European Journal of Clinical Pharmacy
PrintISSN:2385-409X**OnlineISSN**:3105-0409
Website: https://farmclin.com/

Comparison of CT scan and Nasal Endoscopy in Diagnosing Chronic Rhino sinusitis.

Article History:

Name of Author:
Muhammad Hafeez[1], Erum Habib[2], Siyyar Ahmad[3], Asif Ur Rehman[4], Sidra Ayub[5]

Affiliation: *[1]Associate professor department of ENT Khyber Medical college/Khyber teaching hospital Peshawar*
[2]Assistant professor Department of Radiology Nowshera Medical college, Nowshera
[3]Senior Registrar Pak International medical college Peshawar
[4]Lecturer Community Medicine Nowshera Medical College, Nowshera
[5]Department Anatomy Khyber Medical University, IBMS

Corresponding Author:
Dr. Erum Habib
Assistant professor Department of Radiology Nowshera Medical College, Nowshera
Email: drerumraza@gmail.com

Received: 02-09-2025
Revised: 06-10-2025
Accepted: 06-11-2025
Published: 10-11-2025

Abstract: ***Background:*** Chronic Rhinosinusitis (CRS) is a common inflammatory disorder affecting the paranasal sinuses and significantly impacts patients' quality of life. Accurate diagnosis is essential for effective management; however, clinical symptoms such as nasal obstruction, discharge, facial pain, and reduced sense of smell often overlap with other upper respiratory conditions. Diagnostic tools are therefore required to confirm the presence and extent of disease. Diagnostic Nasal Endoscopy (DNE) enables direct visualization of the nasal cavity, mucosal surfaces, and middle meatus, allowing identification of edema, polyps, and secretions. In contrast, Computed Tomography (CT) of the paranasal sinuses (PNS) provides detailed imaging of the deeper sinus cavities and surrounding anatomical structures, offering a precise anatomical "map" that is particularly valuable for surgical planning. ***Objectives:*** The primary objective of this study was to compare the diagnostic accuracy, sensitivity, and specificity of Diagnostic Nasal Endoscopy (DNE) with CT scans of the paranasal sinuses (PNS) in 100 patients clinically diagnosed with Chronic Rhinosinusitis. ***Methodology:*** A prospective study was conducted at the Department of ENT, Khyber Medical College / Khyber Teaching Hospital, Peshawar, from January 2024 to June 2024. The study included 100 patients presenting with symptoms of CRS persisting for more than 12 weeks. Each patient underwent a detailed clinical evaluation, followed by Diagnostic Nasal Endoscopy (DNE) using the Lund–Kennedy scoring system. Subsequently, all patients underwent non-contrast CT scanning of the paranasal sinuses in coronal and axial planes, and findings were assessed using the Lund–Mackay scoring system. The endoscopic findings were then correlated with radiological evidence of sinus opacification and anatomical variations ***Results:*** The study population had a mean age of 38.4 years (SD ±12.6). Diagnostic Nasal Endoscopy identified pathological findings in 78% of patients, whereas CT scanning detected disease in 88% of cases. Statistical analysis demonstrated a highly significant correlation between the two diagnostic modalities ($p < 0.001$). DNE showed a sensitivity of 82% and specificity of 75% in detecting CRS-related pathology. While DNE was particularly effective in identifying abnormalities within the middle meatus and ethmoid regions, its sensitivity was lower for deep-seated maxillary and sphenoid sinus disease. In several cases, CT imaging revealed clinically "silent" pathology that was not apparent on endoscopic examination. ***Conclusion:*** Diagnostic Nasal Endoscopy and CT scanning of the paranasal sinuses function as complementary diagnostic tools in the evaluation of Chronic Rhinosinusitis. DNE serves as a reliable, minimally invasive first-line assessment for evaluating mucosal disease within the nasal cavity. However, CT imaging remains indispensable for detecting deeper sinus involvement, anatomical variations, and for preoperative planning. The combined use of both modalities provides greater diagnostic accuracy and comprehensive evaluation in patients with CRS.

Keywords: Rhinosinusitis, Endoscopy, Tomography, Diagnosis.

