

## Diagnosing Chronic Rhinosinusitis: A Comparative Study between Diagnostic Nasal Endoscopy and Computed Tomographic Scan of Paranasal Sinuses

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### Abstract

**Aim:** Comparative study between diagnostic nasal endoscopy and computed tomographic scan of paranasal sinuses.

**Methods:** This prospective comparative study was carried out in the Department of ENT, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 1 year, after taking the approval of the protocol review committee and institutional ethics committee. 100 patients who visited the ENT OPD, those suffering from at least two of the previous mentioned symptoms of chronic rhinosinusitis and not responding to 3 weeks of medical treatment were selected.

**Results:** Most common symptom experienced was nasal obstruction 91%, followed by nasal discharge 83%, facial pain/headache 77%, anosmia/hyposmia 37%, sneezing 33%, nasal bleeding 9%. Among 100 patients who underwent for nasal endoscopy, edematous mucosa was found in 45% patients, among them 15% had mild edema and 30% had severe edema. According to scoring system 91% patients were diagnosed on CT scan and 85% patients were diagnosed on nasal endoscopy. 9% and 15% were not diagnosed on CT scan and nasal endoscopy respectively. So, by considering CT scan as accurate diagnostic procedure, the accuracy of nasal endoscopy was calculated. The sensitivity of nasal endoscopy is 89.88%. So, the probability of diagnosing CRS when it is present is 89.88%. The specificity is 61%. So, NE has 61% ability to exclude the disease. The chi square value at degree of freedom 1 was 8.12 and p value was 0.0041, which was significant at  $p < 0.05$ , indicates that CT PNS was more accurate than diagnostic nasal endoscopy in diagnosing chronic rhinosinusitis.

**Conclusion:** Nasal endoscopy should be performed in all patients who meet diagnostic criteria of chronic rhinosinusitis as an early diagnostic tool as it has an advantage of being harmless, no radiation exposure, less cost, less time consuming and is an OPD based procedure.

**Keywords:** chronic rhinosinusitis, nasal endoscopy, tomographic scan, paranasal sinuses

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## Introduction:

India is a country where almost 15% of the population is suffering from chronic rhinosinusitis, 1 CT scan of paranasal sinuses and diagnostic nasal endoscopy [DNE] are the two commonly used investigative modalities for chronic rhinosinusitis. With the increased use of endoscopy for the evaluation and surgical treatment of paranasal sinus disease, attention is now directed towards the analysis of the lateral nasal wall and paranasal sinus anatomy. The diagnosis of CRS relies on the clinical judgement based on a number of subjective symptoms and few findings in physical examination. These symptoms and signs are inherently vague and because of the uncertainty associated with the diagnosis of CRS, it is necessary to have the data that are more objective about the extent of the disease. DNE enable clear visualisation of all the structures of the middle meatus and of the osteomeatal complex an ability to accurately access these areas for evidence of localised disease, or for the anatomical defects that compromise ventilation and mucociliary clearance. However, the limitations of DNE includes inability to discern the extent of the disease within the ethmoidal sinus, difficulty in identifying disease in constricted middle meatus and the presence of the hidden air space such as posterior ethmoidal cells[2]

Computerised Tomography (CT) provides essential preoperative information for the assessment of patients undergoing functional endoscopic sinus surgery. It has high sensitivity and provide objective findings regarding the condition of the paranasal sinuses and the presence of fluid and polyps. Furthermore, CT findings are integral part of

severity staging system that are used for CRS.[3,6] This study aims to compare the efficacy of CT and nasal endoscopy findings for the evaluation of CRS in patients with persistent complaints despite appropriate medical therapy.

## Material and methods

This prospective comparative study was carried out in the Department of ENT, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

100 patients who visited the ENT OPD, those suffering from at least two of the previous mentioned symptoms of chronic rhinosinusitis and not responding to 3 weeks of medical treatment were selected.

## Inclusion criteria

- Patients those were >15 years of age to <60 years of age;
- Patients with symptoms of chronic rhinosinusitis not responding to three weeks of medical treatment
- Patients willing for investigation and surgery
- Patients not responding to medical management

## Exclusion criteria

- Patients those were below 15 and above 61 years of age
- Patients with previous facial trauma or major nasal surgeries
- Paranasal sinus malignancy, chronic granulomatous disease

- Patients not fit for surgical intervention or those who cannot undergo radiation exposure such as pregnant females

### Methodology

Detailed history was taken of all the 100 patients and thus the one who has the signs and symptoms suggestive of chronic rhinosinusitis were selected. Diagnostic nasal endoscopy and computed tomography of nose and para nasal sinuses were performed on each patient.

CT scan was performed within 7 days of performing diagnostic nasal endoscopy.

Nasal endoscopic findings were noted and quantified by The Lund-Kennedy scoring system[6] By this scoring system, patients with score  $\geq 2$  were defined as diagnosis of chronic rhinosinusitis.

