

## Original Research Article

# A comparative analysis of CT scan versus diagnostic nasal endoscopy in chronic rhino sinusitis

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### ABSTRACT

**Background:** With the advent of nasal endoscopy (DNE) and computed tomography (CT) in the evaluation of patients with chronic rhinosinusitis, it has popularized the functional endoscopic sinus surgery. The objective of this study is to find out effectiveness and limitations of CT and DNE in chronic rhinosinusitis.

**Methods:** Patients attending the Otorhinolaryngology outpatient department of MES medical college with chronic rhinosinusitis (CRS), who satisfy the inclusion criteria, were included in the study. They were given a course of antibiotics and antihistamines for a period of 10 days prior to CT Nose & PNS followed by an interval of 5 days nasal endoscopy done and findings were compared.

**Results:** In this study, 58% cases were males and 42% females, most common symptom was a headache (76%). In DNE 82% cases had septal deviation and 86% in CT scan. Most common sinus cavity involved in CT scan was maxillary sinus.

**Conclusions:** 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. In conditions like middle meatal secretions, mucosal change, polyp DNE gave a better picture of the condition. Both DNE and CT scan are complementary to each other in CRS.

**Keywords:** Chronic rhinosinusitis, Computerized tomography, Diagnostic nasal endoscopy

### INTRODUCTION

Chronic rhinosinusitis (CRS) is defined as a group of disorders characterized by inflammation of the mucosa of the nose and paranasal sinuses for at least 12 consecutive weeks.<sup>1</sup> It is one of the commonest disease entities amongst patients presenting in the ENT outpatient department. It presents with symptoms such as facial pain/pressure, facial congestion/fullness, nasal obstruction/blockage, nasal discharge, hyposmia/anosmia, halitosis, fatigue, dental pain, etc.<sup>2</sup> Diagnosis of this disease is of utmost importance as it affects the quality of life of the patient to some extent and correct diagnosis aids in its treatment.<sup>3</sup> CRS could be due to

several reasons such as infections, immotile cilia syndrome, cystic fibrosis and due to anatomical abnormalities. Since the pathogenesis of CRS is not well defined and there may be associated with multiple etiologic factors. It is becoming clearer that CRS is an inflammatory disease, and it may or may not involve pathogenic microbes.<sup>3</sup>

The diagnosis of CRS for a long time has been based on clinical history of the nasal disease and physical examination alone. However, many complementary tests are required to come to the final diagnosis. The advent of the nasal endoscope has emphasized the importance of nasal endoscopy in CRS and imaging of the nose and

paranasal sinuses have complemented the evaluation of diseases of the nose and paranasal sinuses.<sup>4</sup> Routine use of a nasal endoscope and computed tomographic scanning (CT scan) of the nose and paranasal sinuses has opened new vistas in peeping into the inaccessible areas and niches of fronto-ethmoidal complex, sphenothmoidal recess and sphenoid sinuses. Nasal endoscopy may help to identify the small lesions or anatomical variation which is undetected clinically or conventional radiography. It is always necessary to have a more objective methodology or investigative protocol for précised diagnosis and decision making. CT scan and diagnostic nasal endoscopy (DNE) play a vital role in day to day assessment of all sinonasal diseases.<sup>5</sup> Hence we have conducted this study to identify the effectiveness and limitations of CT scan and DNE of the nose and paranasal sinuses in the diagnosis of CRS thereby to choose a better tool for the diagnosis.

## METHODS

The study was conducted at the Department of Otorhinolaryngology, MES Medical College, Perinthalmanna. It was a cross-sectional study conducted between 1st June 2015 to 31st May 2016. We recruited 50 patients presenting with clinically diagnosed CRS. The approval from the Institutional ethics committee was obtained to commence the study and written informed

consent was obtained from all the participants. Patients who were not willing to give Informed consent, not ready to undergo CT or DNE and patients with sinus malignancies were excluded from the study. Socio-demographic data were collected from all the participants by using a proforma. The participants were given a course of antibiotics and antihistamines for a period of 10 days prior to CT (GE spiral) and within an interval of 5days DNE was performed. Topical decongestant with lignocaine 4% was used before the DNE and the procedure was carried out by using the standard three pass techniques as per the standard procedure.<sup>6</sup> The outcome from both methods was recorded and measured. Statistical analysis was performed by using SPSS software (Version 21.0).

## RESULTS

Among the total patients recruited in the study, 58% were males and 42% were females. The mean age of the patients was 33.7 years. A headache was the most common symptoms of the patients (76%) followed by nasal obstruction (72%) postnasal discharge (68%) and nasal discharge (52%) respectively (Table 1). The deviated nasal septum was the commonest sign of the CRS in the patients (80%) followed by purulent middle discharge (60%). Signs like Hypertrophied inferior turbinate, congested nasal mucosa and sinus tenderness were also noted in some patients (Table 2).