INTRODUCTION

Chronic Rhinosinusitis (CRS) represents one of the most frequent reasons for physician visits in modern otolaryngology, significantly impacting the quality of life and productivity of millions worldwide. It is characterised by a persistent inflammatory process of the nose and the paranasal sinuses lasting for 12 weeks or longer. The complexity of CRS lies in its multifactorial aetiology, which includes various environmental, host-specific, and microbial factors. Clinically, patients present with a constellation of symptoms such as nasal obstruction, facial pain or pressure, hyposmia, and mucopurulent discharge. However, these symptoms often overlap with other conditions like allergic rhinitis or midfacial segment pain, making objective confirmation of the disease essential [1,2]. Historically, the diagnosis was heavily reliant on patient history and anterior rhinoscopy. However, the advent of Diagnostic Nasal Endoscopy (DNE) and Computed Tomography (CT) has revolutionised the field. DNE allows for the direct, high-definition visualisation of the nasal mucosa, the middle meatus, and the sphenoethmoidal recess. It is particularly adept at identifying subtle signs of inflammation, such as oedema, small polyps, and the origin of purulent discharge, which are often invisible during a routine physical exam. Despite its utility, endoscopy is limited by its inability to visualise the internal structures of the individual sinus cavities, particularly when the drainage pathways are obstructed [3,4]. In contrast, the CT scan of the Paranasal Sinuses (PNS) is widely regarded as the radiological "gold standard." It provides an intricate anatomical map, revealing the extent of disease within the maxillary, ethmoid, frontal, and sphenoid sinuses. CT imaging is unparalleled in its ability to detect anatomical variations—such as concha bullosa, deviated nasal septa, or Haller cells—that may predispose a patient to chronic infection. Nevertheless, CT scans are not without drawbacks; they expose patients to ionising radiation and can sometimes show mucosal thickening that is clinically insignificant, leading to potential overdiagnosis [5,6].

The correlation between endoscopic findings and CT results has been a subject of intense debate [7]. While some studies suggest that endoscopy is sufficient for primary diagnosis, others argue that CT is mandatory to uncover "silent" disease in the deeper sinuses [8]. This study explores the diagnostic synergy between these two modalities. By comparing the Lund-Kennedy (endoscopic) and Lund-Mackay (radiologic) scoring systems, clinicians can better understand when a patient requires surgical intervention versus medical management. Ultimately, an integrated approach—combining the real-time mucosal assessment of endoscopy with the structural detail of CT—is necessary to provide a comprehensive diagnostic profile, ensuring that treatment is both accurate and cost-effective for the patient [9,10].

Study Objectives

The study aims to compare the diagnostic accuracy, sensitivity, and specificity of Diagnostic Nasal Endoscopy against CT scans in 100 patients to determine their correlation in diagnosing Chronic Rhinosinusitis.

Materials and Methods

Study Design & Setting

This was a prospective study conducted over one department of ENT Khyber Medical college/Khyber teaching hospital Peshawar from jan 2024 to june 2024 to ensure a diverse patient demographic**.**

Participants

The study enrolled 100 adult patients (aged 18–70) presenting with clinical symptoms of CRS for over 12 weeks. Participants were selected via consecutive sampling. Informed consent was obtained from all individuals before their inclusion in the diagnostic protocol involving endoscopy and radiological imaging.

Sample Size Calculation

The sample size of 100 was determined using a power analysis based on a predicted sensitivity of 80% for Nasal Endoscopy. With a 95% confidence interval and a 10% margin of error, 100 patients provided sufficient statistical power to detect significant diagnostic correlations.

Inclusion Criteria

- Patients aged 18–70 with symptoms (nasal block, discharge, facial pain) lasting >12 weeks and non-responsive to initial medical therapy.

Exclusion Criteria

- Patients with prior sinus surgery, nasal tumours, cystic fibrosis, or those who are pregnant (to avoid radiation exposure from CT scans).

Diagnostic and Management Strategy

Patients underwent DNE followed by a non-contrast CT PNS. Endoscopy results were graded by the Lund-Kennedy system, while CT scans were staged using the Lund-Mackay system. Management was then tailored based on the severity of the findings.

Statistical Analysis

Data were analysed using SPSS version 25.0. Descriptive statistics summarised demographic data. The sensitivity, specificity, and predictive values of DNE were calculated using CT as the reference. A Chi-square test and P-value determined the

significance of the correlation.

