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ORIGINAL ARTICLE

EFFECTIVENESS OF NASAL ENDOSCOPY AND C.T. SCAN OF NOSE AND PARANASAL SINUSES IN DIAGNOSING SINO-NASAL CONDITIONS

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ABSTRACT: Objective: To assess the effectiveness of Nasal Endoscopy in diagnosis of sinonasal conditions and to correlate it with Computed Tomography of nose and Paranasal Sinuses**. STUDY DESIGN**: Cross sectional study**. SETTING:** Tertiary Rural Health Institute. **DURATION OF STUDY**: 2 years. **MATERIALS AND METHODS:** Diagnostic Nasal Endoscopy and Computed Tomography of nose and Paranasal Sinuses were studied in 122 patients, who presented with various sinonasal complaints to ENT OPD and results were statistically analyzed. **RESULTS:** Mean age of the study population was 35.48 years (SD= 16.15) with male predominance. Headache (77.04%) and nasal obstruction (75.40%) were the commonest presenting symptoms. Out of 122 patients, Computed Tomography scan (CT scan) diagnosed 102 patients of sinonasal pathologies whereas Diagnostic Nasal Endoscopy (DNE) diagnosed it in 94 patients with good correlation between the two and Kappa Coefficient is 0.691. Most commonly encountered sinonasal pathology was chronic Rhinosinusitis diagnosed in 80 patients on CT scan and in 70 patients on DNE. **CONCLUSION:** CT scan is good in diagnosing pathologies related to paranasal sinuses while DNE is good in diagnosing nasal pathologies. Both the diagnostic modalities are complementary to each other in making accurate diagnosis of sinonasal conditions.

KEYWORDS: Sinonasal conditions, Diagnostic Nasal Endoscopy, Computed tomography.
MESH TERMS: Paranasal sinuses, Nasal polyps, Nasal septal perforation, Ethmoid sinusitis.

INTRODUCTION: In Medicine, diagnosis is an important aspect to have a clue to cure. The diagnosis is based on clinical history of nasal disease and physical examination. However many complementary tests are required to come to the final diagnosis. Functional Endoscopic Sinus Surgery has popularized the use of nasal endoscope in sinus surgery and has emphasized the importance of nasal endoscopy and Computed Tomography in evaluation of diseases of the nose and paranasal sinuses.

Routine use of nasal endoscope and Computed Tomographic Scanning (C.T Scan) of nose and paranasal sinuses have opened new vistas in peeping into the inaccessible areas and niches of fronto-ethmoidal complex, spheno-ethmoidal recess and sphenoid sinuses. Small lesions and/or anatomical variants undetected clinically and by conventional radiography can be picked up by nasal endoscopy and C.T scan Nose and PNS.

To know the location and extent of the disease, for confirmation of the diagnosis and for deciding treatment strategies, it is always necessary to have more objective methodology or investigative modality. Computed Tomography Scan (CT scan) and Diagnostic Nasal Endoscopy (DNE) play a vital role in day to day assessment and management of all sinonasal pathologies. Both

the investigations have their own merits and demerits. This study will help in having an insight into necessity, if either of two or both in combination is required in diagnosis of sinonasal pathologies.

OBJECTIVE: To assess the effectiveness of Diagnostic Nasal Endoscopy and CT Scan Nose and Paranasal sinuses in diagnosing Sinonasal conditions.

MATERIALS AND METHODS: This was a cross sectional study conducted in the Department of Otorhinolaryngology, of Tertiary Health Care Hospital and Medical Institute, carried out for the period of 2 years after obtaining approval from Institutional Ethical Committee. Every consecutive patient having sinonasal problem, presented with nasal obstruction, nasal discharge, nasal mass, bleeding from nose, facial pain, headache and olfactory disturbances due to nasal cause and having age more than 10 years were included in the study.

Patients having acute rhinosinusitis, pregnant women and those who underwent nasal surgery previously were excluded from the study. Written informed consent was taken before enrollment of patients into the study. Separate consent was taken for DNE explaining risks of anesthesia and the procedures. After detail history, clinical examination and routine laboratory investigations, cases were subjected to Diagnostic Nasal Endoscopy (DNE) and Computed Tomography (CT) of Nose and Para Nasal sinuses on the same day.

