

ORIGINAL RESEARCH

Comparative study between computed tomography and diagnostic nasal endoscopy and its diagnostic accuracy in case of chronic rhinosinusitis

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Abstract

Background: Computed tomography (CT) scan plays a vital role in the diagnosis of CRS and in detecting its complications. It has the ability to detect mucosal disease and anatomical variations, to demonstrate a primary obstructive pathology and to visualise posterior ethmoid, sphenoid sinuses and thus helps in the management of CRS. Nasal endoscopy plays a main role in recognizing anatomical structural variations and mucosal changes of middle meatus and osteomeatal complex producing drainage block leading to CRS both in patients with normal CT and in patients with abnormal scans. CT scan offers information on anatomical variations, sinus status, and complications. To perform a CT scan simply to confirm CRS poses the unacceptable risk of additional exposure to ionizing radiation, not to mention the additional cost of the procedure. Aim of the study to evaluate the accuracy of Nasal endoscopy as compared to CT in diagnosis CRS

Material & Methods: This was a cross sectional study, conducted over a period of 13 months during SEP 2020 – Dec 2021, in the Department of Otorhinolaryngology, of Career Medical College in Lucknow.

Results: The male: female ratio of the present study was 3:2. The common finding was congested nasal mucosa in 27 patient (54%) and mucopurulent nasal discharge in 32 patient (64%) Septal deviation was found in 45 cases (90%) among that left DNS was in 27 cases (54%) and DNS with spur in 18 cases (36%). Out of total 50 patients, 41 (82.0%) had abnormal endoscopic findings while 44 (88.0%) patients were showing positive CT scan. Out of 8 patients having normal endoscopy, 3 patients had abnormal CT. But one patient who was CT scan negative was found to be endoscopic positive for CRS. The sensitivity of endoscopy was 93.2% and the specificity was 83.3%. Positive predictive value was 97.6% and negative predictive value was 62.5%. Diagnostic accuracy in diagnosing CRS was 92%.

Conclusion:It is mandatory to do both CT scan a DNE in patients with chronic sinusitis, those who are planned for functional endoscopic sinus surgery. Both CT scan and DNE are complimentary to each other in the diagnosis of CRS.

Keywords: CRS, CT Scane.

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Introduction

A study by the National Institute of Allergy and Infectious Diseases (NIAID) recently conclude that 134 million Indians suffer from chronic rhinosinusitis (CRS), which is more than double the number of diabetic patients in India, having great personal and economic impact. 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.^{1,2} Computed tomography (CT) scan plays a vital role in the diagnosis of CRS and in detecting its complications. It has the ability to detect mucosal disease and anatomical variations, to demonstrate a primary obstructive pathology and to visualise posterior ethmoid, sphenoid sinuses and thus helps in the management of CRS.

Nasal endoscopy helps in evaluation of the osteomeatal complex for evidence of the disease and to detect anatomical defects that compromise ventilation and mucociliary clearance. Hence nasal endoscopy and CT have brought the revolution in understanding CRS and are the prerequisites for Functional Endoscopic Sinus Surgery.³ Nasal endoscopy plays a main role in recognizing anatomical structural variations and mucosal changes of middle meatus and osteomeatal complex producing drainage block leading to CRS both in patients with normal CT and in patients with abnormal scans.⁴ Nevertheless, both nasal endoscopy and CT scan are implemented to begin diagnosis in routine practice since the relative values of each have not been well established. Nasal endoscopy is obligatory clinical examination in Otolaryngology, more so in patients with sinonasal symptoms.

Moreover, it allows a detailed examination of the nasal and sinus cavities not possible by standard examination such as anterior rhinoscopy using head light or head mirror.⁵ CT scan offers information on anatomical variations, sinus status, and complications.⁶ To perform a CT scan simply to confirm CRS poses the unacceptable risk of additional exposure to ionizing radiation, not to mention the additional cost of the procedure.⁷ The current study was conducted to assess accuracy between computed tomography and diagnostic nasal endoscopy and its diagnostic accuracy in case of chronic rhinosinusitis.

Material and Methods

This was a cross sectional study, conducted over a period of 13 months during Sep 2020- Dec 2021, in the Department of Otorhinolaryngology, of a Tertiary Teaching Hospital in Lucknow. Institutional Ethics Committee approval was obtained beforehand. Informed written consent was obtained from all the participating patients. Every Consecutive patient of CRS was diagnosed as per the criteria of Task Force on Rhinosinusitis.^{8,9} i.e. those patients who presented with 2 or more major criteria or 1 major criteria and 2 or more minor criteria were enrolled into the study. Patients with acute rhinosinusitis, those with of sinusitis of dental origin, past history of facial trauma or any sino-nasal surgery, tumour of paranasal sinus and patients of age below 15 years were excluded from the study.