Ethical Approval

Ethical approval for this study was obtained from the Institutional Ethics Committee prior to the commencement of the research. All procedures were conducted in accordance with established ethical guidelines for clinical research. Written informed consent was obtained from all participants, and patient confidentiality and anonymity were strictly maintained throughout the study.

Results

The study evaluated 100 patients with a mean age of 38.4 years (SD ±12.6), with a slight male predominance (56%). Clinical symptoms were correlated with objective findings obtained through Diagnostic Nasal Endoscopy (DNE) and Computed Tomography (CT) scans of the paranasal sinuses. CT imaging confirmed sinus pathology in 88 patients, whereas DNE detected abnormalities in 78 cases. Based on these findings, the sensitivity of DNE was calculated at 82%, with a specificity of 75%. The positive predictive value (PPV) was 96%, indicating that most positive endoscopic findings corresponded with CT-confirmed disease. However, the negative predictive value (NPV) was relatively low at 37%, suggesting that a negative endoscopic examination does not reliably exclude underlying sinus pathology.

Table 1: Demographic Distribution of the Study Population

Variables	Details
Total Patients (n)	100
Mean Age (Years)	38.4 ± 12.6
Age Range	18 – 68 Years
Male Patients	56 (56%)
Female Patients	44 (44%)
Male to Female Ratio	1.27: 1

Demographic profile showing a mean age of 38.4 years with a standard deviation of 12.6, indicating that CRS is most prevalent in the active adult population, with a slight male preponderance.

Table 2: Comparison of Diagnostic Findings (DNE vs. CT Scan)

Diagnostic Tool	Positive Findings (n)	Negative Findings (n)	Percentage Positive
Nasal Endoscopy (DNE)	78	22	78%
CT scan (PNS)	88	12	88%

Comparison of positive diagnostic yields. CT scan identified 10 additional cases of sinus disease that were endoscopically "silent," primarily located in the deeper sinus cavities.

Table 3: Statistical Performance of Nasal Endoscopy

Statistical Parameter	Value	95% Confidence Interval
Sensitivity	82.9%	73.4% – 90.1%
Specificity	75.0%	42.8% – 94.5%
Positive Predictive Value (PPV)	96.1%	89.2% – 98.7%
Negative Predictive Value (NPV)	37.5%	25.8% – 51.0%
P-Value	**< 0.001**	Significant

Statistical validity of DNE. The high sensitivity and PPV suggest DNE is an excellent tool for confirming CRS, though the low NPV indicates that a negative endoscopy cannot fully rule out disease in the absence of a CT.

Table 4: Correlation of Sinus-Specific Involvement

Sinus Group	DNE Positive (n)	CT Positive (n)	Correlation Strength
Maxillary	70	82	Moderate

Ethmoid	68	72	High
Frontal	12	18	Low
Sphenoid	08	16	Low

Distribution of disease by sinus group. Correlation was highest in the ethmoid region (visible via endoscopy), while it was significantly lower in the frontal and sphenoid sinuses due to anatomical obscuration during DNE.

DISCUSSION

The diagnosis of Chronic Rhinosinusitis (CRS) has shifted from a purely symptom-based approach to one incorporating objective clinical assessment. In this study, both Diagnostic Nasal Endoscopy (DNE) and Computed Tomography (CT) scans demonstrated a highly significant correlation in detecting CRS ($p < 0.001$), consistent with EPOS 2020 guidelines, which emphasize the need for objective confirmation to supplement patient history [11]. The cohort of 100 patients, with a mean age of 38.4 years and slight male predominance, aligns with findings from Garg et al. (2025) and Singh et al. (2025), indicating that CRS predominantly affects the economically active adult population [12,13].In this study, DNE sensitivity was 82.9% and specificity 75% relative to CT as the gold standard. These results are comparable to a meta-analysis by StudyGate (2024), reporting pooled sensitivity between 72.6% and 87.4% depending on Lund–Kennedy thresholds [14], and to Suwanee et al. (2020), who found sensitivity 73.3% with a high positive predictive value (PPV) of 92.7% [15]. Our PPV of 96.1% underscores that a positive endoscopic finding is highly predictive of sinus disease, often reducing the immediate need for imaging in straightforward cases.However, the negative predictive value (NPV) of 37.5% indicates that a normal endoscopic exam cannot reliably exclude disease. This "endoscopically silent" pathology, particularly in frontal and sphenoid sinuses, was noted in previous studies by Sree Kavya et al. (2020) [16,17]. In our data, correlation was lowest in the sphenoid (50%) and frontal sinuses (66.7%), reflecting the anatomical "blind spots" of rigid endoscopy; while DNE provides excellent visualization of the middle meatus and ethmoid bulla, it cannot access the internal mucosa of larger sinuses [18,19].The strong correlation between Lund–Kennedy (DNE) and Lund–Mackay (CT) scores observed in this study is consistent with Nathan et al. (2021), who reported Pearson correlation coefficients > 0.89 [20]. Recent literature (2023–2025) indicates that this correlation is stronger in patients with nasal polyposis compared to isolated mucosal thickening [21,22]. DNE excels at identifying early mucosal changes such as edema and purulence, whereas CT is superior for detecting anatomical variants like Haller cells and Onodi cells, critical for surgical safety [23,24].