CT PNS findings were noted and quantified by the Lund- Mackay scoring. By this scoring system, patients with score  $\geq 4$  was defined as diagnosis of chronic rhinosinusitis[4]

Data was collected and then statistical calculation for sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio, negative likelihood ratio and p value at 95% confidence interval were calculated to evaluate the accuracy of diagnostic nasal endoscopy and CT paranasal sinuses in diagnosing CRS.

### Results

The present study was conducted on 100 patients in department of ENT, at our institute. Each patient had undergone diagnostic nasal endoscopy and CT PNS. A majority study population lays in the age group of 31-40 years 31% and 41-50 years 27% (Table 1). Among the study population 53% were males and 47% were females (Table 2). Most common symptom experienced was nasal obstruction 91%, followed by nasal discharge 83%, facial

pain/headache 77%, anosmia/hyposmia 37%, sneezing

33%, nasal bleeding 9%.

Most common sign seen was edematous nasal mucosa 61%, followed by sinus tenderness 43%, nasal discharge 29%, middle turbinate hypertrophy 27%, inferior turbinate hypertrophy 23%, polyp 21%.

Among 100 patients who underwent for nasal endoscopy, edematous mucosa was found in 45% patients, among them 15% had mild edema and 30% had severe edema. Discharge in middle meatus was found in 51% patients, among them 13% had discharge on right side, 21% had discharge on left side and 19% had bilateral discharge. 19% had clear/thin discharge and 33% had purulent discharge. Polyps were found in 31% patients, among them 7% had right side, 9% had left side and 17% had bilateral polyps. 7% had polyp up to middle meatus and 25% had polyp beyond middle meatus. By using Lund- Kennedy scoring system 15% patients scored  $< 2$ , 59% patients scored between 2-4, 15% patients scored between 5-7, 11% patients scored between 8-12. 85% patients had score  $\geq 2$  and 17% had score  $< 2$  (Table 3). So, 85% patients were diagnosed as chronic rhinosinusitis on endoscopy and 15% were not diagnosed on endoscopy. Different anatomical variations found on nasal endoscopy were deviated nasal septum 81%, concha bullosa 31%, paradoxical middle turbinate 27%, pneumatized uncinat process 19%, pneumatized bulla ethmoidalis 7%, and accessory maxillary ostium 25%, and Agger nasi cells 37%. Among 50 patients who underwent CT PNS, 67% had maxillary sinus opacification, 63% had anterior ethmoid sinus opacification, 41% had posterior ethmoid sinus opacification, 15% had sphenoid sinus opacification, 25% had frontal sinus opacification, 60% had osteomeatal complex opacification.

By using Lund-Mackay scoring system, 10% patients scored <4, 12% patients scored 4, 30% patients scored between 5-8, 20% patients scored between 9-12, 16% patients scored between 13-16, 6% patients scored between 17-24. 90% patients had score  $\geq 4$  and 10% had score <4 (Table 4). So, 90% patients were diagnosed as chronic rhinosinusitis on CT PNS and 10% were not diagnosed on CT PNS.

Different Anatomical variations found on CT PNS were deviated nasal septum 81%, polyp 35%, concha bullosa 33%, paradoxical middle turbinate 29%, pneumatized uncinate process 21%, pneumatized bulla ethmoidalis 5%, accessory maxillary ostium 15%, Agger nasi cells 41%, Haller cells 9%, Onodi cells 7%. On comparison of nasal endoscopy and CT scan findings, septal deviation, concha bullosa, paradoxical middle turbinate, pneumatized uncinate process, Pneumatized

Bulla Ethmoidalis, accessory maxillary ostium, Agger nasi cells, and polyps were found in NE and CT both, while Haller cells and Onodi cells were only diagnosed by CT scan (Table 5).

According to scoring system 91% patients were diagnosed on CT scan and 85% patients were diagnosed on nasal endoscopy. 9% and 15% were not diagnosed on CT scan and nasal endoscopy respectively. So, by considering CT scan as accurate diagnostic procedure, the accuracy of nasal endoscopy was calculated. The sensitivity of nasal endoscopy is 89.88%. So, the probability of diagnosing CRS when it is present is 89.88%. The specificity is 61%. So, NE has 61% ability to exclude the disease. The chi square value at degree of freedom 1 was 8.12 and p value was 0.0041, which was significant at  $p < 0.05$ , indicates that CT PNS was more accurate than diagnostic nasal endoscopy in diagnosing chronic rhinosinusitis.

