



# Assessment of accuracy of diagnostic nasal endoscopy (DNE) in patients with chronic rhinosinusitis: A study from a tertiary care center of Himachal Pradesh

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## Abstract

**Background:** CRS affects wide range of population in which 15% prevalence occur in India alone. Direct visualization of PNS by using nasal endoscopy and imaging modalities are required to see for the presence of disease and diagnosis of CRS.

**Objectives:** Present study aims to analyze the findings of endoscopy analysis and PNS CT scan among the patients with CRS in Himachal region. Present study also aims to correlate the endoscopic findings with the PNS CT findings.

**Methodology:** Total 60 patients with symptoms of CRS were include in the study. Nasal endoscopy was done with the help of 4mm 0° & 30° nasal endoscopes. It was done under local anaesthesia and after decongestion of the nasal cavity. Non-contrast CT scan of nose and paranasal sinus using Multiscan (Phillips), Model-Ingenuity Core 128 CT was used in diagnosis of CRS. Lund-Kennedy scoring system was used to assess endoscopic findings and Lund-Mackay scoring system was used for CT findings.

**Results:** The mean age of the patients was  $34.22 \pm 12.75$  years with 45 (75%) male patients and 15 (25%) female patients. DNS was the most common anatomical abnormality observed on endoscopy (46.6%) followed by spur (30%) and concha bullosa (8.33%). Most common pathological abnormality detected on nasal endoscopy was middle meatal secretion (55%), next were hypertrophy of inferior turbinate (50%) followed by polypoidal changes (41.6%). Lund Kennedy endoscopy scoring revealed that maximum number of cases (63.33%) was found in the score range from 6 to 10. Lund Mackey CT



scoring revealed that maximum number cases (36.66%) were in the score range from 11 to 15. A significant positive correlation between the Lund Kennedy and Lund Mackey score was observed.

**Conclusion:** Assessment of pathology of nasal cavity such as oedematous mucosa, early polypoidal changes in mucosa can be better assessed by endoscopy. CT nose and paranasal sinus on the other hand helps to provide information regarding sinus involvement and various anatomical variations.

**Keywords:** Endoscopy, CT PNS, Lund Mackey, Lund Kennedy, CRS.

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## Introduction

Chronic rhinosinusitis (CRS) is a common disease worldwide, constituting major rhinologic cases attending an otolaryngology clinic<sup>1</sup>. According to several studies, CRS has a considerable negative impact on patient quality of life and total productivity in addition to its large economic burden<sup>2,3</sup>. CRS is generally described as a chronic inflammatory disorder of the paranasal sinus mucosa and nose which lasts for more than 12 weeks<sup>4</sup>. The symptomatology of this disease is vast and therefore considered as ambiguous. As a result, symptomatology alone cannot be used to diagnose CRS<sup>5</sup>.

Diagnostic nasal endoscopy (DNE) enables to estimate the state of sinonasal mucosa both functionally and anatomically especially that of the osteomeatal complex (OMC) region as well as direct endocavitary observation particularly in the post-operative cases and identification and evacuation of possible secretions. At present, nasal endoscopy examination becomes the primary and therapeutic modality in the diagnosis of patients of CRS and its associated disease<sup>6</sup>.

Computed tomography scan (CT) of paranasal sinuses is the gold standard diagnostic radiological tool for CRS as it has the advantage of concurrent evaluation of the nasal cavities, OMC and paranasal sinuses (PNS). It is also reliable, accurate and effective at demonstrating the extent of disease spread and dehiscence & anatomical variations. Endoscopic and CT-based staging systems are used to determine the extent of disease within the nose and PNS. The Lund Mackey system gives a score of 0-2 based on the nonexistence, incomplete or absolute opacification of each sinus system and of

OMC on CT PNS. A maximum score of 12 per side can be achieved<sup>7</sup>.