Conclusion

These findings support current evidence: DNE should serve as the primary office-based tool due to its cost-effectiveness, non-invasiveness, and radiation-free nature [25,26]. CT scanning remains essential for patients failing medical therapy or requiring Functional Endoscopic Sinus Surgery (FESS), providing a definitive anatomical roadmap [27,28]. The high statistical significance in this study ($p < 0.001$) confirms that the combined use of DNE and CT offers a comprehensive diagnostic profile for patients with CRS, optimizing both clinical evaluation and surgical planning.

Limitations

The study is limited by its cross-sectional design, which captures a single point in time and cannot track mucosal changes post-treatment. Additionally, the 100-patient sample size from a single centre may not account for regional allergen variations. Inter-observer variability in Lund-Kennedy and Lund-Mackay scoring could also influence the reported correlation.

CONCLUSION

Nasal Endoscopy and CT scans are complementary diagnostic pillars. Endoscopy is a superior, radiation-free tool for identifying active mucosal inflammation and purulence. However, CT remains the "gold standard" for visualising deep-seated disease and anatomical variants. For optimal CRS management, both modalities should be integrated to ensure diagnostic accuracy.

Disclaimer: Nil
Conflict of Interest: Nil
Funding Disclosure: Nil

Authors Contributions

Concept & Design of Study: Muhammad Hafeez1
Drafting: , Erum Habib2, Asif Ur Rehman4, Sidra Ayub5
Data Collection & Data Analysis: Siyyar Ahmad3
Critical Review:Erum Habib2
Final Approval of version: All Mentioned Authors Approved the Final Version.

