Section: Otorhinolaryngology

Original Research Article

A COMPARATIVE OUTCOME EVALUATION OF DIAGNOSTIC NASAL ENDOSCOPY AND COMPUTED TOMOGRAPHY SCAN OF NOSE AND PARANASAL SINUSES IN CHRONIC RHINOSINUSITIS: A CROSS-SECTIONAL STUDY

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Abstract

Background: Chronic rhinosinusitis (CRS) has a broad and vague symptomatology. Thus, attempts to diagnose it with symptomatology alone are futile. Computed Tomography (CT) used for diagnosing it is costly and also exposes the patient to radiation hazards. Diagnostic nasal endoscopy (DNE) is a simple tool for diagnosing it. The available literature that compares the two modalities on the diagnosis of CRS offers variable opinions. So, in order to supplement the concerned literature, we conducted this study to assess the effectiveness of DNE in evaluating the validity of CRS when compared to CT of the nose and paranasal sinuses (PNS). The objective is to evaluate the diagnostic outcome of DNE in diagnosing CRS compared to NCCT in terms of Sensitivity, Specificity and Predictive values. **Materials and Methods:** A hospital-based cross-sectional study was done in JNIMS, Imphal during July 2022 – June 2024 among 78 adult patients suggestive of CRS. Data were collected by using a semi-structured proforma which had sections on socio-demography, clinical examination and laboratory findings. Each participant was subjected to DNE on the same day of his/her non-contrast CT evaluation of nose and PNS in 0.6mm thin cuts in coronal, axial and sagittal planes and both in bone-window and soft-tissue window were obtained. DNE was done using 0◦/30◦, 4mm diameter, 18cm length rigid nasal endoscope under local anaesthesia using nasal pack soaked in solution made up of topical 4% lignocaine(30ml) and vasoconstrictor agent (3ml of adrenaline) in 1:10000 concentration by an otorhinolaryngologist. **Result:** From 78 participants (M:F=35:43) with mean age (SD) 36.9 (13.01) years about half of them belonged to age group of 18-30 years (33;42.3%). Symptomatically all patient presented with nasal obstruction and nasal discharge. Facial pain, headache and hyposmia were also found in 58 (74.4%), 55 (70.5%) and 25 (32.2%) respectively. Both DNE and NCCT findings of nose and paranasal sinuses were depicted and compared, of which inferior turbinate hypertrophy was detected in 68 (87.2%). Deviated nasal septum (DNS) was detected in 66 (84.6%) by DNE whereas 65 (83.3%) was detected in NCCT. Passali deformity was seen in 29.5% of cases on NCCT. **Conclusion:** Compared to NCCT, the sensitivity of DNE in diagnosing CRS was 93.9%, specificity was 75%, positive predictive value was 95.3%, negative predictive value was 69.2% and diagnostic accuracy was 91.0%. Hence endoscopy can effectively be the initial diagnostic modality suggest rhinosinusitis and the baseline pictures can serve as documentation to see for treatment outcomes in follow up visits. Further it can reduce unnecessary CT scan radiation exposure.

INTRODUCTION

Chronic rhinosinusitis (CRS) is a common global disease that hampers the overall quality of life and affects approximately 5–15% of the general population worldwide.[1] According to the National Institute of Allergy and Infectious Diseases, it is estimated that, 134 million Indians (≈12.5% of the population) suffer from CRS.[2] CRS can be broadly defined as chronic (>12 weeks duration) inflammatory condition of nose and paranasal sinuses mucosa associated with polyp (CRSwNP) or without nasal polyposis (CRSsNP) and it should be recognized irrespective of treatment status.[3] This disease entity has a broad and vague symptomatology. Thus, attempts to diagnose it with symptomatology alone are futile.[4] There have been infrequent amendments in the defined diagnostic criteria for CRS, and the most updated and widely followed and internationally accepted are the recent recommendations for diagnosis of CRS made on clinical grounds listed in The European position paper on rhinosinusitis and nasal polyp (EPOS) taking into accounts both subjective and objective parameters of more than a 12-weeks duration.[5]

To evaluate the objective components of CRS diagnosis, the computed tomography (CT) scan and diagnostic nasal endoscopy (DNE) play important roles. CT is costly and also exposes the patient to radiation. Thus, it is particularly important to define a cost-effective and easily available diagnostic tool for it. The available literature that compares the two modalities on the diagnosis of CRS offers variable opinions. So, in order to supplement the concerned literature, we conducted this study to assess the effectiveness of DNE in evaluating the validity of CRS when compared to CT of the nose and PNS.

