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Original Research Article

Diagnosing chronic rhinosinusitis: a comparative study between diagnostic nasal endoscopy and computed tomographic scan paranasal sinuses

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ABSTRACT

Background: The term 'rhinosinusitis' refers to a heterogenous group of disorders characterized by inflammation of mucosa of the nose and paranasal sinuses. The National Institute of Allergy and Infectious Diseases (NIAID) have recently mentioned that 136 million people of India suffer from chronic rhino sinusitis.
Methods: A total 50 patients with symptoms of rhinosinusitis were investigated with both diagnostic nasal endoscopy and CT scan paranasal sinuses and their findings were scored with particular scoring system and compared with each other.
Results: Out of 50 patients, 90% patients were diagnosed on CT scan and 84% patients were diagnosed on nasal endoscopy. By considering CT scan as accurate procedure and correlating nasal endoscopy with CT scan, sensitivity was 88.88%, specificity was 60%, positive predictive value was 95.23%, negative predictive value was 37.5%, and p value was 0.004671, which was significant at $p<0.05$, indicates that CT paranasal sinuses is more accurate than diagnostic nasal endoscopy in diagnosing chronic rhinosinusitis.
Conclusions: Both diagnostic nasal endoscopy and CT paranasal sinuses are important pre-operative evaluation tools in detecting pathology and both are complementary to each other. But CT paranasal sinuses are more convenient than endoscopy according to this study.

Keywords: Chronic rhinosinusitis, Diagnostic nasal endoscopy, Computed tomography of paranasal sinuses

INTRODUCTION

Paranasal sinus diseases are one of the commonest causes of patients visit to otorhinolaryngologists. The National Institute of Allergy and Infectious Diseases (NIAID) have recently mentioned that 134 million people of India suffer from chronic Rhinosinusitis which is more than the number of diabetic patients in India having personal and economic impact.[1,2]

'Rhinosinusitis' is preferred term to describe this inflammation of mucosa of the nose and paranasal sinuses.[3] Drainage and ventilation are the two important factors in the maintenance of normal physiology of paranasal sinuses and their mucous membrane. It is very difficult to determine the precise nature of the chronic condition of sinusitis, which in turn compromises the treatment plan.[4,5] Approximately 87% of patients for diagnosis and treatment of rhinosinusitis are primarily symptom based where nasal endoscopy and CT ccan are not used. Consequently, a variety of national and international consensus meetings have made symptom-based definitions for initial diagnosis of rhinosinusitis.

In 2007, new guidelines for RS, from a multidisciplinary panel commissioned by the American Academy of

Otolaryngology- Head and Neck Surgery, were published.[2,6] These revised guidelines elaborated a more specific set of symptoms criteria for the diagnosis of CRS, and the major and minor symptom categories were simplified into the following four symptoms: twelve weeks or longer of two or more of the following signs and symptoms: (a) mucopurulent drainage (anterior, posterior, or both); (b) nasal obstruction (congestion); (c) facial pain-pressure-fullness; and (d) decreased sense of smell.

Furthermore, an objective measure for the diagnosis of CRS was recommended by task force funded by SAHP (Sinus and Allergy Health Partnership) in 2002, i.e.; inflammation documented by one or more of the following findings: (a) purulent (not clear) mucus or edema in the middle meatus or ethmoid region; (b) polyps in nasal cavity or the middle meatus; and (c) radiographic imaging demonstrating inflammation of the PNS. The diagnostic nasal endoscopy allows detailed and evaluation and identification of pathology that is not possible with standard examination techniques like head light and head mirror. With the use of endoscopy surgeons can get the precise anatomy identification, more angulated illuminated and magnified view of internal nose. The aim of the CT scan is to know the extent of disease, anatomical variants, and relationship of sinuses with surrounding structures. For evaluation of inaccessible areas of nose and paranasal sinuses, Computer tomography paranasal sinuses (CT PNS) is the investigation of choice.

There are differences of opinions regarding the correlation between the endoscopic and radiological findings in previous studies on the same subject. The present study was carried out to know and compare the accuracy and usefulness of diagnostic modalities like diagnostic nasal endoscopy and CT PNS in diagnosing chronic rhinosinusitis.

METHODS

50 patients who visited the ENT OPD at G. G. Hospital, Jamnagar, 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. A prospective study was carried out from May 2017 to May 2019 (2 years).

