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A COMPARATIVE STUDY BETWEEN COMPUTED TOMOGRAPHY OF PARANASAL SINUSES AND DIAGNOSTIC NASAL ENDOSCOPY IN CASES OF CHRONIC NASAL OBSTRUCTION

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ABSTRACT **Chronic Nasal Obstruction** (CNO) is a highly prevalent complaint impacting patient quality of life and productivity globally. Accurate diagnosis of CNO requires defining cost-effective and precise tools. This study aimed to assess and compare the findings of **Diagnostic Nasal Endoscopy (DNE)** and **Computed Tomography Of Paranasal Sinuses (CT PNS)** in adult patients presenting with CNO. A cross-sectional study involving 75 adult patients with CNO lasting more than 12 weeks was conducted. All participants underwent both NCCT PNS and DNE, with the examiners blinded to the findings of the alternate modality. The majority of participants were male (73.3%) and belonged to the 15–30 years age group (54.7%). Unilateral nasal blockage was significantly more common (64.0%, $p = 0.015$). DNE excels as an outpatient procedure providing real-time visualization of mucosal changes, with congested mucosa (42.7%) and mucous discharge (50.7%) being common findings. CT PNS provided a comprehensive anatomical overview, revealing paranasal sinus haziness in 52.0% and osteomeatal complex opacification in 20.0%. The comparative analysis demonstrated that CT PNS was significantly superior in detecting certain deep anatomical variations, specifically septal deviations (61.3% vs. 52.0%, $p < 0.001$), accessory maxillary ostia (33.3% vs. 26.7%, $p < 0.001$), and abnormalities of the bulla ethmoidalis (34.7% vs. 13.3%, $p = 0.002$). Both DNE and CT PNS identified inferior turbinate hypertrophy comparably. The study reinforces that DNE should serve as the initial, cost-effective, non-radiating diagnostic modality, while CT PNS is indispensable for comprehensive preoperative planning and evaluation of complex or deep-seated sinonasal pathology, confirming their complementary roles in managing CNO.

KEYWORDS :

INTRODUCTION AND REVIEW OF LITERATURE

Chronic Nasal Obstruction and Diagnostic Modalities

Chronic nasal obstruction (CNO) is a prevalent complaint encountered by otolaryngologists, defined not as a disease itself but as the manifestation of an underlying disease. It is estimated to affect approximately 50 million people annually around the globe [1]. CNO significantly impacts a patient's quality of life, economic condition, and productivity. The potential causes of CNO are diverse can be divided into unilateral obstructions.

While the diagnosis of CNO has historically relied on clinical presentation and physical examination, modern techniques like Computed Tomography of Paranasal Sinuses (CT PNS) and Diagnostic Nasal Endoscopy (DNE) have revolutionized the diagnosis and management of these conditions.

Computed Tomography of Paranasal Sinuses (CT PNS)

CT PNS is a radiological investigation that provides both intracavitary and extra cavitary objective findings of the nasal cavity. CT accurately defines microanatomical locales in and around the osteomeatal complex (OMC) and identifies dangerous anatomical variants such as dehiscent Optic nerve canal and Carotid artery canal, making it an essential preoperative investigation for safe surgery planning.[2]

Advantages of CT PNS include high-resolution imaging that detects minor abnormalities. CT is essential for pre-surgical planning, particularly for Functional Endoscopic Sinus Surgery (FESS) and tumour excision. However, disadvantages include radiation exposure, cost, and limited ability to differentiate soft tissue abnormalities compared to MRI.

Diagnostic Nasal Endoscopy (DNE)

DNE is an outpatient department (OPD) procedure typically performed under local anaesthesia. It allows for a direct, well-illuminated, and magnified examination of the nasal cavity and nasopharynx, assessing both anatomy and function in real time. DNE is effective for visualizing local inflammation of the nasal mucosa [3]

Advantages include being minimally invasive, providing immediate, accurate diagnosis, guiding treatment planning, and being safe and quick. Limitations include potential mild discomfort, risk of minor bleeding, and the inability to assess the full extent of disease deep inside the paranasal sinuses or hidden areas like the sphenoid sinus.