After detail history, clinical examination and routine laboratory investigations, cases were subjected to diagnostic nasal endoscopy (DNE) and computed tomography (CT) of nose and para nasal sinuses (PNS) on the same day. Rigid nasal endoscopy was performed in all subjects under local anaesthesia with topical application of 2% xylocaine and using 0 degree and 30 degree, 4 mm diameter rigid nasal endoscope (Scholley, Germany). Nasal endoscopy was done by using the standard three pass technique as described by Kennedy.¹⁰ Nasal endoscopy findings were noted using Lund-Kennedy Endoscopic Scoring system¹¹ to assess the following parameters: nasal mucosa oedema (absent = 0, mild-moderate = 1 or polypoid degeneration = 2), presence of secretion (absent = 0, hyaline = 1 or thick and/or mucopurulent = 2) and presence of polyps (absent = 0, limited to the middle meatus = 1 or extended to the nasal cavity = 2). The assessment was performed bilaterally, with the total points corresponding to the sum of values obtained in both sides total score >2 was considered as positive.

Plain CT Scan Nose and PNS was done in all cases included in the study. Scanning was done on Toshiba Spiral CT scanner with patient in supine position with head extension. Patient in whom head extension was contraindicated due to cervical spondylosis, Gantry tilt was suitably adjusted. The images were obtained in Axial and Coronal planes with reconstruction in Sagittal images using the raw data. Thickness of sections was 3 mm at Osteomeatal Complex and 5 mm for rest of the structures with same shift to get continuous sections.

CT scan was done for both bony and soft tissue windows. Lund-Mackay scoring system was used to assess involvement of the maxillary, anterior ethmoid, posterior ethmoid, sphenoid and frontal sinuses as the follows: 0-no opacification, 1-partial opacification, 2-complete opacification. Osteomeatal unit was scored as 0-no opacification, 2-total opacification. Each side was graded separately and the scores from each side were then added to determine the overall CT Score which ranged from 0 to 24.⁹ CT findings were considered positive for CRS when the Lund-Mackay Score was more than one.

Assessment of CT scan and nasal endoscopy in all patients were performed independently by two different assessors and were blinded to each other's scores.

Statistical Analysis

The data from case record forms were tabulated in a Microsoft Excel spreadsheet. Statistical Analysis was done using Statistical Package of Social Science Software program, version 21 (SPSS). Data was tabulated in 2 * 2 contingency tables and statistical tests were applied to calculate sensitivity, specificity, positive predictive value, negative predictive value and accuracy of DNE considering CT scan as a gold standard in diagnosing CRS.

Result

Maximum number of patients was in the second and the third decade and the mean age of study group was 29.48± 16.15 years. The male:female ratio of the present study was 3:2 (**Table 1**). The common finding was congested nasal mucosa in 27 patient (54%) and mucopurulent nasal discharge in 32 patient (64%) Septal deviation was found in 45 cases (90%) among that left DNS was in 27 cases (54%) and DNS with spur in 18 cases (36%) (**Table 2**). Out of total 50 patients, 41 (82.0%) had abnormal endoscopic findings while 44 (88.0%) patients were showing positive CT scan. Out of 8 patients having normal endoscopy, 3 patients had abnormal CT. But one patient who was CT scan negative was found to be endoscopic positive for CRS. 5 patients were both endoscopy and CT negative for CRS indicating no disease. The sensitivity of endoscopy was 93.2% and the specificity was 83.3%. Positive predictive value was 97.6% and negative predictive value was 62.5%. Diagnostic accuracy in diagnosing CRS was 92%. Most of the endoscopy positive patients of CRS were CT positive. (**Table 3**)

Table 1: Demographic Details

Parameters	No. of patients (n=50)	Percentage
Age in years	20.-30	20
	31-40	12
	41-50	10
	>50	8
Gender	Male	30
	Female	20

Table 2: Common Findings

Findings	No. of Patients (n=50)	Percentage
Congestednasalmucosa	27	54.0
Mucopurulentnasaldischarge	32	64.0
SeptalDeviation	45	90.0
LeftDeviated NasalSeptum	27	54.0
DNS withspur	18	36.0

Table 3: correlation between diagnostic nasal endoscopy and CT in CRS patients (n= 50)

Endoscopy	CT Scan		Total
	Positive	Negative	
Positive	41	1	42
Negative	3	5	8
Total	44	6	50

Sensitivity:93.2%;Specificity:83.3%;PPV:97.6%;NPV:62.5%;Accuracy:92.0%

Discussion

Risingprevalenceofrhinosinusitisisasignificanthealthproblem and stillposes a challenge for the ENT surgeons in terms of its diagnosis and treatment. We extremely rely upon CT to confirm the diagnosis of CRS, to assess its severity and in

management decision. It has become the gold standard in the evaluation and surgical planning for CRS.¹² It has been recently recommended that either a CT scan or endoscopic evaluation of nose (preferably with photo or video documentation) should be a part of any prospective clinical trial, as it provides most of objective data used to diagnose CRS.^{13,14} Endoscopic findings are often used to support a diagnosis of CRS. But the true diagnostic value of nasal endoscopy in diagnosing CRS has not yet been clearly defined. In this study, we tried to find out the correlation between nasal endoscopy and CT in diagnosis and assessment of severity of CRS.