CT scan of the PNS helps in knowing the important relations of paranasal sinuses and its extent on the other hand DNE helps in understanding its pathology<sup>8</sup>. Endoscopic findings (any of these) include polyp in nasal cavity, discharge in middle meatus which is mucopurulent, swelling, middle meatus obstruction. Findings in CT comprise of change in nasal mucosa within the OMC and sinuses. CRS can be phenotypically divided into those cases with polyps (CRSWNPs) and those without (CRS w/o NPs) based on endoscopic findings. Polypoidal CRS can be classified as localized polyposis (CRSWNPs-localized) and Diffuse nasal polyposis (CRSWNP-diffuse)<sup>7</sup>.

Direct visualization of PNS by using nasal endoscopy and imaging modalities are required to see for the presence of disease and diagnosis of CRS<sup>4</sup>. In order to understand the pattern of CRS in Himachal area, this study is planned and further aims to know the diagnostic accuracy of nasal endoscopy and its correlation with CT PNS who present in OPD, Department of ENT, Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan.

## Methodology

**Study design:** Total 60 patients in the age group of 19-60 years with symptoms of CRS presenting at outpatient department were recruited in this study. Patients having symptoms of nasal blockage, obstruction, congestion and discharge from past three months or patients with secondary symptoms like facial pain or pressure or olfactory dysfunction or hyposmia, anosmia for a duration of more than 3 months were included in the study. Patients with suspected malignancy of nose and paranasal sinus,

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granulomatous disease, invasive fungal sinusitis, those with previous nasal surgery, with any history of facial trauma, with clinical evidence of sinusitis of dental origin and congenital malformations were excluded from the study.

**Nasal Endoscopy:** Nasal endoscopy was done with the help of 4mm 0° & 30° nasal endoscopes. Patient was made to lie supine and head tilt towards the examiner. It was done under local anaesthesia and decongestion of the nasal cavity with 4% lignocaine and 1:10000 adrenaline. Lund-kennedy scoring system was used for chronic sinusitis on DNE.

**CT PNS:** Plain CT scan of nose and paranasal sinus using Multiscanne (Phillips), Model-Ingenuity Core 128 CT was done to assess in coronal and axial cuts thickness of 3mm to support the diagnosis of CRS and proper assessment of the factors responsible for CRS. CT scan findings include mucosal changes within the osteomeatal complex and sinuses. Lund-Mackay scoring system was used for chronic sinusitis on CT PNS.

**Statistical analysis:** The statistical analysis was carried out using SPSS 27.0. For quantitative variables, mean and standard deviation was

used as measures of central tendency and variability respectively. For qualitative variable, fraction of total and percentages was calculated. Chi-square test was used to compare two qualitative groups and unpaired t-test was used to compare two quantitative groups. A p value <0.05 was considered as significant.

**Results**

The mean age of the patients in this study was 34.22 ± 12.75 years with 45 (75%) of patients were male and 15 (25%) of patients were female. In our study, findings on DNE include DNS which was the most common finding seen in 46.6% on left side and 40% on right side, next common finding is spur seen in 16% on left side and 30% on right side, polyp 3.33% on left side, 3.33% on right side and bilateral 43.4%, ITH was found in 10% on left side, 15% on right side and 25% bilateral followed by Middle meatal secretion seen in 8.3% on left side, 6.67% on right side and bilateral 18.33% and concha bullosa was seen in 8.33% on left side and 6.67 on right side and 11.67% bilateral. Paradoxical middle turbinate bent was found 3.33% on right side and 3.33% on left side (Table 1).