MATERIALS AND METHODS

Aim And Objectives

AIM : To assess and compare the findings of Diagnostic Nasal Endoscopy (DNE) and CT PNS in adult patients with chronic nasal obstruction.

The **Objectives** were:

1. To assess the findings of diagnostic nasal endoscopy in patients with chronic nasal obstruction.
2. To assess the findings of CT PNS in chronic nasal obstruction.
3. Comparing both diagnostic modalities (DNE and CT scan) to reach the diagnosis of chronic nasal obstruction and correlate the findings of both modalities.

Study Design And Patient Selection

Study Design: Cross-sectional study design

Duration: 18 months (July 2023 to December 2024). Ethical approval was obtained from the Institutional Ethical Review Board (IERB), and all subjects provided signed informed consent.

The Source Of Data: ENT Outpatient Department of BRLSABVM Medical College and Hospital, Rajnandgaon.

Sample Size: 75.

Inclusion Criteria: patients with a complaint of nasal obstruction lasting more than 12 weeks, aged between 18 and 80 years, who had not responded to routine medical therapy.

Exclusion Criteria: patients with facial trauma or major sinonasal surgery in the last three months, those who could not undergo radiation exposure, individuals with gross facial anomalies, and patients unwilling to participate.

Study Procedure

Following ethical approval, participants underwent a detailed clinical history recording and a comprehensive ENT examination, including external inspection, anterior/posterior rhinoscopy, and functional tests. All participants underwent NCCT of the paranasal sinuses in axial and coronal planes with sagittal reconstruction using a GE 16 slice CT machine with a section thickness of 3 mm. The report was generated by a consultant radiologist who was explicitly blinded from

the nasal endoscopic findings.

Diagnostic Nasal Endoscopy (DNE): After applying topical anaesthesia (4% xylocaine), DNE was performed using Karl Storz 0° and 30°, 4mm rigid endoscopes by an Otorhinolaryngologist. The standard three-pass technique was utilized. Findings were recorded digitally and later reviewed by a consultant Otolaryngologist.

Statistical Analysis

Data was compiled in Microsoft Office Excel and exported to SPSS (version 22). Descriptive analysis was performed, and the mean and standard deviations were calculated. Statistical significance was predetermined at a probability value of 0.05 or less (95% Confidence Interval). Appropriate tests, including the Chi-square test were applied.

RESULTS AND OBSERVATIONS

Demographic And Clinical Profile

The total sample size was 75. The majority of participants were aged 15–30 years (54.7%), followed by those over 50 years (18.7%). The study exhibited a statistically significant male predominance, with males comprising 73.3% of the cohort, compared to 26.7% females ($p < 0.001$). A statistically significant majority resided in rural areas (68.0%, $p = 0.002$) and belonged to the Below Poverty Line (BPL) category (62.7%, $p = 0.028$).

Nasal blockage was the predominant chief complaint (70.7%). The duration of obstruction varied, with 50.7% experiencing symptoms for 3–6 months, and 45.3% experiencing them for 9 months or more, indicating the chronic nature of the condition. Unilateral nasal blockage was significantly more common, observed in 64.0% of participants, while 36.0% had bilateral blockage ($p = 0.015$).

Diagnostic Modality Findings

Diagnostic Nasal Endoscopy (DNE) Findings (Table 01): Endoscopy revealed that the nasal mucosa was congested in 42.7% and pale in 29.3%. Mucous discharge was the most common type (50.7%), followed by no discharge (45.3%). The nasal septum colour was normal in 53.3%. Key structural findings included normal adenoids in 98.7% and patent Eustachian tubes (ET) in 97.3%. Choanal abnormalities included mass (6.7%) and maggots (2.7%). Superior turbinate hypertrophy was present in 4%.