MATERIALS AND METHODS

A cross-sectional study was conducted in the Department of Otorhinolaryngology in a tertiary care teaching hospital, Jawaharlal Nehru Institute of Medical sciences, Imphal from July 2022 to June 2024 among patients aged 18-65 years. Patients who were provisionally diagnosed as CRS based on the EPOS Criteria and also patients with history of allergic rhinitis with polypoidal changes and/or obstructing sinus ostia were the study participants. Patients unwilling to participate, pregnant or lactating mothers and patients with previous history of sino-nasal surgeries, chronic/uncontrolled severe asthma and immunocompromised patients, autoimmune disorders, or suffering from any severe acute diseases, heart diseases, COPD, chronic renal failure, malignant hypertension or any other chronic medical diseases were excluded. Taking proportion of chronic rhinosinusitis as 72% (Chavan A et Al[6]) with precision of 10% and alpha of 1.96, a sample size of 78 was calculated. Patients were recruited consecutively until the desired sample size was reached. Ethical clearance for the study was obtained from the Institutional Ethical Committee, JNIMS.

Data were collected by using a semi-structured proforma which had sections on socio-demography, clinical examination and laboratory findings. Each participant was subjected to DNE on the same day of his/her non-contrast CT evaluation of nose and PNS. CT scan was performed in 0.6mm thin cuts in coronal, axial and sagittal planes and both in bone-window and soft-tissue window were obtained. DNE was done using 0◦/30◦, 4mm diameter, 18cm length rigid nasal endoscope under local anaesthesia using nasal pack soaked in solution made up of topical 4% lignocaine (30ml) and vasoconstrictor agent (3ml of adrenaline) in 1:10000 concentration by an otorhinolaryngologist.

Through DNE the diagnosis of CRS was confirmed by presence of mucopurulent discharge from sinuses into the middle meatus, superior meatus and spheno-ethmoidal recess, and blockage of the natural ostium of one or more sinuses by edema or polyps. Confirmation of CRS by NCCT was done by presence of blockage of natural ostia of ≥1 sinuses in the PNS and complete or partial opacification. [Figure 1- 4]

Figure 1: Endoscopic view of muco-purulent discharge in (L) middle meatus

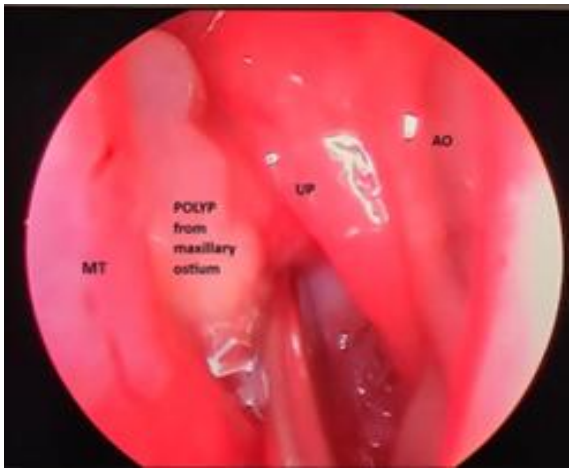

Figure 2: Endoscopic view of antral polyp in (L) middle meatus

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Figure 3: NCCT scan showing partial obstruction of (L) maxillary sinus

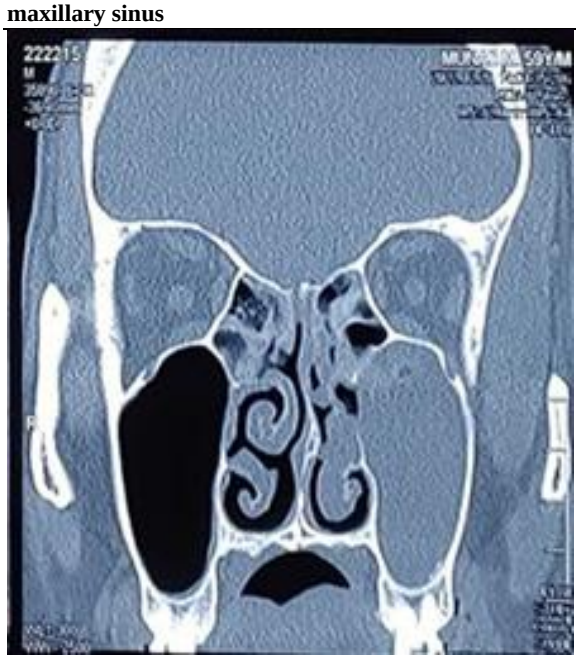

Figure 4: NCCT scan showing complete opacification of (L) maxillary sinus

Data collected were entered and analyzed by using SPSSv.23 Windows (IBM Corp. 1995,2012). Sensitivity, specificity, positive predictive value, negative predictive value of DNE were calculated taking NCCT as the gold standard P-value <0.05 was taken as statistically significant.