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Variable	Total	Left		Right		Bilateral	
		N	%	N	%	N	%
DNS	52	28	46.67	24	40	0	0
Spur	28	10	16.67	18	30	0	0
Polyp	30	2	3.33	2	3.33	26	43.33
ITH	30	6	10	9	15	15	25
Middlemeatussecretion (MMS)	33	5	8.33	17	28.33	11	18.33
Conchabullosa	16	5	8.33	4	6.67	7	11.67
Paradoxical Bent	3	0	0	1	1.67	2	3.33

**Table 1:** DNE findings.

NCCT nose and PNS of all patients were taken. Axial and coronal cuts were studied. CT nose and PNS showed DNS to be the most common finding in CT scan seen in 48.33% on left side, 38.33% on right, spur was seen in 15% on left side and 28.33% on right side, CT also demonstrated polyp which was found in 10% on left side, 5% on right side and 16% bilateral, followed by ITH which was found in 3.33% on left side, 16.67% on right side and

16% bilateral, CT further showed MTH found in 3.33% on left side, 1.67% on right side and 1.67% bilateral, agger nasi cells was seen in 5% on left side, followed by heller cells seen in 1.67% on right side and 3.33% bilateral and OMC obstruction was seen in 5% on left side, 3% on right side and 88.33% bilateral. Middle turbinate pneumatization was found 3.33% on left side and 5% on right side (Table 2).



Variable	Total	Left		Right		Bilateral	
		N	%	N	%	N	%
DNS	52	29	48.33	23	38.33	0	0
Spur	26	9	15	17	28.33	0	0
Polyyps	25	6	10	3	5	16	26.67
ITH	28	2	3.33	10	16.67	16	26.67
MTH	4	2	3.33	1	1.67	1	1.67
Agger nasi cells	3	3	5	0	0	0	0
Heller cells	3	0	0	1	1.67	2	3.33
OMC	11	3	5	3	5	53	88.33
Paradoxical Bent	4	2	3.33	2	3.33	0	0

**Table 2:** CT nose and PNS findings.

For the diagnosis of DNS, DNE exhibit the sensitivity of 94% compared to the CT scan. Similar diagnosis on DNE and CT was observed in 49 patients whereas in 3 patients, successful diagnosis was made only on CT but not on DNE. For the diagnosis of Spur, DNE exhibit the sensitivity of 100% which is same as CT scan. All 26 patients with spur were successfully diagnosed on DNE as well as CT scan. For the diagnosis of polyp, DNE exhibit the sensitivity of 80%. Similar diagnosis of polyp was found on DNE and CT which was observed in 20 patients whereas in 5 patients,

successful diagnosis was made only on CT but not on DNE. For the diagnosis of ITH, DNE is more sensitive than CT scan with the sensitivity of 85%. Similar diagnosis on DNE and CT was observed in 24 patients whereas in 4 patients, successful diagnosis was made only on CT but not on DNE. For the diagnosis of paradoxical bent, DNE showed sensitivity of 25% for the diagnosis of paradoxical bent. Paradoxical bent was observed in 1 patient on DNE whereas on CT 4 patients have paradoxical bent. (Table 3).

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Variable	DNE	CT		Sensitivity	Specificity	PPV	NPV
		Yes	No				
DNS	Yes	49	0	94%	NA	1	0
	No	3	0				
Spur	Yes	26	2	100%	NA	0.9	NA
	No	0	0				
Polyp	Yes	20	5	80%	NA	0.8	0
	No	5	0				
ITH	Yes	24	3	85%	NA	0.8	0
	No	4	0				
Paradoxical Bent	Yes	1	2	25%	NA	0.33	0
	No	3	0				

**Table 3:** Correlation between CT scan and endoscopy.

Lund-kennedy scoring system was used to evaluate endoscopy findings and score was 2,1 and 0 for oedema, polyp, discharge, scarring and crusting. Total score was 20, 10 on each side. Maximum number of cases was found in the score range from 6 to 10 i.e., 63.33% followed by 35% of cases in the

range of 0 to 5 and only 1 patient had a score range from 11 to 15 i.e., 1.66%. Lund-Mackey CT scoring system was used to evaluate the degree of opacification of different sinuses & score range from 2, 1 & 0. Total score of Lund-Mackey scoring system is 24. Maximum number cases were in the score range from