In the present study, maximum number of patients was in the second and the third decade and the mean age of study group was 29.48 ± 16.15 years. This corresponds with the study carried out by **Sinha K**¹⁵ where majority of patients were in the age group of 20–40 and **Deosthale NV et al**¹⁶ reported the common age as 20–40 years which was comparable to the present study. While **Hwang PH et al**¹⁷ reported mean age of patients as 47.4 years, in their study. **Deosthale NV et al**¹⁶ study showed slight male preponderance with a male to female ratio of 1.25:1. In the study conducted by **Sinha DK**¹⁵, male to female ratio was 1.6:1 and in the present study the ratio was 3:2.

In our study the common finding was congested nasal mucosa in 27 patients (54%) and mucopurulent nasal discharge in 32 patients (64%). Septal deviation was found in 45 cases (90%) among that left DNS was in 27 cases (54%) and DNS with spur in 18 cases (36%).

Our findings are consistent with **Nayak S et al**¹⁸ in his study observed the commonest complaint as nasal discharge occurring in 25 patients (78.1%) followed by headache in 22 patients (68.7%) and nasal obstruction in 22 (68.7%). The other complaints were sneezing in 6 patients (18.7%), anosmia and cacosmia in 2 patients each (6.25%). **Hussein RK et al**¹⁹ reported that the main symptoms of the patients in this study were nasal obstruction (80%), ear pressure (80%), nasal discharge (78.3%), halitosis (78.3%), hyposmia (68.3%), and nasal congestion (65%). These results were compatible with several authors who mentioned that diagnosis of chronic rhinosinusitis is done on two major criteria.^{12,20}

Rosbe and Jones²¹ in 1998, prospectively compared results of nasal endoscopy, CT scanning, and a symptom questionnaire, to determine whether a combination of patient symptoms and nasal endoscopy could accurately predict CRS on CT in 92 consecutive patients referred for sinus symptoms. According to them 91% of patients with positive findings on endoscopy had CT scans consistent with CRS. **Stankiewicz and Chow**²², in their study of 78 patients of CRS in year 2002, evaluated the relationship between symptoms, nasal endoscopy, and CT findings. The sensitivity of endoscopy as compared with CT 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.

The 2010 study by **Bhattacharyya and Lee**²³ prospectively evaluated 202 patients of CRS. According to them, endoscopy coupled with 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%. There was significant improvement in specificity from 12.3 to 84.1% after the addition of endoscopy.

Ferguson BJ et al²⁴ evaluated associations between symptom-based criteria as well as endoscopy and CT results. The specificity of endoscopy was 100%, sensitivity was only 24%.

From this they concluded that high specificity and low sensitivity of endoscopy makes it a useful tool for confirming CRS diagnosis but not for ruling it out.

A CT scan, besides being valuable in defining the objective component of CRS diagnosis, also helps in assessing the extent of the disease and the involvement of the adjacent structures, more so when a surgical intervention (FESS) is planned. Even though CT is known as a gold standard modality for diagnosing CRS, it cannot diagnose the disease with 100% accuracy.^{25,26} Radiation exposure also remains a concern with CT. On the other hand, due to its minimally invasive nature, DNE remains a preferred modality for direct visualization of the nasal cavities, especially the osteomeatal complex.

DNE also has its limitations, as it cannot look beyond certain confines. Yet, on comparative evaluation of DNE and CT, our study results suggest that DNE can be an effective tool to diagnose CRS.

Conclusion

It is concluded that CRS has a higher preponderance in male patients and is commonly seen in the age group of 21 to 30 years. CT scan has got a better advantage compared to DNE in detecting the anatomical variations as well as to know the condition of the sinus cavity and the extent of disease in sinuses. DNE can prove to be a better diagnostic modality compared to CT scan when conditions like middle ear secretions, the condition of the mucosa, polyps are looked for. It is mandatory to do both CT scan and DNE in patients with chronic sinusitis, those who are planned for functional endoscopic sinus surgery. Both CT scan and DNE are complementary to each other in the diagnosis of CRS.

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