**Table 1: Symptoms of the patients.**

Symptoms	Percentage (%)	Number of people
Headache	76	38
Nasal obstruction	72	36
Post nasal drip	68	34
Epistaxis	2	1
Nasal discharge	52	36
Sneezing	34	17
Others (smell disturbances)	32	16

**Table 2: Signs of the patient.**

Signs	Number of people	Percentage (%)
Nasal mucosa: congested	12	24.0
Nasal mucosa: pale	10	20.0
Nasal mucosa: edematous	6	12.0
Inferior turbinate hypertrophy	20	40.0
Middle turbinate hypertrophy	7	14.0
Middle meatus: non purulent	12	24.0
Middle meatus: purulent	30	60.0
Nasal polyps	4	8.0
Sinus tenderness	11	22.0
Deviated nasal septum	41	82.0

Table 3 shows the comparative findings in CT and DNE of the nasal cavity. We found a difference in CT and DNE result regarding the proportion of septal deviation to

right and left. Both CT and DNE revealed that 78% cases had an attachment of uncinat process to lamina papyracea on right and left. The uncinat attachment to

middle turbinate in both right and left was similar in both results. Secretions in the middle meatus are seen in 48% cases on the right side, 56% on the left side and 44% cases had bilateral in DNE. The CT scan could not

visualize a clear picture regarding the secretions in the middle meatus. There was a difference in the observations on frontal recess patency in DNE and CT.

**Table 3: Comparative findings in CT and DNE of nasal cavity (n=50).**

Findings	DNE Right (%)	DNE Left (%)	CT Right (%)	CT Left (%)
Septal deviation	34	48	34	52
Uncinate attachments: to lamina papyracea	78	78	78	78
Uncinate attachment: to middle turbinate	10	10	10	10
Uncinate attachments: to skull base	12	12	12	12
Middle meatus secretions	48	56	0	0
Frontal recess patency	61	64	72	76
Maxillary ostium patency	38	43	41	44
Spheno ethmoidal recess	78	74	71	76

**Table 4: Comparative findings in CT and DNE in relation to anatomical variations.**

Findings	DNE Right (%)	DNE Left (%)	CT Right (%)	CT Left (%)
Pneumatised uncinata	0	0	2	0
Agger nasi	8	12	18	26
Haller or infraorbital cells	NV	NV	6	4
Onodi or sphenoethmoidal cells	NV	NV	2	0
Accessory maxillary ostium presence	18	6	0	0
Middle turbinate: paradoxical	0	2	0	6
Middle turbinate: concha bullosa	24	16	32	20

**Table 5: Comparative findings of CT and DNE of mucosal changes (n=50).**

Findings	DNE Right (%)	DNE Left (%)	CT Right (%)	CT Left (%)
Middle turbinate: hypertrophy	18	12	16	12
Inferior turbinate: hypertrophied	34	32	32	30
Polyp	26	18	24	16
Frontal sinus haziness	NV	NV	36	34
Anterior ethmoidal sinus haziness	NV	NV	76	74
Maxillary sinus haziness	NV	NV	80	78
Posterior ethmoidal sinus haziness	NV	NV	44	40
sphenoid sinus haziness	NV	NV	28	22

Table 4 shows comparative findings in CT and DNE in relation to anatomical variations. We could visualize only 2% pneumatised uncinata in CT on the right side. Whereas, with DNE, pneumatised Agger nasi visualised in 8% cases on right side and 12% cases on the left side. While in

CT scan it is visualized in 18% cases on right and 26% cases on the left side. The Haller cells and sphenoethmoidal air cells could visualize only in CT, where the accessory maxillary ostium was visualized only in DNE. There was some difference in identification of Paradoxical middle turbinate in both CT and DNE.

Table 5 shows the comparative findings in mucosal changes in both CT and DNE. By using DNE we found

that 18% of middle turbinate hypertrophy on the right side and 12% on the left side. Whereas in CT 16% cases show hypertrophy of middle turbinate on right and 12% cases on the left. The incidence of inferior turbinate hypertrophy was differently noted in DNE and CT.

The anterior ethmoid sinus haziness was also noted differently.

