

ORIGINAL RESEARCH

Correlation of Computed Tomography And Nasal Endoscopic Findings In Chronic Rhinosinusitis – A Clinical Study

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ABSTRACT

Introduction: Chronic rhinosinusitis (CRS) is one of the most frequent otorhinologic disease encountered in clinical practice and for loss in the work force. The diagnosis is by clinical criterias, but recently computed tomography (CT) together with sinonasal endoscopy, have been added to the objective data. This study was carried out to determine the degree of correlation between CT findings and nasal endoscopic findings in patients with CRS.

Material and Methods: 50 patients aged between 16 and 62 were investigated using CT who subsequently underwent endoscopy for CRS. The CT and endoscopic findings were assessed by appropriate statistics for data analysis.

Results: Leading symptom of CRS was nasal obstruction followed by headache, facial pressure and postnasal drip and other minor symptoms. Ostiomeatal complex block was the most obvious finding in CT (>85%) and during endoscopic evaluation (about 70%) followed by 88% cases diagnosed with mucopus in endoscopy whereas 20% cases with mucosal thickening on CT scan. Polyps were diagnosed by both modalities equally. There are good to excellent agreements between the two diagnostic procedures.

Conclusion: The results of nasal fossa findings obtained by nasal endoscopy are more conclusive in the elucidation of diagnosis than those obtained by paranasal sinus CTs. In spite of a good agreement between CT and ESS findings in most patients, it seems in some unusual cases, CT may miss many patients.

Keywords: Chronic Rhinosinusitis, Computed Tomography, Nasal endoscopy, ostiomeatal complex

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INTRODUCTION

Chronic rhinosinusitis (CRS) is one of the most frequent otorhinologic disease encountered in clinical practice. CRS is a very common ailment which negatively affects quality of life in patients. The epidemiological studies focussing on CRS in Indian population are sparse in published literature. CRS significantly impacts quality of life measures with decrements in general health perception and is one of the main reason for which antibiotics are prescribed and for loss in the work force.^{1,2}

Chronic Rhinosinusitis is defined as longstanding inflammation of nasal and paranasal mucosa as lasting more than 12 weeks^{3,4} and is diagnosed by presence of major and minor factors⁵ (Figure-1).

There were potential pitfalls in using only symptom criteria for CRS diagnosis. The poor specificity of using patient symptoms alone makes this an inaccurate way to diagnose CRS. Objective measures alone are not 100% accurate in determining CRS, however, in 2005, the European Academy of Allergology and Clinical Immunology (EAACI) revised the definition to include objective signs of disease on nasal endoscopy and or paranasal CT scan, endoscopic sign of polyp and/or mucopurulent discharge primarily from middle meatus; and /or edema, mucosal obstruction primarily middle meatus evidence of mucosal changes within the osteomeatal complex and or sinuses. Both objective signs increase the accuracy of CRS diagnosis. For areas that are not accessible to nasal endoscopy, CT scan can be useful in identifying the disease.⁶

The definition was further revised in the European position paper on rhinosinusitis (EPOS) to include the presence of nasal obstruction or nasal discharge as a prerequisite to the diagnosis of CRS in addition to one or more other symptoms, as highlighted in (Figure-1).⁷

An important adjunct to nasal endoscopy is the CT scan of nose. CT scan is used to reveal bony defects

and abnormalities as well as mucosal changes deeper in the ostiomeatal complex (OMC) that are not visible endoscopically and also to identify the extent of disease.

In 1978, Messerklinger introduced the concept of fess (functional endoscopic sinus surgery) based on endoscopic observation and demonstration of anatomy and pathology in the middle meatus area and sinus mucociliary clearance in normal and diseased mucosa.⁸ The major advantage of this is the use of endoscopes improves visualization, enables greater preservation of normal structures and reduces the necessity for wider exposure and confirmation of diagnosis as well as treatment of recurrent CRS. However, the surgery is technically demanding, since the key is the accurate diagnosis and removal of the underlying causes of sinus disease. The ability to diagnose these problems and to correct them with FESS has opened new possibilities in the field.^{9,10}

The diagnostic evaluation of the patient to be taken for FESS therefore consists of a combination of nasal endoscopy and CT scan the two modalities being adjunctive. In this study we will try to correlate the CT and endoscopic findings.

