarded a consensus on diagnosis and treatment of sinus headache from a neurology, otolaryngology, allergy and primary care points of view [14] . They compared the features of headaches of sinus origin with that of migraine without aura and tension headaches and suggested that as many patients presenting to otolaryngologists with facial pain will actually be suffering from

The Sinus, Allergy and Migraine Study of 100 patients who believed that they had sinus pain made a diagnosis of headache secondary to rhinosinusitis in only 3% of these patients [17]

2. Suggestive examination findings and is nasal endoscopy essential in every case?

The physical findings suggestive of CRS were put forward by the 1997 Task Force and were divided into external findings, those found on anterior rhinoscopy and those on

Box 3 :

Migraine without aura :
A: At least 5 attacks fulfilling criteria B-D.
B: Headache attacks lasting 4-72 hours(untreated or treated successfully)
C: Headache has at least 2 of the following characteristics: unilateral location, pulsating quality, moderate or severe pain intensity, aggravated by or causing avoidance of routine physical activity(eg walking or climbing stairs)
D: During headache at least one of the following: nausea and or vomiting, photophobia and photophobia.
E: Not attributed to another disorder.

Tension-type headache:
A: At least 10 episodes fulfilling criteria B through D.
B: Episodes last from 30 minutes to 7 days.
C: Headache has at least two of the following charachteristics:
1. Pressing or tightening quality
2. Mild or moderate intensity.
3. Bilateral location
4. No aggravation by routine physical activity

D. During headache both of the following:
1. No nausea or vomiting
2. Photophobia or phonophobia.

Headache classification subcommittee of the International Headache Society. The International Classification of headache disorders 2nd ed. Cephalgia 2004;24(suppl):9-160

Box 4 : ***Examination findings in chronic rhinosinusitis.***
External findings:
Swelling and erythema of the maxillary, ocular, orbital or frontal areas.
Anterior rhinoscopy:
Purulence
Polyps
Hyperemia
Edema
Crusts
Changes in symptoms after topical decongestion.
Nasal endoscopy:
Osteomeatal complex/ sinus ostea purulence
Polyp formation
Blue discolouration of the turbinate

Hadley JA, Schaefer SD. Clinical Evaluation of rhinosinusitis: history and physical examination. Otolaryngol Head Neck Surg 1997;117(3):S8-11.

Kaplan BA, Kountakis SE Role of nasal endoscopy in patients undergoing endoscopic sinus surgery. Am J of Rhinol 2004 May-June, vol 18 No 32, pp161-164

nasal endoscopy (Box 4). Of these, the most important physical findings are nasal purulence and polyps, and should be looked for by anterior rhinoscopy and nasal endoscopy in the vasoconstricted nose. In a patient with a suggestive history, it confirms the diagnosis and does not require CT in order to start medical treatment. Patients with a negative physical examination also do not require a CT scan and should be treated for rhinitis with topical nasal steroids and decongesants and undergo allergy screening. Patients with inflammation, watery congestion, oedema of the nasal mucosa and turbinates should be submitted for diagnostic CT scan. If the findings are positive on CT scanning, these patients should be treated of CRS. If the CT is negative, the patient should be treated for rhinitis as mentioned above [18,19]. Mucous membrane cysts on nasal endoscopy are sometimes encountered in

patients with recurring bacterial infections and are sometimes filled not with mucous but pus. They can be a nidus for reinfection following surgery [20].

Nasal endoscopy appears to be able to elicit more findings than anterior rhinoscopy alone and can even be done in children . However, opinions are divided as to whether all patients need to undergo this procedure. Hughes studied a group of 140 patients with 'nasal symptoms' who had undergone CT who were examined by one surgeon [21]. The history, rhinoscopy, endoscopy findings were reviewed and compared with the CT findings. In those patients who had CT findings suggestive of CRS, endoscopy identified more disease (85%) than anterior rhinoscopy (74%). In 25 patients endoscopy contributed positively to a correct diagnosis. However in 11 patients it produced a false positive diagnosis. He concluded that endoscopy helped to fine tune the diagnosis supplementary to a detailed history but that a diagnosis based on history and anterior rhinoscopy was as sensitive as diagnosis based on history and endoscopy, as the increased sensitivity of endoscopy was offset by its decreased specificity [22]. Benninger also studied a group of 100 new patients with nasal and sinus complaints but excluded patients with a grossly deviated nasal septum[23]. He divided the patients into 2 groups. In the first group he examined them by anterior rhinoscopy after decongestion and the second by nasal endoscopy . He made the following diagnoses in the anterior rhinoscopy group: allergic rhinitis in 21 patients, non allergic rhinitis in 12 patients, 19 cases of CRS with polyps and 9 cases with CRS without polyps, non sinus pain in 13 cases. He found that endoscopy played a role in 11% of cases by visualizing past an enlarged turbinate or deviated septum in 6 cases, confirmed a suspected diagnosis by visualization of the middle meatus in 3 cases and found a chaonal polyp in one case and a paradoxical turbinate in another case. However, in no case did it change the diagnosis or the treatment plan. Other surgeons recommend that nasal endoscopy as essential as it is able to identify more positive signs [24].Patients with normal findings on endoscopy do not have gross changes on CT scanning in 95% of patients [26] and in such cases CT is unlikely to add any additional information. Nasal endoscopy can also be carried out in children. Ameli et al were able to successfully endoscope 128 of 145 patients aged 2 to 15 years using 1% ossibuprocaine hydrochloride and xylometazoline 0.1% pledgets placed between the inferior turbinate and the nasal septum for 5 minutes using a 2.7mm rigid endoscope [27].