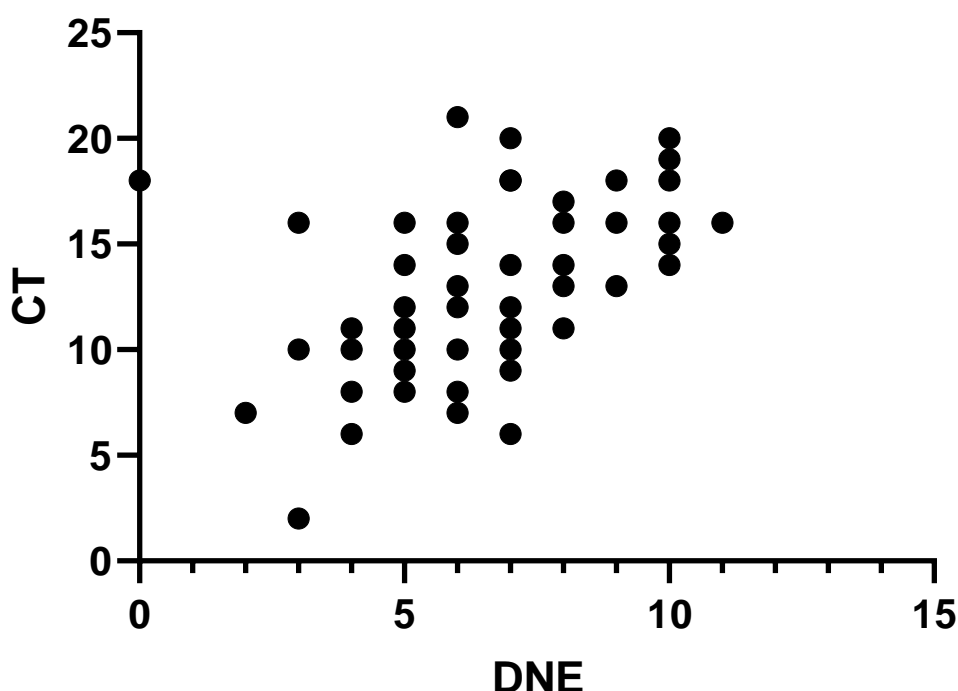
11 to 15 i.e., 36.66%, 30% of patients had a score range from 6-10, 28.33% of patients had a range from 16-20 followed by 3.33% being

in the score range from 0-5 and 1.66% of patient in a score range from 21-25 (Table 4).

Score	Lund kennedy score (DNE)	Lund mackey score (CT)
0-5	21 (35%)	3 (5%)
6-10	38 (63.33%)	26 (43.33%)
11-15	1 (1.66%)	23 (38.33%)
16-20	0	8 (13.33%)
21-25	0	0

**Table 4:** Lund kennedy score (DNE) and Lund mackey score (CT)

A significant ( $p=0.0002^{***}$ ) positive correlation between the LUND Kennedy and LUND Mackey score was found in our study indicated by the Pearson's correlation coefficient ( $r$ ) of 0.4651 (Figure 1).



**Figure 1:** Correlation between Lund kennedy score (DNE) and Lund mackey score (CT).

**Discussion**

An essential component of the rhinologic examination carried out by otolaryngologists in the assessment of sinonasal disease is diagnostic nasal endoscopy. In order to confirm our clinical diagnosis, it is required to evaluate the patient by combined approach of diagnostic nasal endoscopy and CT nose and paranasal sinuses. Both approaches contribute and work synergistically in studying the sinonasal area by making more precise and peculiar information about the disease and sinus anatomy and its variations.

In a study conducted by Hamdani et al they found that out of 104 patients, 92 (88.46%) patients had DNS which was in accordance with our study (86.66%)<sup>9</sup>. In a similar work done by Chakraborty et al<sup>10</sup> out of 82 patients, 70 (85%) patients had DNS and, in another study, conducted by Sreekavya et al<sup>11</sup> found similar observation in which out of 100 patients 84% patients had DNS. However, Baruah et al<sup>8</sup> reported 60% of DNS in their study.