## DISCUSSION

The current study was conducted to identify the effectiveness and limitations of CT scan and DNE of the nose and paranasal sinuses in the diagnosis of CRS. In this study we found that majority of the patients affected were belongs to the age group between 21 to 30 years and

we could infer that this age group is more exposed to the environment and recurrent upper respiratory tract infections. Among the study population, 58% of the patients were males and the findings were at par with the findings of Goutam et al.<sup>7</sup>

In the current study, we observed that headache and nasal obstructions were the commonest symptoms occurred in the patients. Nasal discharge, sneezing and smell disturbance (anosmia, parosmia, cacosmia) were also observed among the patients. Epistaxis was the least noted symptoms among the patient group. Most of the symptoms had lasted for more than 3 months. Similar findings were noted in the study conducted by Gautam et al.<sup>7</sup> They found that 84% of the patients in their study population had both a headache and nasal obstruction and nearly 70% cases had nasal discharge.<sup>7</sup> The current study also revealed that nasal septum deviation was the most common sign among the people with CRS followed by purulent middle meatal discharge. Other signs like hypertrophied inferior turbinate, congested nasal mucosa, non-purulent discharge and sinus tenderness were also noted among the recruited patients. Venkatchalam et al observed hypertrophied inferior turbinate and hypertrophied middle turbinate and congested mucous membrane.<sup>8</sup>

The septal deviation was one of the most common variations in both CT and DNE observed in our study. Similar findings were observed in a study conducted by Shahizon et al in 40 patients. They observed that 41% cases show septal deviation in CT scan and 25% cases in DNE. However, the study population was less than the current study population.<sup>9</sup> In the current study, we observed that the proportion of attachment of uncinate process to lamina papyracea on right and left was same in DNE and CT. However, the study conducted by Sheetal et al found that in CT scan the uncinate process is commonly attached to the lamina papyracea (70% on the right, and 66% on the left side), followed by the middle turbinate (24% on the right, 31% on the left side). The uncinate process on DNE was commonly attached to the lamina papyracea (71% on the right and, 69% on the left), followed by the middle turbinate (26% on the right and 31% on the left). By comparing both studies, the current study shows no difference in findings on either side of both DNE and CT.<sup>10</sup>

The mucopurulent secretions in the middle meatus are seen in DNE, in which 44% cases had bilateral secretions, while it was not visualized in CT. Similarly, the study conducted by Patel et al could not visualize the mucopurulent secretions in the middle meatus and it was seen in DNE.<sup>11</sup> From the above studies, it is clear that middle meatal secretions cannot be visualized with CT scan; DNE is required to assess meatal secretions and mucosal changes.

Frontal recess patency and maxillary ostium patency were clearly visualized in both CT and DNE. However,

there was some difference in the percentage of right and left patency. In the study conducted by Sheetal et al 65% cases showed the frontal recess patency in CT scan 63% cases in DNE.<sup>10</sup> In a different study conducted by Zojaji et al found that maxillary sinus patency in 62.7% on right and 64.7% on left in CT and 68.6% on both rights and left in DNE.<sup>12</sup> Maxillary sinus patency was less in number in Zojaji et al study when compared to that of our study; it could be due to the difference in duration of disease. In our study, we also found significant increase in a number of patients with frontal recess patency.

As far as the anatomical variation is concerned, the CT could visualize only 2% pneumatised uncinate. The study conducted by Sheetal et al also obtained a similar result. The Onodi or sphenoidal air cells only visualised in CT scan and could, not visualize in DNE.<sup>10</sup> A similar study conducted by Talaipour et al. Out of 143 cases CT scan showed Onodi cells in 7% cases. By comparing both studies, our study had a significant reduction in a number of cases with Onodi cells. The accessory maxillary ostium, middle turbinate concha bullosa and paradoxical turbinate had different findings in DNE and CT.<sup>13</sup>

The current study showed that the middle turbinate hypertrophy was commonly seen in cases with allergic rhinitis. In DNE, 16% had middle turbinate hypertrophy on the right side and 12% on left side whereas in CT it was 18% and 12% right and left respectively. The reason for more cases detected in CT could be because the nasal packing was done prior to DNE. Similar findings were observed in the study conducted by Zojaji et al. Slightly higher incidence of right and left inferior turbinate hypertrophy was seen in DNE when compared to that of CT outcome.<sup>12</sup> The condition of mucosa whether it is pale, congested or edematous could be clearly detected with DNE whereas CT scan could not detect mucosal changes in our study. Whereas in the study conducted by Naghibi et al observed that both CT and DNE were useful to identify the inferior turbinate hypertrophy. The current study also identified that DNE is more accurate for detecting mild polyposis and CT scan detect only extensive polyposis.<sup>12</sup> In the study conducted by Duarte, et al number of nasal polyposis were evidenced in DNE but not in CT.<sup>14</sup> Evidence from both studies indicates that nasal polyps are visualized more in DNE when compared to CT. In our study, we noted that Sinus haziness could visualize only with CT scan and not with DNE. The findings are at par with the findings of Sheetal et al.<sup>10</sup>

## CONCLUSION

From current study, 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 meatal 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 complimentary to each other in the diagnosis of CRS. The authors admit that the sample size is a limitation of the current study; a larger sample size would have brought out many other facets of the specific role of CT and DNE and their further merits and demerits, if any.

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