In the present study for performing Diagnostic Nasal Endoscopy, we used 0^0 and 30^0 rigid nasal endoscope made by Scholley (Germany). After testing the patient for lignocaine sensitivity, Diagnostic Nasal Endoscopy was performed with patient in supine position and head elevation by 20^0 turned towards the examiner standing on the right side of the patient. Under local anesthesia, Diagnostic Nasal Endoscopy was performed using the standard three pass technique as described by Kennedy.[1]

Plain CT scan nose and PNS was done in all enrolled cases and contrast was done whenever indicated. Scanning was done on Toshiba Spiral CT scanner. Patient's position was supine with head extension. Patient in whom head extension was contraindicated due to cervical spondylosis, gantry tilt was suitably adjusted. Angulation was perpendicular to hard palate for coronal section and parallel to hard palate for axial sections.

Extent of sections was taken from nasion to posterior extent of sphenoid for Coronal cuts and from hard palate to upper margin of Frontal sinus for axial cuts. Thickness of sections was 3 mm at Osteomeatal Complex and for rest of structures, 5mm with same shift to get continuous sections. CT scan was done for both bony and soft tissue windows. Reporting of CT scan was done by Senior Radiologist.

STATISTICAL ANALYSIS: The data from case record forms were tabulated in a Microsoft Excel spreadsheet. Data was then exported to Graphpad Quickcal software 2013 and Medcalc software version 12.7.7 for statistical analysis. Data was tabulated in 2x2 contingency tables and statistical tests were applied to calculate sensitivity, specificity, positive predictive value, negative predictive value and accuracy of Diagnostic Nasal Endoscopy considering CT scan as a gold standard in diagnosing Sinonasal conditions. The level of agreement between Diagnostic Nasal Endoscopy and CT scan nose and PNS was determined by calculating kappa statistics. Chi square test was used for analysis. P values <0.05 was considered statistically significant.

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RESULTS: Total 122 patients of sinonasal conditions were included in the study. The age of the patients ranged from 11 years to 76 years. Maximum patients were of age group 21-30 years (30.32%) with mean age of 35.48 years (SD=16.15). Male to female ratio in the study was 1.9:1.

Common presenting symptom of the patients was Headache (77.04%) followed by nasal obstruction (75.40%), nasal discharge (65.57%), altered sense of smell (46.72%). Other less common symptoms include facial pain (22.95%); nasal mass (18.85%) and nasal bleed (16.39%). Most of the patients in this study presented with multiple symptoms except for few who presented with a single complaint of headache only. Duration of symptoms ranged from few days to 6 years.

On clinical examination (on anterior and posterior rhinoscopy), commonest sign was bilateral inferior turbinate hypertrophy (48.36%) followed by congested nasal mucosa (45.08%) and purulent middle meatus discharge (42.62%). Other signs were sinus tenderness (39.34%), deviated nasal septum (37.70%), edematous nasal mucosa (31.14%), non-purulent nasal discharge (25.40%), pale nasal mucosa and polyps (15.57%) in decreasing order. And less common signs were middle turbinate hypertrophy (13.11%), nasal mass (11.47%), crusts in nasal cavity (5.73%), inferior turbinate atrophy (5.73%), adenoid hypertrophy (4.91%), maggots and middle turbinate atrophy (4.09%) followed by septal perforation (2.45%). Nasal Synechiae was seen in 1 patient.

As shown in Table No. 1, mucosal changes in nasal cavity were visualized only on DNE and not on CT scan. Edematous Nasal mucosa was seen in 46 patients (37.70%) while congested Nasal mucosa was seen in 28(22.95%) patients and pale nasal mucosa in 26 (21.31%) patients.

As shown in Table No. 2, mucosal changes in paranasal sinuses were detected only by CT scan and not on DNE. Maxillary sinus was most commonly affected Paranasal sinus in 80(65.57%) patients. Mucosal thickening in Anterior Ethmoid (60.66%), Frontal sinus (31.97%), Posterior Ethmoids (31.15%) and Sphenoid sinus (18.03%) was detected by CT scan in decreasing of frequency.