Table 01: Descriptive Statistics Showing Diagnostic Nasal Endoscopic Findings In Study Subjects

DNE		Frequency	Percentage
Colour of Mucosa	Normal	21	28.0
	Congested	32	42.7
	Pale	22	29.3
Discharge	Absent	34	45.3
	Mucous	38	50.7
	Purulent	3	4.0
Colour of Septum	Normal	40	53.3
	Congested	20	26.7
	Pale	15	20.0
Adenoid	Normal	74	98.7
	Hypertrophic	1	1.3
Opening of ET	Patent	73	97.3
	Blocked	2	2.7
Choana	NAD	68	90.7
	Mass	5	6.7
	Maggots	2	2.7
Superior Turbinates	Normal	72	96
	Hypertrophy	3	4

Computed Tomography (CT PNS) Findings (Table 02): CT scans indicated that paranasal sinus haziness was present in 52.0% of participants. Osteomeatal complex (OMC) opacification was observed in 20.0%. Bony walls were normal in 96.0%, with erosion noted in 4.0%. Anatomical variants, which are important for surgical planning, included the presence of Haller cells in 13.3% and Onodi cells in 2.7%.

Table 02: Descriptive Statistics Showing Computed Tomography Findings In Study Subjects

CT		Frequency	Percentage
Paranasal sinus Haziness	Present	39	52.0
	Absent	36	48.0
Osteomeatal complex opacification	Present	15	20.0
	Absent	60	80.0
Bony wall	Normal	72	96.0
	Eroded	3	4.0
Haller cell	Absent	65	86.7
	Present	10	13.3
Onodi cell	Absent	73	97.3
	Present	2	2.7

Comparative Analysis Of DNE And CT PNS Findings (table 03)

Table 03: Comparison Of Diagnostic Nasal Endoscopic And Computed Tomography Findings In Study Subjects

Findings		DNE	CT	p-value
Septum	Normal	25(33.3%)	16(21.3%)	<0.001
	Spur	10(13.3%)	12(16.0%)	
	Deviation	39(52.0%)	46(61.3%)	
	Perforation	1(1.4%)	1(1.4%)	
Accessory Maxillary ostium	Absent	55(73.3%)	50(66.7%)	<0.001
	Present	20(26.7%)	25(33.3%)	
Nasal Growth	Polyp	8(10.7%)	15(20.0%)	0.105
	Rhinosporidiosis	7(9.3%)	6(8.0%)	
	Others	5(6.7%)	8(10.7%)	
	None	55(73.3%)	46(61.3%)	
Concha Bullosa	Absent	61(82.4%)	56(74.7%)	0.250
	Present	14(17.6%)	19(25.3%)	

Table 04: Comparison Of Diagnostic Nasal Endoscopic And Computed Tomography Findings In Study Subjects

Findings		DNE	CT	p-value
Inferior Turbinate	Normal	37(49.3%)	35(46.0%)	0.570
	Hypertrophy	36(48.0%)	38(50.7%)	
	Atrophy	2(2.7%)	2(2.7%)	
Agger Nasi Cells	Absent	55(73.3%)	54(72.0%)	0.855
	Present	20(26.7%)	21(28.0%)	
Uncinate Process	Normal	45(60.0%)	51(68.0%)	0.309
	Medialized	30(40.0%)	24(32.0%)	
Bulla Ethmoidalis	Absent	65(86.7%)	49(65.3%)	0.002*
	Present	10(13.3%)	26(34.7%)	

Statistically Significant Finding.

The comparison revealed statistically significant differences ($p < 0.001$) favouring CT PNS in the detection of septal deviations and accessory maxillary ostia. CT also showed a statistically significant superiority in detecting abnormalities of the bulla ethmoidalis ($p = 0.002$). For superficial structures like the inferior turbinate and Agger nasi cells, the results were consistent between both modalities.