Inclusion criteria

Patients with following criteria's were included (a) patients those were >15 years of age to <60 years of age; (b) with symptoms of chronic rhinosinusitis not responding to three weeks of medical treatment; (c) willing for investigation and surgery; and (d) those not responding to medical management and was planned for surgery.

Exclusion criteria

Patients with following criteria's were excluded (a) patients those were below 15 and above 61 years of age; (b) with previous facial trauma or major nasal surgeries; (c) paranasal sinus malignancy, chronic granulomatous disease; and (d) not fit for surgical intervention or those who cannot undergo radiation exposure such as pregnant females.

Detailed history was taken of all the 50 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 ≥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 ≥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 50 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 30% and 41-50 years 28% (Table 1). Among the study population 54% were males and 46% were females (Table 2). Most common symptom experienced was nasal obstruction 90%, followed by nasal discharge 82%, facial pain/headache 76%, anosmia/hyposmia 36%, sneezing 32%, nasal bleeding 8% (Figure 1).

Most common sign seen was edematous nasal mucosa 60%, followed by sinus tenderness 42%, nasal discharge 28%, middle turbinate hypertrophy 26%, inferior turbinate hypertrophy 22%, polyp 20% (Figure 2).

Among 50 patients who underwent for nasal endoscopy, edematous mucosa was found in 46% patients, among them 16% had mild edema and 30% had severe edema. Discharge in middle meatus was found in 50% patients, among them 12% had discharge on right side, 20% had discharge on left side and 18% had bilateral discharge. 18% had clear/thin discharge and 32% had purulent discharge. Polyps were found in 30% patients, among

them 6% had right side, 8% had left side and 16% had bilateral polyps. 6% had polyp up to middle meatus and 24% had polyp beyond middle meatus. By using Lund-Kennedy scoring system 16% patients scored <2, 58% patients scored between 2-4, 16% patients scored between 5-7, 10% patients scored between 8-12. 84% patients had score ≥2 and 16% had score <2 (Table 3). So, 84% patients were diagnosed as chronic rhinosinusitis on endoscopy and 16% were not diagnosed on endoscopy. Different anatomical variations found on nasal endoscopy were deviated nasal septum 80%, concha bullosa 30%, paradoxical middle turbinate 26%, pneumatized uncinate process 18%, pneumatized bulla ethmoidalis 6%, and accessory maxillary ostium 24%, and Agger nasi cells 36%. Among 50 patients who underwent CT PNS, 66% had maxillary sinus opacification, 62% had anterior ethmoid sinus opacification, 40% had posterior ethmoid sinus opacification, 14% had sphenoid sinus opacification, 24% had frontal sinus opacification, 62% had osteomeatal complex opacification.

By using Lund-Mackay scoring system, 10% patients scored <4, 12% patients scored 4, 28% patients scored between 5-8, 22% patients scored between 9-12, 16% patients scored between 13-16, 6% patients scored between 17-6% patients scored between 21-24. 90% patients had score ≥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 80%, polyp 34%, concha bullosa 32%, paradoxical middle turbinate 28%, pneumatized uncinate process 20%, pneumatized bulla ethmoidalis 4%, accessory maxillary ostium 14%, Agger nasi cells 40%, Haller cells 8%, Onodi cells 6%. 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 (Figure 3 and Table 5).

According to scoring system 90% patients were diagnosed on CT scan and 84% patients were diagnosed on nasal endoscopy. 10% and 16% 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 88.88%. So, the probability of diagnosing CRS when it is present is 88.88%. The specificity is 60%. So, NE has 60% ability to exclude the disease. The chi square value at degree of freedom 1 was 8.0026 and p value was 0.004671, 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	1	2
21-30	11	22
31-40	15	30
41-50	14	28
51-60	9	18
Total	50	100

Table 2: Gender distribution.

Gender	Frequency	Percentage (%)
Male	27	54
Female	23	46

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

Score	Frequency	Percentage (%)
<2	8	16
2-4	29	58
5-7	8	16
8-12	5	10

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

Score	Frequency	Percentage (%)
<4	5	10
4	6	12
5-8	14	28

Continued.