MATERIALS AND METHOD

A total of 50 cases of chronic rhinosinusitis refractory to medical treatment in the age group of 15 to 65 years were investigated and subjected to the study during a period of one year.

Detailed history and complete local and general physical examination was done. Patients presenting with any two of the following major symptoms and signs or one major and two minor symptoms and signs for duration of more than 2 weeks were selected.

Major symptoms and signs

- a) Nasal obstruction
- b) Purulence in nasal cavity on examination
- c) Purulent nasal discharge with post nasal drip
- d) Hyposmia/anosmia
- e) Nasal congestion/fullness
- f) Facial pain / pressure

Minor symptoms and signs

- a) Headache
- b) Halitosis
- c) Fatigue
- d) Dental pain
- e) Cough
- f) Ear pain/pressure/ fullness

All the patients selected for the study were subjected to a standard protocol of investigations which included:

- a) Complete haemogram, X-ray chest and pulmonary function tests (where ever required).

b) **NCCT scan of PNS** were performed at 4 to 6 weeks from the initiation of medical treatment. 3-mm coronal sections were taken for anatomic evaluation. The patient was instructed to clear nose on entering the scanning site and immediately before the scan. After application of local decongestant, the nose was cleared again and then the patient was placed in supine position on CT couch with the head hyperextended (hanging head coronal position). Preoperatively, in CT scan slope, shape and symmetry of fovea ethmoidalis and cribriform plate was assessed, and integrity of skull base and medial orbital wall was examined. The shape, rotation and development of the uncinate process with respect to the medial orbital wall and infundibulum was noted, as is relative height of the roof of maxillary sinus. The presence of anatomical variants such as Haller cells, concha bullosa or lamellar cells, and sphenoethmoid cells containing potentially dehiscent optic nerve was noted (Figure- 2,3,4).

c) **Nasal endoscopy (NE):** Lanza Kennedy criteria is used to grade nasal endoscopy findings looking at the presence of secretion, oedema and polyps.^{4,5} NE findings were considered positive when there was presence of either or combination of polyps, mucopus in the middle meatus or diseased mucosa (Fig 5,6,7,8.) A diagnostic nasal endoscopy was performed pre-operatively on all patients under local anaesthesia, using 4mm -0 & -30 degree Hopkin rods. Three cotton pledgets soaked in 4% with Adrenaline/xylocaine and then squeezed will be placed in nose along the floor, along the middle turbinate and along the roof, respectively for about five minutes. The patients will be placed in the supine position with head and Neck slightly flexed. The endoscopy was done in three passes:

First pass: The first pass of the scope was along floor and into the nasopharynx, allowing for careful examination of overall nasal anatomy, the inferior meatus, and turbinate were examined for any previous antrostomy and the endoscope was then guided further backward towards the posterior choanae, Eustachian tube orifices, Torus tubralis, adenoid pad, fossa of Rosenmuller and entire nasopharynx was examined. Any pathology around such as postnasal discharge and mucosal oedema was noted.

Second pass: The second pass was made between the middle meatus and inferior turbinate, aimed at examining of the osteomeatal complex (OMC), which included a detailed assessment of the agger nasi cells, middle turbinate and high deviation of septum. The