RESULTS

Completed data-sets could be obtained from 78 participants (M: F=35:43). Their mean age (SD) was 36.9 (13.01) years. Nearly half of them belonged to the age-group of 18-30 years (33; 42.3%).

All patients presented with nasal obstruction and nasal discharge. Facial pain, headache and hyposmia were also found in 58 (74.4%), 55 (70.5%) and 25 (32.2%) respectively. The DNE findings are depicted as given in Table No. 1. Out of 78 patients, inferior turbinate hypertrophy, polyp, secretion, concha bullosa, bulla ethmoidalis and accessory ostium were present in 87.2%, 65.4%, 100%, 32.1%,93.6% and 12.8% respectively.

Table 1: Distribution of the patients by DNE findings (N=78)

DNE findings	No. of patients, n (%)			
	Absent	Present		
Inferior turbinate hypertrophy	10 (12.8)	68 (87.2)	Right	7 (9.0)
			Left	11 (14.1)
			Bilateral	50 (64.1)
Polyp	27 (34.6)	51 (65.4)	Right	8 (10.3)
			Left	11 (14.1)
			Bilateral	32 (41.0)
Secretion	-	78 (100)	Right	1 (1.3)
			Left	1 (1.3)
			Bilateral	76 (97.4)
Concha bullosa	53 (67.9)	25 (32.1)	Right	11 (14.1)
			Left	5 (6.4)
			Bilateral	9 (11.6)
Bulla ethmoidalis	5 (6.4)	73 (93.6)	Right	2 (2.6)
			Left	0 (0)
			Bilateral	71 (91.0)
Accessory ostium	68 (87.2)	10 (12.8)	Right	7 (9.0)

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			Left	1 (1.3)
			Bilateral	(2.5)

Table 2: Distribution of the patients by NCCT findings (N=78)

NCCT findings	No. of patients, n (%)			
	Absent	Present		
Concha bullosa	54 (69.2)	24 (30.8)	Right	8 (10.3)
			Left	1 (1.3)
			Bilateral	15 (19.2)
Agger nasi cell	3 (3.8)	75 (96.2)	Right	0 (0)
			Left	2 (2.6)
			Bilateral	73 (93.6)
Bulla ethmoidalis	-	78 (100)	Right	0 (0)
			Left	0 (0)
			Bilateral	78 (100)
Onodi cells	54 (69.2)	24 (30.8)	-	-
Pneumatized uncinate process	74 (94.9)	4 (5.1)	Right	3 (3.8)
			Left	0 (0)
			Bilateral	1 (1.3)
Haller cells	71 (91.0)	7 (9.0)	Right	6 (7.7)
			Left	0 (0)
			Bilateral	1 (1.3)
Pneumatized septum	77 (98.7)	1 (1.3)	-	-
Paradoxical middle turbinate	74 (94.9)	4 (5.1)	Right	3 (3.8)
			Left	1 (1.3)
			Bilateral	0 (0)
Interfrontal sinus septum cell	64 (82.1)	14 (17.9)	-	-
Inferior turbinate hypertrophy	10 (12.8)	68 (87.2)	Right	6 (7.7)
			Left	10 (12.8)
			Bilateral	52 (66.7)

Out of the 78 patients, inferior turbinate hypertrophy, polyp, secretion, concha bullosa, bulla ethmoidalis and accessory ostium were present in 87.2%, 65.4%, 98.7%, 32.1%, 93.6% and 12.8% respectively. [Table 2].

Both DNE and NCCT could detect inferior turbinate hypertrophy in 68 (87.2%) of all the patients. Deviated nasal septum was detected in 66 (84.6%) of patients by DNE whereas, it could be detected by NCCT in 65 (83.3%) of patients. Passali deformity, a combination of deformities, was commonly seen in 29.5% of cases on NCCT. Mild deviation in the vertical plane and C- or reverse C-shaped septum were also commonly seen in 16.7% of cases each. The majority of patients with Passali deformity were in the age group of 18-30 years. The majority of patients with mild deviation in the vertical plane were in the age group of 41-50 years.