Score	Frequency	Percentage (%)
9-12	11	22
13-16	8	16
17-20	3	6
21-24	3	6

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

Findings	Nasal endoscopy		CT paranasal sinuses	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Edematous mucosa	23	46	-	-
Discharge in middle meatus	25	50	-	-
Polyp	15	30	17	34
Deviated nasal septum	40	80	40	80
Concha bullosa	15	30	16	32
Paradoxical middle turbinate	13	26	14	28
Pneumatized uncinate process	9	18	10	20
Pneumatized bulla ethmoidalis	3	6	2	4
Accessory maxillary ostium	12	24	7	14
Agger nasi cells	18	36	20	40
Haller cells	-	-	4	8
Onodi cells	-	-	3	6
Maxillary sinus haziness	-	-	33	66
Anterior ethmoid sinus haziness	-	-	31	62
Posterior ethmoid sinus haziness	-	-	20	40
Sphenoid sinus haziness	-	-	7	14
Frontal sinus haziness	-	-	12	24
Osteomeatal complex opacification	-	-	31	62

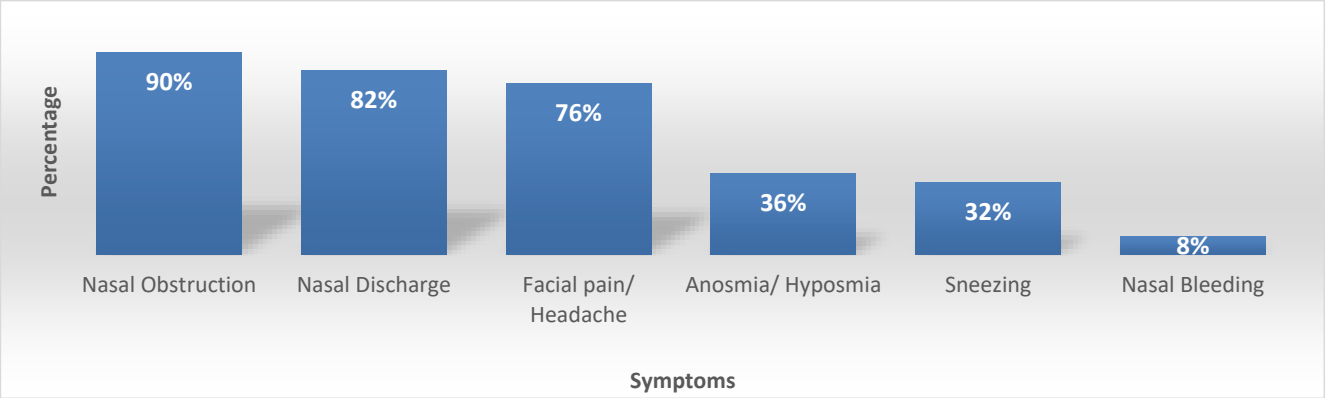

Figure 1: Symptoms of rhinosinusitis.

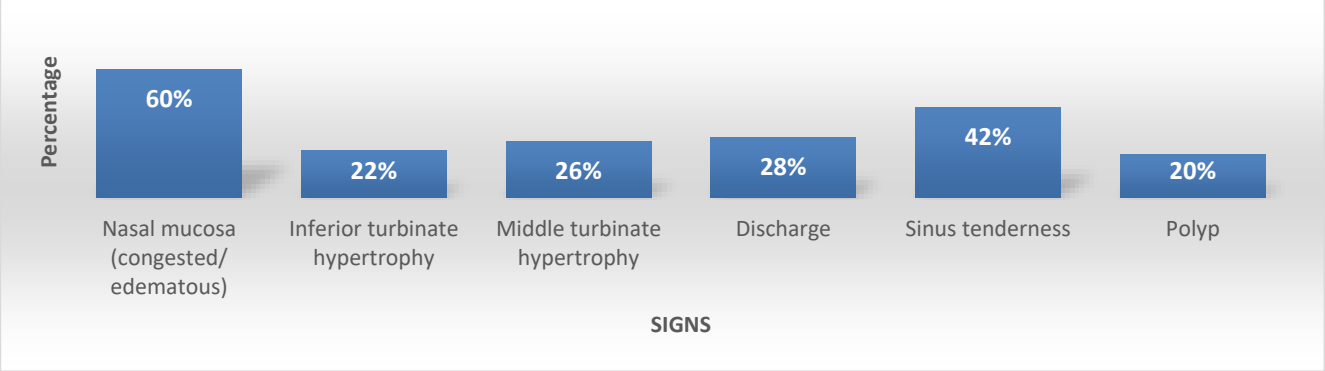

Figure 2: Signs.