As shown in Table No. 1, Middle meatal discharge was visualized only on DNE (Fig No.1) and missed by CT scan. Mucopurulent middle meatal discharge was seen in 53 (43.44%) cases on DNE out of which 23 (18.85%) cases were unilateral and 30 (24.59%) were bilateral cases. Non purulent thick discharge was seen in 51(41.80%) cases on DNE out of which in 20 (16.39%) cases, it was unilateral and in 31 (25.40%) it was bilateral.

Table No.1 shows, Sinonasal pathologies which were diagnosed on DNE but not by C.T. Scan. Maggots and crusts in 6 (4.91%) cases, unilateral foreign body nose in 1 case (0.81%), unilateral nasal synechiae in 1(0.81%) case (Fig No. 2). Septal perforation was diagnosed in 5 cases by DNE but CT scan could diagnose it in 2 cases. Other conditions like inferior turbinate hypertrophy, inferior turbinate atrophy, middle turbinate hypertrophy, nasal mass, unilateral Rhinolith (Fig. No. 3) were diagnosed equally by both modalities. Unilateral nasal polyp was diagnosed in 5 cases by both DNE (Fig.4) and CT scan. Bilateral nasal polyps were detected in 20 (16.39%) cases by DNE and in 12 (9.83%) cases by CT scan and adenoid hypertrophy in 8 (6.55%) cases by DNE and in 6 (4.91%) cases by CT scan.

Out of 122 patients, DNE could diagnose sinonasal conditions in 94 patients while CT scan diagnosed 102 patients with Sino nasal conditions. Remaining 18 patients who presented with headache were diagnosed neither by DNE nor by CT scan. As shown in Table No. 3, some of the patients were having more than one Sino-nasal condition either as associated pathology or coexisting pathology and both the diagnostic modalities used in the study were able to diagnose them. If either

of these diagnostic modalities (i.e. DNE or CT scan) diagnose a patient with multiple Sino-nasal conditions, we took it as a single complete diagnosis for that patient and labeled as positive case. That means 102 patients out of 122 were diagnosed by CT scan and 94 by DNE. Chronic Rhinosinusitis was the commonest condition detected in 70(57.37%) patients on DNE and in 80(65.57%) patients by CT scan (Fig. No. 6) followed by DNS in 59(48.36%) and 62(50.81%) cases by DNE and CT scan respectively (Fig. No. 7)

Sensitivity of DNE with respect to CT scan nose and PNS in detecting sinonasal conditions was 90.20%, and specificity was 90%. Positive predictive value, negative predictive value and accuracy was 97.87%, 64.29% and 90.16% respectively. Correlation between the DNE and CT scan in detecting sinonasal pathologies was calculated and kappa coefficient was 0.691. It states that agreement between DNE and CT scan is good in diagnosing Sinonasal conditions with good correlation between the two. Chi square was 56.36 and p value was less than 0.001 which is statistically highly significant (Table No. 4).

DISCUSSION: Development of modern rigid endoscopy represents a major advancement in Rhinologic diagnostic capability. Nasal endoscopy involves evaluation of nasal and sinus passages with direct vision using a magnified high quality view. It serves as an objective diagnostic tool in evaluation of nasal mucosa, sinonasal anatomy and nasal pathology. Computed Tomography (CT) Scan is another invaluable tool for managing clinical decisions, and planning surgical strategies. 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 detecting sinonasal pathologies.

In the present study and those of Sheetal et al[2] and Zojaji et al[3], mean age of the study population and male: female ratio was almost same and comparable. Our study is also comparable with Sheetal et al[2] and Zojaji et al[3] studies in terms of common presenting symptoms which were headache and nasal obstruction.

Mucosal changes in the nasal cavity were visualized only on DNE and not by CT scan. Arun Kumar Patel et al[4] in his study of 92 patients, he found edematous/ polypoidal nasal mucosa in 66 cases (71.73%) out of which 40 (43.47%) cases were unilateral and 26 (28.26%) were bilateral. This differs from our study, where we found edematous nasal mucosa in 46 patients (37.70%). This variation is seen because polypoidal and edematous mucosa are clubbed together in Arun Kumar Patel et al[4]study, while we included polypoidal mucosa under the heading of nasal polyps.