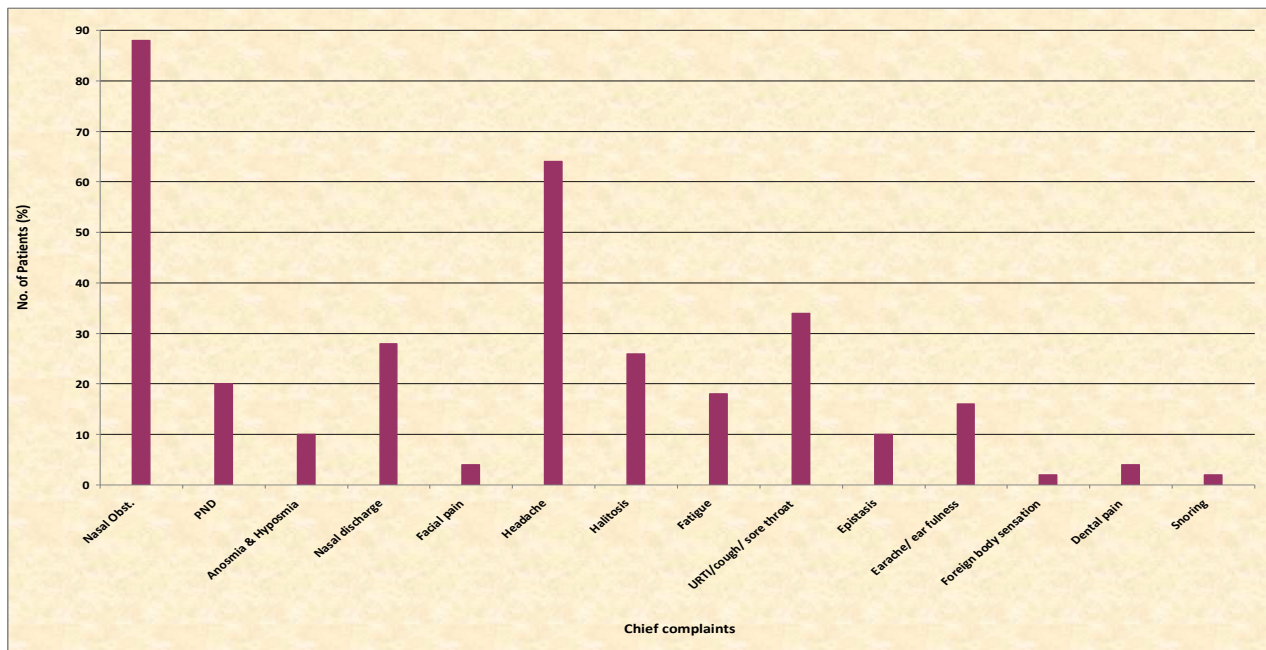


Figure-1: Chief complaint of the patients



Figure-2: Coronal CT PNS at the level of OMC showing Bilateral Paradoxical Middle Turbinates.



Figure-4: Coronal CT PNS showing soft tissue density filling Right maxillary sinus and Right Nasal cavity causing expansion of sinus without erosion and with blockage of Right OMC, suggestive of Antrochoanal polyp. Left DNS with bony spur also noted.

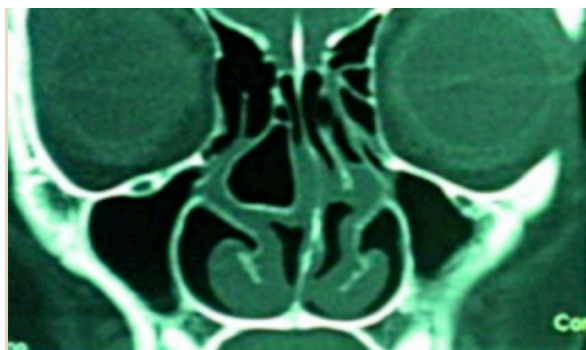


Figure-3: Coronal CT of the paranasal sinus at the level of OMC shows right concha bullosa. The non diseased concha bullosa does not cause obstruction to the right OMC. Right inferior turbinate hypertrophy with subtle left DNS is noted.

endoscope was focussed on the uncinate process and was gently guided into the middle meatus and rotated to bring the lateral wall of nose into the view thus allowing examination of the hiatus-semilunaris, bulla ethmoidals and rarely maxillary osteum, basal lame-



Figure-5: NE showing the presence of left middle meatal polyps, nasal septum, middle turbinate

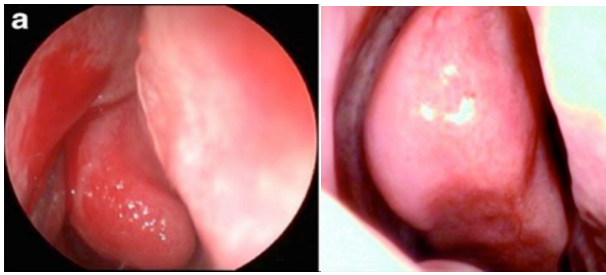


Figure-6: NE Showing hypertrophied middle turbinate and uncinate process; **Figure-7:** NE of the right middle meatus showing Concha bullosa, Nasal septum, Uncinate process