**Table 1: Age distribution**

Age group (years)	Frequency	Percentage (%)
15-20	2	2
21-30	23	23
31-40	31	31
41-50	27	27
51-60	17	17
Total	100	100

**Table 2: Gender distribution**

Gender	Frequency	Percentage (%)
Male	57	53
Female	47	47

**Table 3: Lund-Kennedy score of nasal endoscopic finding**

Score	Frequency	Percentage (%)
<2	15	15
2-4	59	59
5-7	15	15
8-12	11	11

**Table 4: Lund-Mackay score of CT paranasal sinuses**

Score	Frequency	Percentage (%)
<4	10	10
4	12	12
5-8	30	30
9-12	20	20
13-16	16	16
17-20	6	6
21-24	6	6

**Table 5: Comparison of nasal endoscopy with CT paranasal sinuses**

Findings	Nasal endoscopy		CT paranasal sinuses	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Edematous mucosa	47	47	-	-
Discharge in middle meatus	51	51	-	-
Polyp	31	31	35	35
Deviated nasal septum	81	81	81	81
Concha bullosa	31	31	33	33
Paradoxical middle turbinate	27	27	29	29
Pneumatized uncinata process	19	19	21	21
Pneumatized bulla ethmoidalis	7	7	5	5
Accessory maxillary ostium	25	25	15	15
Agger nasi cells	37	37	41	41
Haller cells	-	-	9	9
Onodi cells	-	-	7	7
Maxillary sinus haziness	-	-	67	67
Anterior ethmoid sinus haziness	-	-	63	63
Posterior ethmoid sinus haziness	-	-	41	41
Sphenoid sinus haziness	-	-	15	15
Frontal sinus haziness	-	-	25	25
Osteomeatal complex opacification	-	-	63	63

## Discussion

The development of modern rigid endoscopy shows major improvement in diagnostic capability. Nasal endoscopy can find nasal and sinus pathology that might be missed with routine speculum and nasopharyngeal examination and it serves as objective diagnostic tool. CT PNS is another important diagnostic tool for managing clinical

decisions and planning surgical management. It is the method of choice for assessment of paranasal sinuses, nasal cavity and their anatomical variants. In this study, we compared the effectiveness of these two modalities in diagnosing chronic rhinosinusitis. In the study of Deosthale et al the most common age group was 20-40 years and mean age was 35.48 and in the study of

Srivastava et al the most common age group was 21-30 years.[5,7] In the study of Lohiya et al in which, most common symptoms were Nasal Obstruction 95% followed by nasal discharge 66% and in the study of Deosthale et al in which most common symptoms were headache 77.04% followed by nasal obstruction 75.04%.[5,8] In the study by Tegnoor et al most common sign was sinus tenderness 86% and in the study by Deosthale et al most common sign was inferior turbinate hypertrophy and 2<sup>nd</sup> most common sign was edematous nasal mucosa 45.08%.[5,9]

In the study by Lohiya et al most common diagnostic nasal endoscopic findings were discharge in middle meatus 47%, followed by edematous mucosa 39%, and polyp 27% and chronic rhinosinusitis was diagnosed in 87% of patients by nasal endoscopy.[8] In the study by Tegnoor et al where most common nasal endoscopic findings were discharge in middle meatus 76%, followed by polyp 28% and edematous mucosa 18% and chronic rhinosinusitis was diagnosed in 62% of patients by nasal endoscopy[9]

In the study by Deosthale et al in which positive CT findings were maxillary sinus opacification 65.07%, anterior ethmoid sinus opacification 60.66%, posterior ethmoid sinus opacification 31.15%, sphenoid sinus opacification 18.03%, frontal sinus opacification 31.97% and chronic rhinosinusitis was diagnosed in 65.57% of patients by CT PNS; and to the study by Lohiya et al in which positive CT findings were maxillary sinus opacification 62.25%, anterior ethmoid sinus opacification 54.5%, posterior ethmoid sinus opacification 32.25%, sphenoid sinus opacification 19.75%, frontal sinus opacification 24.5%, osteomeatal complex opacification 60.5% and chronic rhinosinusitis was diagnosed in 93% of patients by CT PNS.[5]

Both CT PNS and nasal endoscopy has its own limitations, limited visualization in

patients with polyp, septal deviations, or turbinate hypertrophy and some sinus like sphenoid, posterior ethmoids and frontal recess is found in nasal endoscopy whereas CT scan is only that it has high cost and radiation exposure.

### Conclusion

Nasal endoscopy should be performed in all patients who meet diagnostic criteria of chronic rhinosinusitis as an early diagnostic tool as it has an advantage of being harmless, no radiation exposure, less cost, less time consuming and is an OPD based procedure. CT scan should be performed in all patients who are being diagnosed by endoscopic findings as it helps in further management by diagnosing the extent of disease where nasal endoscopy has limited visualization and can also give 3D imaging of structures. CT PNS is the road-Map for surgery in sinus diseases. Both diagnostic nasal endoscopy and CT PNS are important for preoperative evaluation in detecting pathology and both are complementary to each other. But a CT PNS is more convenient than endoscopy according to this study.

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