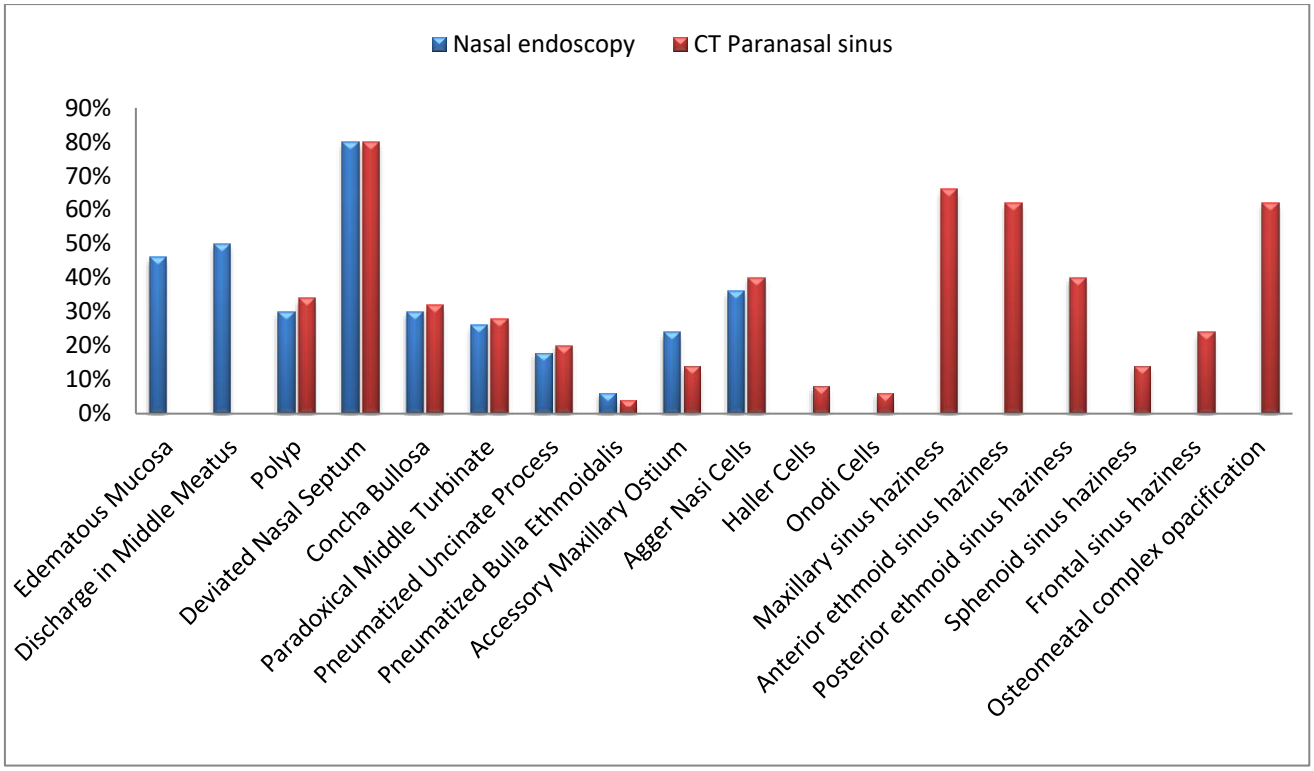

Figure 3: Comparison of nasal endoscopy with CT paranasal sinuses.

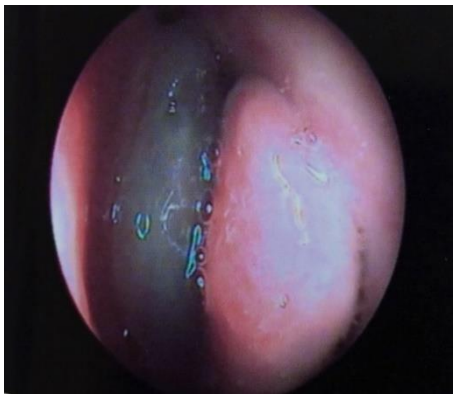

Figure 4: Nasal polyp seen in nasal endoscopy.

Figure 5: Right maxillary sinusitis (CT PNS).

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 2nd 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 polyp27% 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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