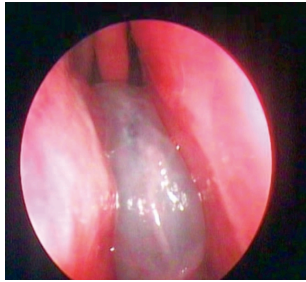


Figure-8: NE showing the presence of antrochoanal polyp, nasal septum,

lla and accessory ostium (if present). A note was made of findings in the middle meatus whether it was normal, narrowed, polypoid, oedematous inferior portion of middle meatus and the fontanelles for evidence of bulging or accessory maxillary ostia. The pass is continued by rolling the scope medially into the sphenoethmoidal recess, examining the sphenoid sinus ostium.

Third pass: The third pass is made between the septum and the posterior part of the middle turbinate. The endoscope was directed superiorly to examine the superior turbinate and meatus, the spheno-ethmoidal recess and sphenoid sinus ostium.

RESULTS

In the present study, maximum number of patients were falling in the age group of 15 – 25 years (52 %). The youngest patient being 16 years and the oldest was 62 years of age (Table-1). The most frequently involved sinus in the present study as demonstrated by CT scan was maxillary sinus (94%), followed blocked OMC (49%), anterior ethmoid (66%) and the least commonly involved sinus was the sphenoid sinus (14%) (Table-2). Polyps 38% followed by mucosal thickening 20% were the most common findings on a CT scan. Least frequent findings were paradoxical MT and concha bullosa (Table-2). In the present study, most frequent finding on pre operative endoscopy was mucopus 44 (88%) followed by diseased mucosa with polyps 25 (50%), polyps 17 (34%) and minor findings concha bullosa 2 (4%) and paradoxical MT 2 (4%). The most frequent intraoperative finding during ESS include OMC block

Age of patients (years)	No. of patients	Percentage (%)
15 – 25	26	52
26 – 35	8	16
36 – 45	7	14
46 – 55	7	14
>55	2	4
Total	50	100
p-value	0.073	
Remarks	NS	

Table-1: Age distribution

(68 % - 74%) of patients. The next frequent finding was mucosal thickening (62%) followed by polyps (32%) and CB (6%) patients (Table-3). Both (Figure-9, Table 4) show clearly that endoscopically more patients were diagnosed with the conditions shown as compared to CT scan. Though polyps, concha bullosa, paradoxical MT were diagnosed equally by both modalities of treatment more OMC blocks were found out by the endoscopic method while mucopus cases were exclusively diagnosed by endoscope.

DISCUSSION

For areas that are not accessible to nasal endoscopy, CT scan can be useful in identifying the disease.⁶ When coupled with nasal endoscopy, it provides most of the objective data needed for diagnosing CRS.^{11,12} However CT's true accuracy in diagnosing CRS is less clear.¹³ The aim of this study was to determine the agreement between preoperative CT and intraoperative Endoscopic findings in patients with CRS. The results of our study indicated that although for most of the findings, there was a good to excellent level of agreement between the results of the two methods, Similar findings were reported by other studies, in which patients who had negative CT scans, showed endoscopic exams with nasal polyposis and septum deviation.^{14,15} According to the present results, (Table 4 & Fig 9) the finding of polyps was more evidenced endoscopically scan compared to CT (17 vs 15 out of 50 cases). This result is contradictory to the previous study, in which 16 (80%) out of 20 patients showed turbinate hypertrophy evidenced by nasofibroscope and only nine (45%) of 20 patients showed the same affection at CT scan.¹⁴ In 10 (20%) of 50 patients we found mucosal thickness evidenced by CT; while as 34 (68%) of 50 patients by endoscopy. Comparison of the other findings by the two modalities i.e CT scan and nasal endoscopy are shown in (Table 4 & Fig 9). This discrepancy may be due to the fact that opacification of the paranasal sinuses on CT cannot be picked up.¹⁶ A study by Giannetto and Pratt found that operative findings are

Condition	Unilateral Right side	Unilateral Left side	Bilateral	Total number	Percentage (%)
Polyps	5	4	6	15	30
Concha bullosa	2	0	0	2	0.04
Mucosal thickening	3	3	4	10	20
Paradoxical MT	2	0	-	2	0.04
Maxillary sinus block	6	9	32	47	94
Osteomeatal complex (OMC) block.	8	6	10	24	49