Enlargement of Agger nasi cell could be seen in 22 (28.2%) of patients by DNE while NCCT could detect it in 75 (96.2%) of patients. DNE could detect concha bullosa in 25 (32.1%) of patients. Same condition could be detected in 24 (30.8%) of patients by NCCT. Bulla ethmoidalis could be seen in 73 (93.6%) of patients by DNE whereas, it could be detected in all patients by NCCT. Paradoxical middle turbinate could be seen in 06 (7.7%) patients by DNE while NCCT could detect it in 04 (5.1%) of patients. Further, DNE could diagnose enlarged uncinate process in 15 (19.2%) of patients. The same condition could be detected in 04 (5.1%) patients by NCCT. DNE could diagnose Chronic rhinosinusitis (CRS) in 65 (83.3%) of patients whereas, NCCT could confirm it in 62 (93.9%) of patients. The sensitivity of DNE in diagnosing CRS was 93.9%, specificity was 75%, positive predictive value was 95.3%, negative predictive value was 69.2% and diagnostic accuracy was 91.0%.

DISCUSSION

The study included a total of 78 patients who were suspected of having chronic rhinosinusitis (CRS). Out of which 35 (44.9%) were males and 43 (55.1%) were females. Earlier studies done by Chakraborty P et al,[7] Idugboe et al,[8] Nangia S et al,[9] Amine M et al,[10] Lohiye SS et al,[11] and Deosthale et al,[12] both in the country and abroad give comparable findings. In the present study, the mean age of the study population was found to be 36.90 ± 13.01 years and the age group 18 - 30 years had the maximum number of patients (42.3%). Similar findings were observed by other scholars.

In this study, all the patients presented with nasal obstruction and nasal discharge, 74.4% of the patients presented with facial pain followed by 70.5% of the patients with headache. Most of the studies done earlier by different scholars had similar observations. On diagnostic endoscopy examination of all 78 patients, inferior turbinate hypertrophy, polyp, secretion, concha bullosa, bulla ethmoidalis and accessory ostium were seen in 87.2%, 65.4%, 98.7%, 32.1%, 93.6% and 12.8%, respectively in the current study. DNS was present in 84.6% of the patients. Right side deviation, left side deviation and S shaped deviation were seen in 29.5%, 25.6% and 29.5% of the patients. Further, 14.1% of the patients had bilateral enlargement of Agger nasi cell and 11.5% of the patients had enlarged right side followed by 6.5%

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of the patients with enlarged left of Agger nasi cell. Out of 78 patients, 7.7% of the patients had paradoxical middle turbinate. 5.1% had in the right and 2.6% had in the left. Further on DNE examination of OMC it was found that maximum of the patient had ostium blocked by bilateral polyp (34.6%) followed by bilateral mucopurulent discharge in 14.1% of the patient. Similarly, the maximum number of the patient had normal sphenoethmoidal recess (43.6%) and bilateral polyp blocking the ostium, bilateral ostium blocked by mucosal edema and bilateral mucopurulent discharge were few common findings on DNE. Bilateral polyp blocking the ostium was found in 33.3% of the study population on DNE examination of superior meatus and normal superior meatus was seen in 30.8% of the patients. Mucopurulent discharge on the right (7.7%), ostium blocked by polyp on the left (7.7%) and bilateral mucopurulent discharge (7.7%) were few common findings on DNE of superior meatus. Chakraborty P et al,[7] observed DNS in 85.36%, secretion/discharge in 87.8% and inferior turbinate hypertrophy in 67.1% on DNE examination of their study population which is similar to this study finding. Further they reported polyp and concha bullosa in only 4.8% and 9.7% of their study population, respectively. Chavan A et al,[6] reported DNS in 80%, inferior turbinate hypertrophy in 66%, nasal polyp in 28%, OMC block in 52%, Agger nasi cell in 16% and paradoxical middle turbinate in 30% on DNE examination of their study population. Nangia S et al,[9] reported 100% paradoxical middle turbinate and 32% mucopurulent discharge in the middle meatus on DNE examination among their study population. Lohiya SS et al,[11] reported oedematous mucosa in 39 % subjects, discharge in middle meatus in 47 %, 27 % subjects having polyps among their study population on endoscopy. In addition, they reported septal deviation in 79%, agger nasi in 35%, paradoxical middle turbinate in 28%, concha bullosa in 28%, accessory maxillary ostium in 21%, uncinate process hypertrophy in 16% and enlarged bulla ethmoidalis in 4% on endoscopy. Deosthale NV et al,[12] reported on nasal endoscopy they observed polyp in 24.1%, mucopurulent discharge with polyp in 11.1%, polyp with deceased mucosa and mucopurulent discharge in 14.8%, diseased mucosa in 9.2% and mucopurulent discharge with diseased mucosa in 9.2%. The most common endoscopy finding was nasal discharge (73.3%), deviated nasal septum (71.7%), nasal polyp (70%), and the paradoxical medial turbinate (25%) as observed and reported by Hussein RK et al,[13] among their study population. Another study reported middle meatal discharge in 56.7%, middle meatal mucosal oedema in 38.3%, polyps in 32.5% and anatomical variation in 20.8%.[14] Similar finding has been reported by Krishniya P et al,[15] on DNE, DNS was seen in 64%, inferior turbinate hypertrophy was identified in 30% patients, pneumatized middle turbinate or concha bullosa was seen in 28% of patients, paradoxically curved middle turbinate was seen in 14% and an accessory ostium was seen in 26% of the patients. Al Shamy H et al,[16] reported polyp in 91.7%, discharge in 25% and edema in 50% of their study population. Debbarma A et al,[17] reported 88% DNS on endoscopy, 36% secretion, concha bullosa hypertrophy in 44%, middle turbinate paradoxical 6% and inferior turbinate hypertrophy in 44%. Thus, most of the studies reported DNS, inferior turbinate hypertrophy, concha bullosa and polyp on DNE which is in line with this study finding.