3. Do anatomical abnormalities predispose to CRS:

Anatomical abnormalities that may block the natural openings of the sinuses have been shown to occur with equal frequency in chronically inflamed as well as normal sinuses and, therefore, may not have a part to play in the aetiology of CRS except for a gross deviation of the nasal septum. These studies were based on observing CT scans of patients with CRS and comparing them with either the normal side or a normal group of patients [28-31]

Olli-Pekka showed that the incidence of anatomical abnormalities in a group of 23 patients with a history of 3 episodes of sinusitis a year during viral colds was no different from a control group of 25 patients. [32] However, in the sinusitis prone group, the CT score was higher in patients with anatomical abnormalities obstructing the osteomeatal complex than in the sinusitis prone group without such obstruction. Anatomic deviations as a cause for facial pain were an open subject. Occasional patients who have undergone septal surgery or inferior or middle turbinate surgery had abrupt disappearance of a chronic headache [33,34.]

4. Positive findings on CT should be interpreted only in correlation with the history and examination:

CT scan is now the imaging modality of choice for diagnosing CRS and Magnetic Resonance Imaging (MRI) for complications because of the low sensitivity and specificity of plain sinus X- Rays. However, findings of an air fluid level or mucosal thickening of more than 5mm, or opacification of one or more sinuses on a Water's view plain sinus film which may have been requested as a preliminary investigation , are considered confirmatory evidence of CRS. Suggestive findings on CT are isolated or diffuse mucosal thickening, bony changes, an air fluid level or obstruction of the sinus openings into the nose . Mucosal thickening is demonstrated equally well with CT and MRI. Surgeons may alter their decision to resort to surgery based on the CT findings. Anzai showed that in 21 patients, the decision among 3 surgeons to perform surgery for CRS was altered in one third of patients by CT [35]. The factors favourably influencing surgical treatment were obstruction of the osteomeatal complex on CT and concordance of CT abnormality with the patients symptoms.

However, CT has some shortcomings (Box 4) . Being a sensitive form of imaging, 27%-42% of asymptomatic individuals will have CT changes suggestive of CRS [36-38]. Also symptom scores* and the severity of CRS histopathologically do not correlate with CT scores. (**Picarillo devised a scoring system for symptoms of sinonasal conditions called the Sinonasal Outcome (SNOT 20) Test.)* Patients were asked to grade their symptoms on a scale of 1-5 as absent, very mild, mild, moderate, severe or extreme. The symptoms were a need to blow the nose, sneezing, runny nose, cough, post nasal discharge, thick nasal discharge, ear fullness, dizziness, ear pain, facial pain or pressure, difficulty falling asleep, waking up at night, lack of a good night's sleep, waking up tired, fatigue, reduced productivity, reduced concentration, frustration, sadness or embarrassment. The mean was calculated and compared with the mean score after treatment, called the SNOT 20 Change score [39-43].

CT may also over diagnose complications of sinusitis in a small proportion of patients. Younis found that CT over diagnosed one case out of 5 of orbital cellulitis and 2 out of 10 cases of subperiosteal abscess [45]. The decision to operate in these cases was based on CT findings of an orbital abscess or an initial presentation with a decreased visual acuity of 20/60, diminished papillary reflex, rapid progression of orbital signs and symptoms or no improvement within 48 hours of starting medical treatment. It may also be associated with some amount of artefactual thickening of the bony walls of the fluid filled sinus in soft tissue windows and, less frequently, in the bone windows. Sichelimmersed one half of a dried skull in water to fill the paranasal sinuses on that side and then scanned the whole skull with soft tissue and bony windows[46]. This could lead to an underestimation of bone erosion in tumours and CRS.