Table-2: Involvement of sinuses as documented by CT scan

Pre-op findings	No. of Patients	Percentage (%)
Polyps	17	34.00
Mucopus	44	88.00
Diseased mucosa with polyps	25	50.00
Conchabullosa (C B)	2	4.00
Paradoxical MT	2	4.00
Intra op. findings		
Polyps	16	32.00
Mucosal thickness	34	62.00
Lt. Osteomeatal complex Block (OMC).	37	74.00
Rt.Osteomeatal complex Block (OMC).	34	68.00
Concha bullosa (CB)	3	6

Table-3: Endoscopic findings (Lanza Kannedy criteria)

Condition	CT scan documented (total patients) out of 50	Endoscopy documented (total patients) out of 50
Polyps	15	17
Mucopus	0	44
Paradoxical MT	2	2
Mucosal thickness	10	34
Lt. Osteomeatal complex Block (OMC).	6	37
Rt.Osteomeatal complex Block (OMC).	8	34
Concha bullosa (CB)	3	2

Table-4: Comparison between CT & Endoscopic findings in terms of number of patients.

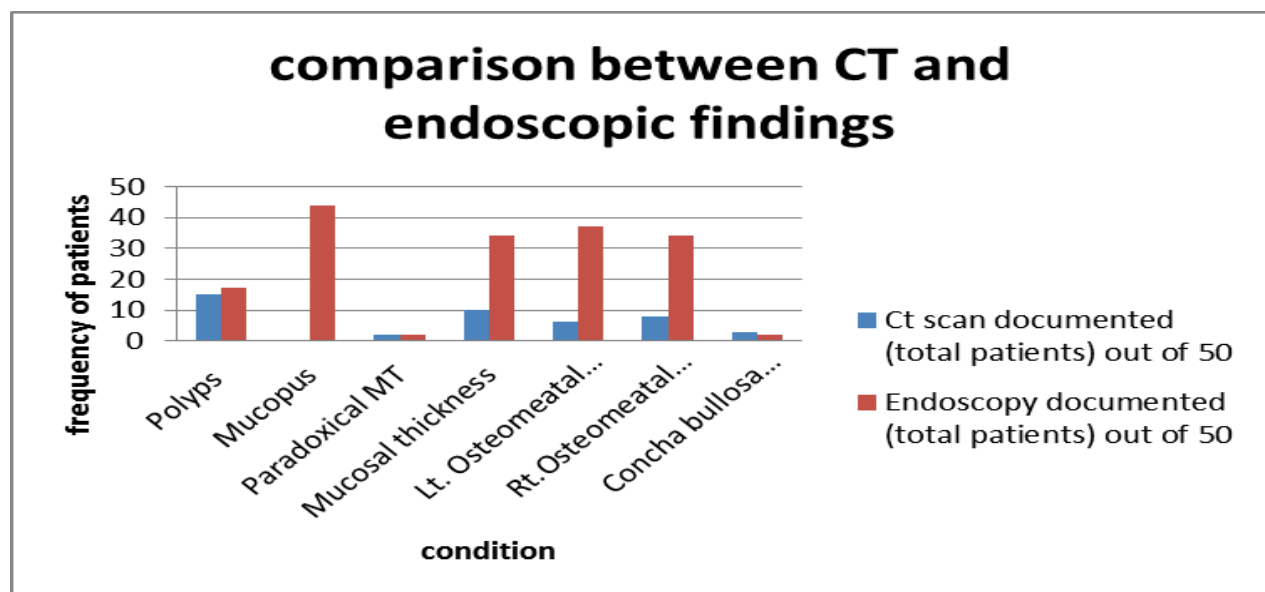


Figure-9: Comparison between CT & Endoscopic findings in terms of no of patients.

better consistent with the surgeon's CT scan interpretation than with the radiologist's CT report. Therefore, surgeon rated-CT scans form an important and reliable objective assessment tool for patients undergoing surgery for CRS.¹³ When combined with a directed and thoughtful history, endoscopy can yield valuable information regarding anatomic location and severity of the disease.¹⁷ According to Morra, sinus endoscopy and CT can be considered complementary techniques for effective demonstration of nasal anatomy and paranasal sinuses.¹⁸ Such statement is added to the theory that CT would be more specific for the assessment of paranasal sinuses and can serve as an anatomic map for the surgeon.