DISCUSSION

The findings of this study reinforce the principle that Diagnostic Nasal Endoscopy (DNE) and Computed Tomography of the Paranasal Sinuses (CT PNS) serve complementary, rather than mutually exclusive, roles in the evaluation of chronic nasal obstruction (CNO).

Demographic Context And Clinical Presentation

The study's demographic results, showing a majority in the 15–30 years age group (54.7%), align with previous reports noting increased chronic rhinosinusitis (CRS) symptoms in young adults, possibly linked to environmental or allergic predisposition. The significant male predominance (73.3%) observed is consistent with findings by Busaba et al., which suggested gender-linked differences in disease susceptibility, though other studies report a more balanced sex distribution[4]. The high rate of unilateral nasal blockage (64.0%) suggests that structural causes, such as deviated nasal septum (DNS) or nasal masses, were predominant underlying factors in this cohort.

Strengths Of DNE In Mucosal Assessment

DNE proved highly effective for identifying mucosal pathology, which is crucial for diagnosis. The high prevalence of congested mucosa (42.7%) and mucous discharge (50.7%) is typical of inflammatory conditions like CRS, consistent with findings reported by Fokkens et al [5]. The presence of pale mucosa (29.3%) suggests a notable underlying allergic component. DNE's ability to provide real-time, magnified visualization of the nasal cavity-an advantage that CT lacks-is reaffirmed by its utility in detecting even rare but clinically significant findings such as choanal masses (6.7%) and maggots (2.7%).

Furthermore, DNE was equally effective as CT in assessing visible structures like inferior turbinate hypertrophy and identifying septal spurs when they are prominent anteriorly.

Strengths Of CT PNS In Anatomical And Deep Pathology

CT PNS demonstrated superior sensitivity in evaluating bony anatomy and deep-seated structures, highlighting its necessity for comprehensive assessment. The finding that CT detected significantly more septal deviations (61.3% vs. 52.0%) confirms its advantage in assessing bony architecture.

Critically, CT significantly outperformed DNE in detecting abnormalities of the bulla ethmoidalis ($p = 0.002$). This difference is explained by the fact that posterior ethmoid structures are often hidden from endoscopic view. Similarly, CT identified nearly double the number of nasal polyps (20.0% vs. 10.7%). This supports the use of CT for evaluating the full extent of polypoidal disease, especially in posterior or high paranasal areas inaccessible to routine endoscopy.

The high incidence of paranasal sinus haziness (52.0%) and OMC opacification (20.0%) identified on CT strongly suggests underlying CRS pathogenesis in a significant portion of the patient population. Additionally, CT's unique capability to identify anatomical variants like Haller cells (13.3%) and Onodi cells (2.7%) makes it indispensable for surgical planning, as these structures can influence OMC obstruction or pose risks near vital neurovascular structures (optic nerve/carotid artery).

Conclusion On Diagnostic Strategy

The findings align with the consensus that combining DNE and CT PNS optimizes diagnostic accuracy. DNE serves as the most accessible, low-cost, and non-radiating initial diagnostic step, excelling at evaluating the mucosal status and dynamic anomalies in the anterior nasal cavity. However, for patients with persistent symptoms, inconclusive endoscopic findings, or those being considered for surgical intervention (FESS), CT remains the gold standard for identifying deep or complex anatomical variations and evaluating the extent of sinus pathology. A stepwise approach-DNE first, followed by CT in complex cases-ensures efficient resource utilization and effective diagnosis.

Conclusion And Future Perspective

Comparative analysis showed that CT holds higher sensitivity in detecting certain bony and deeper abnormalities, notably septal deviations, accessory maxillary ostia, and bulla ethmoidalis pathology. Therefore, a complementary approach is strongly supported, where DNE is the primary diagnostic tool due to its accessibility and low cost, while CT PNS is reserved for complex cases or surgical candidates. Future research should aim for larger multicentric studies to validate these findings and explore the long-term predictive value of combined DNE and CT findings on treatment outcomes.

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