In this study, NCCT detected DNS in 83.3% of the patients. Out of which Passali deformity, a combination of deformities (29.5%) was commonly reported. Mild deviations in vertical plane and C or reverse C shaped septum were also commonly seen in 16.7% and 16.7% respectively. Further on NCCT scan, inferior turbinate hypertrophy, polyp, secretion, concha bullosa, bulla ethmoidalis and accessory ostium were present in 87.2%, 65.4%, 98.7%, 32.1%, 93.6% and 12.8% respectively. Similar uncinate process was seen in left and right side with maximum free (51.3%), lamina papyracea in 28.2%, middle turbinate in 15.4% and skull base in 5.1%. Frontal cell was present in 85.9% of the patients in both right and left, out of which, Supra Agger cell was maximum with 48.7% in both right and left. Chakraborty P et al,[7] observed 92.6% DNS in NCCT among their study population. In addition, they reported polyp nasal cavity in 10.9%, inferior turbinate hypertrophy in 57.3%, concha bullosa in 30.4% and paradoxical middle turbinate in 14.6% of the patients. Chavan A et al,[6] reported 84% DNS in NCCT, inferior turbinate hypertrophy in 60%, concha bullosa in 44%, OMC block in 60% and paradoxical middle turbinate in 16%. Lohiya SS et al,[11] reported 79% DNS, 27% nasal polyp, 21% accessory maxillary ostium, 41% Agger nasi, 32% concha bullosa, 30% paradoxical middle turbinate, 16 % pneumatized uncinate process, 8 % over-pneumatized ethmoid bulla, 7 % Haller cells, 3% Onodi cells. Further they reported 60.5% patient had ostiomeatal complex opacification, 62.25% maxillary sinus haziness, 54.5% anterior ethmoid sinus haziness, 32.25 % posterior ethmoid sinus haziness, 24.5 % frontal sinus haziness and 19.75% sphenoid sinus haziness. Thus, maximum of the studies demonstrated the common findings in NCCT as DNS, inferior turbinate hypertrophy, nasal polyp, agger nasi cell, concha bullosa and paradoxical middle turbinate which is in line with this study finding.

In the current study 83.3% of the patients were diagnosed with CRS on DNE examination and 84.6% of the patients were diagnosed with CRS on NCCT examination. On further analysis, maximum of the patient in NCCT diagnosed CRS were also DNE diagnosed CRS. Thus, there was a significant association between NCCT diagnosed CRS group and DNE diagnosed CRS group. Further, the sensitivity of DNE in diagnosing CRS was 93.9%, specificity was 75%, positive predictive value was 95.3%, negative predictive value was 69.2% and

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diagnostic accuracy was 91.0%. Most of the endoscopy positive patients of CRS were NCCT positive. CRS. Krishniya P et al,[15] reported 84% CRS by DNE and 88% CRS by CT scan. They also reported the sensitivity of endoscopy was 93.18% and the specificity was 83.33%. Positive predictive value of DNE was 97.62% and negative predictive value was 62.50%. Most of the endoscopy positive patients of CRS were CT positive. There was significant association in diagnosis of CRS on basis of endoscopic score and CT score which is similar to this study finding.

CONCLUSION

Compared to NCCT, the sensitivity of DNE in diagnosing CRS was 93.9%, specificity was 75%, positive predictive value was 95.3%, negative predictive value was 69.2% and diagnostic accuracy was 91.0%. Hence endoscopy can effectively be the initial diagnostic modality suggestive of rhinosinusitis and the baseline pictures can serve as documentation to see for treatment outcomes in follow up visits. Further it can reduce unnecessary CT scan radiation exposure.

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