Mucosal changes in paranasal sinuses were detected only by CT Scan. In the present study and studies done by Sheetal et al[2] and Zojaji et al,[3] Maxillary sinus was the commonly affected sinus and sphenoid sinus was the least affected sinus on CT Scan.

Inferior turbinate hypertrophy detected equally by both CT scan and DNE in 48.36% cases in the present study. Arun Kumar Patel et al[4] found it in 41.30% cases and Nagibhi et al[5] detected in 70.6% cases by CT scan and in 68.6 % cases on Endoscopic evaluation. Middle Turbinate hypertrophy was seen in 19.67% and 21.31% on DNE and CT scan respectively in our study which is similar to the study conducted by Zojaji et al[3]. Cause for middle and inferior turbinate hypertrophy in most of the cases was allergy.

We diagnosed Chronic Rhinosinusitis (CRS) according to recommendation of Task Force on rhinosinusitis.[6,7,8] Nasal endoscopy could diagnose Chronic rhinosinusitis in 70 (57.37%) patients and

CT scan diagnosed it in 80 (65.57%) patients. Kappa coefficient is 0.828 indicating good agreement between the two in diagnosing chronic rhinosinusitis with good correlation (82.8%).

In the studies conducted by Richard L Nass[9] and Kasapoglu et al,[10] correlation between DNE and CT scan was 90% and 87% respectively. Zojaji et al[3] detected 64.7% cases of CRS on CT scan and remaining 35.2% cases were having other sinonasal conditions. Neil Bhattacharya and Linda N. Lee[11] in their study concluded that addition of nasal endoscopy improves diagnostic accuracy of CRS and should be emphasized as an early diagnostic tool.

The reported prevalence of Deviated Nasal Septum varies widely. In the study conducted by Shahizon et al,[12] nasal endoscopy detected septal deviation in 25% cases and CT scan found it in 40% cases. Kasapaglu et al[10] and Jareoncharsri et al[13] diagnosed septal deviation in 41.9% and 72.3% cases respectively on DNE. In our study, association between DNE and CT scan in diagnosing Deviated nasal septum is statistically highly significant (p value less than 0.01) with Kappa coefficient 0.951.

This is comparable with the study done by Zojaji et al[3] (k=0.81).

In our study, both DNE and CT scan detected nasal mass in 8.19% patients. But DNE gives much better view of the lesion in respect to its surface, consistency, margins etc. While CT Scan was able to detect pathology in paranasal sinuses. Zojaji et al[3] found nasal mass in 9.8% and 7.8% patients on CT scan and DNE respectively with Kappa coefficient of 0.88 (k= 1 in our study).

All cases of Nasal Myasis were diagnosed only by Nasal Endoscopy. CT scan possess no diagnostic value in this condition. Similar was the case with Foreign Body nose and Nasal synachiae.

CT scan could diagnose Atrophic Rhinitis in 6 cases and DNE in 7 cases. CT scan missed 1 patient having early atrophic changes. Rhinolith was diagnosed equally with DNE and CT scan, but CT scan could also tell the size and posterior extent of rhinolith.

CONCLUSION: From the present study it is concluded that, DNE can prove to be better diagnostic modality in conditions like middle meatal secretions, atrophic rhinitis, nasal myasis, foreign body of nose, nasal polyps and to know the condition of nasal mucosa. While CT scan is better diagnostic tool to know the condition of sinus cavity and extent of the disease in sinuses. Diagnostic nasal Endoscopy and CT scan are complimentary to each other in diagnosing sinonasal conditions and are essential to plan for the management.