CONCLUSION

In conclusion, though the number of patients in the study was less to draw a bold conclusion it can be said that nasal endoscopy is more objective in the confirmation of diagnosis than obtained by CT. In spite of a good correlation between CT and endoscopy findings in most of the patients, it seems that CT may miss many patients. So the two modalities are complimentary to each other.

REFERENCE

1. Benninger MS, Ferguson BJ, Hadley JA, Hamilos DL, Jacobs M, Kennedy DW et al. Adult chronic rhinosinusitis: definitions, diagnosis, epidemiology, and pathophysiology. *Otolaryngol Head Neck Surg.* 2003;129: S1-32.
2. Osgurthrope JD, Hadley JA. Rhinosinusitis-Current concepts in diagnosis and management. *Med clin North Am.*1999;83:27-42
3. Kennedy DW, Senior BA, Tanabodee J, Kroger H, Hassab M, Lanza D. Long-term results of functional endoscopic sinus surgery. *Laryngoscope.*1998;108:151-7.
4. Kennedy DW, Zinreich SJ, Rosenbaum AE. Functional endoscopic sinus surgery. *Archives of Otolaryngology.*1985; 111:576-582.
5. Lenza DC, Kennedy DW. Adult rhinosinusitis defined. *Otolaryngology Head & Neck Surgery* 1997;117:1-7
6. European Academy of Allergy and Clinical Immunology (EAACI). Position paper on rhinosinusitis and nasal polyps. <http://www.eaac i.org> 2005.
7. Fokkens WJ, Lund VJ, Mullol J. European Position Paper on Rhinosinusitis and Nasal Polyps group (EPOS). European Position Paper on Nasal Polyps 2007. *Rhinology Supplement* 2007;45:1-136.
8. Messerklinger W. Endoskopische Diagnosis und Chirurgie der Rezidivierender Sinusiti. In:Krajina Z, ed. Advance innose & sinussurgery. Zagreb university.1985;35:27:150-7
9. Messerklinger W. On the drainage of the normal frontal sinus of man . *Acta Otolaryngology* 1967; 63:176-181.
10. Messerklinger W. Endoscopy of the nose. Baltimore, MD: Urban and Schwarzenberg; 1978.
11. Bolger W, Butzin C, Parsons D. Paranasal sinus bony anatomic variations and mucosal abnormalities: CT analysis for endoscopic sinus surgery. *Laryngoscope* 1991;101:56-64.
12. Manning SC, Biavati MJ, Phillips DL. Correlation of clinical sinusitis signs and symptoms to imaging findings in pediatric patients. *Int J Pediatr Otorhinolaryngol* 1996;37: 65-74.
13. Jones NS. CT of the paranasal sinuses: a review of the correlation with clinical, surgical and histopathological findings. *Clin Otolaryngol Allied Sci* 2002;27:11-7.
14. Duarte AF, Soler Rde C, Zavarezzi F. Nasal endoscopy associated with paranasal sinus computerized tomography scan in the diagnosis of chronic nasal obstruction. *Rev Bras Otorrinolaringol (Engl Ed)* 2005;71:361-3.
15. Jannetto DF, Pratt MF. Correlation between preoperative computed tomography and operative findings in functional endoscopic sinus surgery. *Laryngoscope* 1995;105(9 Pt 1):924-7.
16. Lloyd GA. CT of the paranasal sinuses: study of a control series in relation to endoscopic sinus surgery. *J Laryngol Otol* 1990;104:477-81.
17. Kaplan BA, Kountakis SE. Role of nasal endoscopy in patients undergoing endoscopic sinus surgery. *Am J Rhinol* 2004;18:161-4.
18. Morra A, Calgaro A, Cioffi V, Pravato M, Cova M, Pozzi Mucelli R. Virtual endoscopy of the nasal cavity and the paranasal sinuses with computerized tomography-Anatomical study. *Radiol Med (Torino)* 1998;96:29-34.