In a study conducted by Sreekavya et al<sup>11</sup> showed that 75% patients had ITH. In a similar study conducted by Chakraborty et



al<sup>10</sup> found that 67% patients had ITH. Our study found that out of 60 patients, 30 (50%) patients had ITH. However, Hamdani et al<sup>9</sup> showed that only 25% patients had ITH on DNE which had similar observation in a study conducted by Baruah et al<sup>8</sup> which reported 23.3% of ITH in their study.

In a study conducted by Baruah et al<sup>8</sup> it was found that 61% patients had polyp. Another study reported 31% of patients showed polyp on DNE. In our study we found that out of 60 patients 30 (50%) patients had polyp. However, in a study conducted by Chakraborty et al<sup>10</sup> reported only 4.8% polyp in their study. Hamdani et al showed 16% patients had polyp in their study.

In our study CT and DNE was able to diagnose DNS equally in 86% and 81% patients whereas variation exists in the other studies which showed DNE more than CT. In a similar study conducted by Baruah et al<sup>8</sup>, DNS was found in 60% on DNE and 46.67% on CT scan. Baruah et al<sup>8</sup> found that polyp was found in 61% on DNE however 45% on CT scan, however in a study conducted by Tyagi et al<sup>12</sup> polyp was found in 26.5% on DNE and 31.25% on CT scan. In our study polyp was seen in 50% on DNE and 41.66% on CT scan. These variations may be because of individual variations in observing the DNE and also variations during the CT scan reporting.

In our study paradoxical bent was seen in 6.66% of patients on CT scan. However, Baruah et al<sup>8</sup> showed 16.9% of patients had paradoxical bent which was in accordance with a study conducted by Tyagi et al<sup>12</sup> which showed 16.25% of patients had paradoxical bent. The high incidence of concha bullosa may be because of hypertrophied mucosa of middle turbinate seen as concha bullosa on DNE. In all these studies it was shown that paradoxical bent was more with DNE finding as compare CT scan.

Sreekavya et al<sup>11</sup> reported 48% patients had concha bullosa on endoscopic examination. In another study by Baruah et al<sup>8</sup> found concha bullosa in 31.1%. However, in a study conducted by Chakraborty et al<sup>10</sup> they found concha bullosa in only 9.7% patients. In our

study we found concha bullosa in 26% patients which was in accordance with Hamdani which showed 25% patients had concha bullosa<sup>9</sup>.

The mean LUND Kennedy score was  $6.383 \pm 2.256$  and mean LUND Mackey score was  $12.75 \pm 4.037$ . A significant ( $p=0.0002^{***}$ ) positive correlation between the LUND Kennedy and LUND Mackey score was found in our study indicated by the Pearson's correlation coefficient ( $r$ ) of 0.4651 which was in accordance with a study conducted by Deosthale et al<sup>13</sup> who concluded that high degree of correlation was found between Lund Mackey CT score and Lund Kennedy Endoscopy score with  $p$  value  $\leq 0.05$  which showed statistical significance.

### Conclusion

To study to pathology of nasal cavity such as oedematous mucosa, early polypoidal changes in mucosa can be better assessed by endoscopy. Also, Diagnostic nasal endoscopy is outpatient procedure and avoids radiation exposure of CT scan. CT nose and paranasal sinus on the other hand helps to provide information regarding sinus involvement and various anatomical variations which could be missed out by nasal endoscopy. The mean endoscopic score is showing significance with CT score, that provides information that if there is disease in the nose seen on endoscopy, chances of finding disease in sinus are also high on CT scan. This information can be very useful in hilly and remote areas of Himachal where radiology facility is not well developed. Hence treatment can be given on endoscopic basis also with subject to surgery in unsuccessful medically treated patients.

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