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Mucosal Changes And Pathological Conditions		**Diagnostic nasal Endoscopy N (%)**			**Computed Tomography findings N (%)**		
Septal Perforation		05 (4.09%)			02 (1.63%)		
Adenoids Hypertrophy		08 (6.55%)			06 (4.91%)		
Deviated nasal septum		59 (48.36%)			62 (50.81%)		
		U/L	**B/L**	**Total**	**U/L**	**B/L**	**Total**
Nasal Mucosa	Congested	00	28	28 (22.95%)	00	00	00 (0%)
	Pale	00	26	26 (21.31%)	00	00	00 (0%)
	Edematous	00	46	46 (37.70)	00	00	00 (0%)
Inferior Turbinate Hypertrophy		06	53	59 (48.36%)	06	53	59 (48.36%)
Inferior Turbinate Atrophy		00	07	07 (5.73%)	00	06	6 (4.91%)
Middle Turbinate Hypertrophy		00	24	24 (19.67%)	00	26	26 (21.31%)
Middle Turbinate Atrophy		0	07	07 (5.73%)	00	06	6 (4.91%)
Middle Meatal Discharge	Purulent	23	30	53 (43.44%)	00	00	00 (0%)
	Non-purulent	20	31	51 (41.80%)	00	00	00 (0%)
Polyps		05	20	25 (20.49%)	05	12	17 (13.93%)
Synechiae		01	00	01 (0.81%)	00	00	0 (0%)
Crusts		00	07	07 (5.73%)	00	00	0 (0%)
Maggots		00	06	06 (4.91%)	00	00	0 (0%)

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Nasal Mass	10	00	10 (8.19%)	10	00	10 (8.91%)
Rhinolith	01	00	01 (0.81%)	01	00	01 (0.81%)
Foreign Body	01	00	01 (0.81%)	00	00	0 (0%)

Table 1: Comparative findings of CT Scan and DNE in relation to Mucosal changes and pathological conditions in Nasal Cavity (n=122)

Mucosal thickening	**CT Scan PNS findings**		
	Unilateral N (%)	**Bilateral N (%)**	**Total N (%)**
Maxillary Sinus	40 (32.78%)	39 (31.97%)	80 (65.057%)
Anterior Ethmoid Sinus	25 (20.49%)	49 (40.16%)	74 (60.66%)
Posterior Ethmoid Sinus	19 (15.57%)	19 (15.57%)	38 (31.15%)
Frontal Sinus	25 (20.49%)	14 (11.48%)	39 (31.97%)
Sphenoid sinus	16 (13.11%)	06 (4.91%)	22 (18.03%)

Table 2: Mucosal Thickening in different Paranasal Sinuses on CT Scan (n=122)

Sino-Nasal Conditions	**Diagnosed by DNE(*)**	**%**	**Diagnosed by CT Scan(*)**	**%**
Chronic Rhinosinusitis	70	57.37%	80	65.57%
Deviated Nasal Septum	59	48.36%	62	50.81%
Nasal Mass	10	8.19%	10	8.19%
Atrophic Rhinitis	07	5.73%	06	4.91%
Adenoid Hypertrophy	08	6.55%	06	4.91%
Nasal Myiasis	06	4.91%	00	00%
Septal Perforation	05	4.09%	02	1.63%
Synechiae	01	0.81%	00	0.00%
Rhinolith	01	0.81%	01	0.81%
Foreign Body	01	0.81%	00	00%

Table 3: Sino-Nasal Conditions seen on DNE and CT Scan (n=122)

(*) Multiple responses allowed.

Sino-Nasal conditions	**CT SCAN +**	**CT SCAN -**	**TOTAL**
DNE +	92	02	94
DNE -	10	18	28
TOTAL	**102**	**20**	**122**

Table 4: Diagnosis of Sino-Nasal conditions by DNE and CT scan

Chi squared equals 56.36 with1 degree of freedom.
P value < 0.0001.
Kappa coefficient= 0.691.