Therefore it has been suggested that only gross changes on CT scan may be more confirmatory. Bhattacharya [47] concluded that Lund Mackay scores (Box 5) of 0-1 are highly likely to exclude CRS and 4 or more to indicate true CRS disease based on a retrospective review of 131 patients who had undergone FESS and who had been diagnosed to be suffering from CRS according to the AAO criteria and histopathologically confirmed against a control group of 130 patients who had undergone computerized scanning of the paranasal sinuses for other indications apart from CRS. Again Hill examined 192 CT scans of patients without signs or symptoms of CRS undergoing computed tomography of the brain or orbit[48]. He found that the mean Lund Mackay score in this patient population was 2.81 and that only 37 patients had

Box 5: Limitations of CT in diagnosis of CRS:

27-42% of normal persons will have changes on CT suggestive of CRS. CT scores of 4 or 5 are more
likely to be associated with CRS.
Symptom and histopathology scores do not correlate with CT scores
CT may overdiagnose complications of sinusitis
CT may be associated some artifactual thickening of the sinus walls

Box 6: The Lund Mackay System of scoring CT findings of CRS

Sinus	**Left**	**Right**
Maxillary		
Anterior ethmoid		
Posteror ethmoid		
Sphenoid		
Frontal		

Ostiomeatal complex.
Score 0 for no abnormality, 1 for partial opacification and 2 for total opacification ; for each sinus.
The ostiomeatal complex is scored as: 0 for not occluded and 2 for occluded.

Lund VJ, Kennedy DW. Staging for rhinusinusitis. Otolaryngol Head Neck Surg 1997; 117(3):S35-40.

The Lund system has been confirmed to be easy to use and the scores are accurately reproducible.

completely normal sinuses radiographically. Again, in 2004 Bhattacharya showed that in a diseased group of 66 paediatric patients listed for FESS for CRS compared to a non-diseased group of 192 control patients, adopting a Lund Mackay cut off score of 5 was more likely to represent true disease. He found CT scan had a sensitivity of 86% and a specificity of 85%.[49]

A small percentage of scans with findings suggestive of CRS may at operation reveal other pathology, especially if the CT findings are unilateral. Busaba found 5 cases of inverting papillomata, 1 case each of adenocarcinoma, squamous cell carcinoma, chronic invasive granulomatosis, fungal sinusitis and sinonasal sarcoidosis in 200 positive scans [50]. Lehnerdt found that in 43 patients over the age of 60 years who underwent FESS for a unilateral opacity there were 8 inverting papillomas, 5 malignomas, 3 mycoses, 1 brown tumour, 1 osteoid osteoma and 1 haemangioma.[51] However, at least in Kaplan's series of inverting papillomas presenting in this way, the tumour was always visible on examination before CT; although its full extent would require CT assessment to plan treatment. [52]

In order to reduce the cost and radiation dosage from a CT series, limited scans have been suggested with an increased width between each slice, 10mm instead of the usual 2mm. Rezende showed in a series of 21 children aged 4-13 years, that such a protocol is as sensitive in detecting sinus opacification, concha bullosae and polyposis but less sensitive in detecting infra orbital and agger nasai cells and alteration in the maxillary sinus ostea[53]. However, in terms of cost, it may not work out to be a saving in the long term. Francese hypothesized that in a population group, ordering limited scans for diagnosis of CRS would actually not be a cost saving as those patients who had a positive scan and failed medical treatment would require another full scan for endoscopic surgery[54]. This additional expense would make the total expenditure on scans for the entire group actually more than if full scans had been initially requested.

5. What can be done for cases that have only pain and a normal CT?:

Such cases may benefit from referral to other specialists for eg. a neurologist, maxillofacial surgeon or pain consultant especially if their main complaint is facial pain. Neurological conditions mimicking CRS are mainly migraine and atypical facial pain, a form of tension headache. Paulson[55] in 2004 reviewed 75 patients whose CT results were nil to mild who were referred to a neurologist. Two thirds of these patients with no deviation of the nasal septum or contact points responded to neurological treatment. The most common neurological diagnosis was migraine, rebound headachechronic daily headache, obstructive sleep apnoea syndrome and tension headache. Three of the 75 patients were found to have serious disease: meningioma, intracranial hypertension and cerebellar tonsillar herniation.

During the last decade, it has been shown that some patients present with facial pain similar in location to sinus pain and sometimes even nasal obstruction but with normal a examination and or CT. This type of pain is now recognized to be a form of tension headache and is called midfacial segment pain [56]. The aetiology is unclear but psychological stress and emotional disturbance play a part.. Most patients respond to amitriptyline 10mg at night as it is sedating for up to 6 weeks before obtaining relief which then needs to be continued for 6 months. A similar type of facial pain is atypical facial pain which is often unilateral, crosses recognized neurological dermatomes and associated with psychological factors. It also responds to low dose, long term amitriptyiline

Conclusion:

The current literature indicates that CRS has become a less serious condition with less obvious signs on examination. Correlation of the history, physical examination and imaging findings are most likely to make a correct diagnosis. History and anterior rhinoscopic examination may be as sensitive as endoscopy. Only gross findings on CT or examination should be considered confirmatory. Cases with negative findings are most likely to be suffering from midsegment facial pain, atypical facial pain, tension headache or migraine and may benefit from amitriptyline or sumatriptan. Unilateral opacity on CT should be treated aggressively to avoid missing an inverted papilloma. Surgery to relieve facial pain in the absence of objective evidence of CRS continues to be a controversial subject.

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