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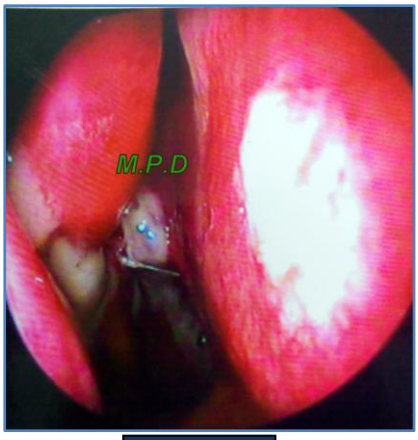

Figure 1

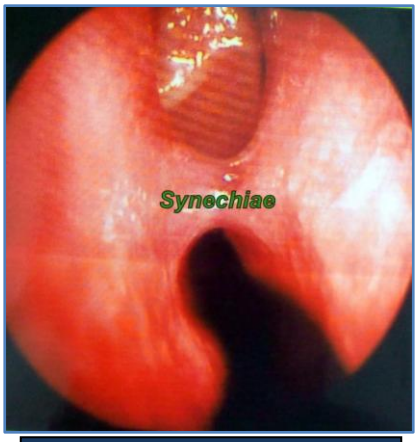

Fig. 2: Endoscopic view of right Nasal synachiae

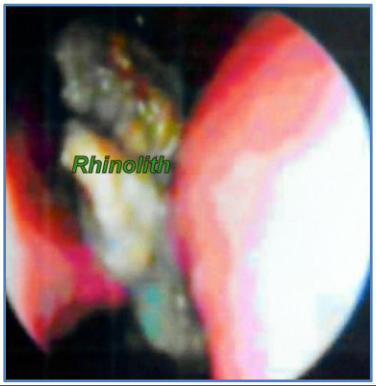

Fig. 3: Endoscopic view of Right Rhinolith

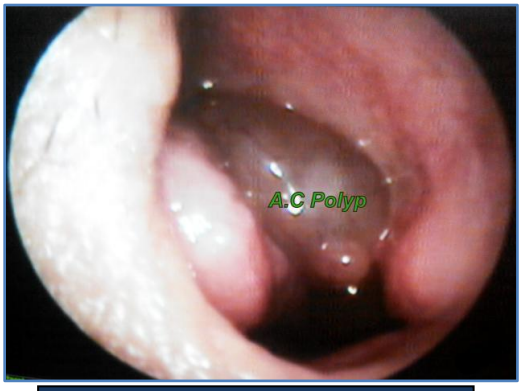

Fig. 4: Endoscopic view of Left Antrochoanal Polyp

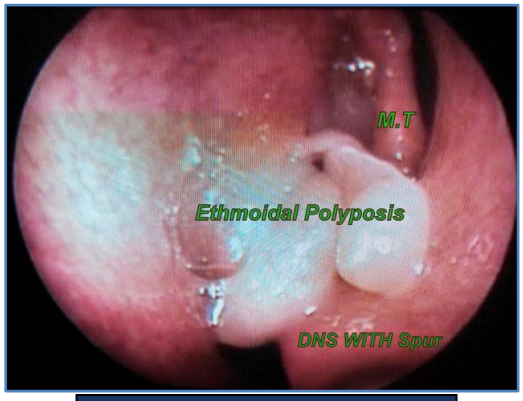

Fig. 5: Endoscopic view of Right Ethmoidal Polyp

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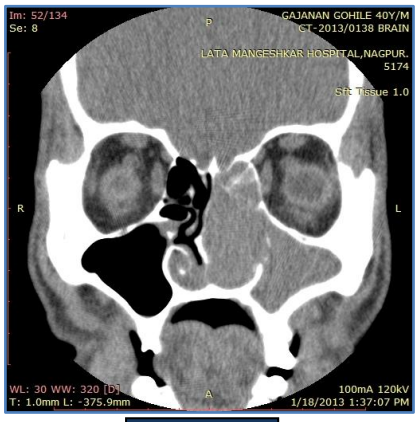

Figure 6

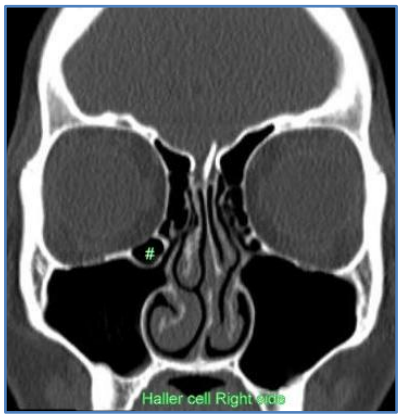

Figure 7

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