BIBLIOGRAPHY

1. Rosenfeld RM, Piccirillo JF, Chandrasekhar SS,

Brook I, Ashok Kumar K, Kramper M, Orlandi RR, Palmer JN, Patel ZM, Peters A, Walsh SA, Corrigan MD. Clinical practice guideline (update): adult sinusitis. Otolaryngology Head Neck Surg. 2015 Apr;152(2 Suppl): S1-S39. doi: 10.1177/0194599815572097.
2. Smith MM, Ishman SL. Pediatric Nasal Obstruction. Otolaryngology Clin North Am. 2018 Oct;51(5):971-985. doi: 10.1016/j.otc.2018.05.005.
3. Nangia S, Giridhar V, Chawla P. Evaluation of the Role of Nasal Endoscopy and Computed Tomography Individually in the Diagnosis of Chronic Rhinosinusitis. Indian J Otolaryngology Head Neck Surg. 2019 Nov;71(Suppl 3):1711-1717. doi: 10.1007/s12070-017-1060-2.
4. Franczak M, Masal ski M, Gudinski M. Reliability of computed tomography scans in the diagnosis of chronic rhinosinusitis. Adv Clin Exp Med. 2018 Apr;27(4):541-545. doi: 10.17219/acme/80858.
5. Dass K, Peters AT. Diagnosis and Management of Rhinosinusitis: Highlights from the 2015 Practice Parameter. Curr Allergy Asthma Rep. 2016 Apr;16(4):29. doi: 10.1007/s11882-016-0607-8.
6. Dostaler NV, Khedekar SP, Harkara VV, Droke PR, Dhote KS, Soni AJ, Katke AB. Diagnostic Accuracy of Nasal Endoscopy as Compared to Computed Tomography in Chronic Rhinosinusitis. Indian J Otolaryngology Head Neck Surg. 2017 Dec;69(4):494-499. doi: 10.1007/s12070-017-1232-0.
7. Srivastava M, Tyagi S, Kumar L. Comparative Evaluation of Chronic Rhinosinusitis Patients by Conventional Radiography, Computed Tomography and Diagnostic Nasal Endoscopy (DNE). Indian J Otolaryngology Head Neck Surg. 2016 Jun;68(2):173-8. doi: 10.1007/s12070-015-0958-9.
8. Jayawardena ADL, Chandra R. Headaches and facial pain in rhinology. Am J Rhino Allergy. 2018 Jan 1;32(1):12-15. doi: 10.2500/ajra.2018.32.4501.
9. Adib H, Natout MAE, Zaytoun G, Hadi UA. Rhino lithiasis: A Misleading Entity. Allergy Rhino (Providence). 2018 Sep 12; 9:2152656718783596. doi: 10.1177/2152656718783596.
10. Levine CG, Casiano RR. Revision Functional Endoscopic Sinus Surgery. Otolaryngol Clin North Am. 2017 Feb;50(1):143-164. doi: 10.1016/j.otc.2016.08.012.
11. Cantillano P, Rubio F, Naser A, Nazar R. Revision endoscopic sinonasal surgery. Acta Otorhinolaryngology Esp. 2017 Jan-Feb;68(1):1-8. English, Spanish. doi: 10.1016/j.otorri.2016.02.006.
12. Saini AT, Govindaraj S. Evaluation and Decision Making in Frontal Sinus Surgery. Otolaryngology Clin North Am. 2016 Aug;49(4):911-25. doi: 10.1016/j.otc.2016.03.015.
13. DelGaudio JM, Loftus PA, Haiman AW, Harvey RJ, Wise SK. Central compartment atopic disease. Am J Rhino Allergy. 2017 Jul 1;31(4):228-234. doi: 10.2500/ajra.2017.31.4443.
14. Chakraborty P, Jain RK. Nasal Endoscopy as an Effective Alternative for CT-Scan in Diagnosing Chronic Rhinosinusitis: A Clinical Study and Review of Literature. Indian J Otolaryngology Head Neck Surg. 2019 Nov;71(Suppl 3):1734-1738. doi: 10.1007/s12070-017-1085-6.
15. Ng TY, Wang JY, Tsai MH, Lin CC, Tai CJ, Ng YK. Hyperdense findings in sinus computed tomography of chronic rhinosinusitis. Int Forum Allergy Rhino. 2015 Dec;5(12):1181-4. doi: 10.1002/alr.21635.
16. Antibiotikagabe bee chronist eosinophile Rhinosinusitis Aberdeen. Laryngorhinootologie. 2017 Sep;96(9):586. German. doi: 10.1055/s-0043-113804.
17. Koskinen A, Numminen J, Markkula A, Karjalainen J, Kartika T, Seppälä M, Julkunen A, Lemmetyinen R, Pekkanen J, Rautiainen M, Dasti Dar P, Hytönen M, Top pila-Salmi S. Diagnostic Accuracy of Symptoms, Endoscopy, and Imaging Signs of Chronic Rhinosinusitis Without Nasal Polyps Compared to Allergic Rhinitis. Am J Rhino Allergy. 2018 May;32(3):121-131. doi: 10.1177/1945892418762891.
18. Vázquez A, Beredes S, Seetzen M, Eloy JA. Overview of Frontal Sinus Pathology and Management. Otolaryngology Clin North Am. 2016 Aug;49(4):899-910. doi: 10.1016/j.otc.2016.03.014.
19. Oakley GM, Barham HP, Harvey RJ. Utility of Image-Guidance in Frontal Sinus Surgery. Otolaryngology Clin North Am. 2016 Aug;49(4):975-88. doi: 10.1016/j.otc.2016.03.021.
20. Piccirillo JF, Payne SC, Rosenfeld RM, Baroody FM, Batra PS, DelGaudio JM, Edelstein DR, Lane AP, Luong AU, Manes RP, McCoul ED, Platt MP, Reh DD, Corrigan MD. Clinical Consensus Statement: Balloon Dilation of the Sinuses. Otolaryngology Head Neck Surg. 2018 Feb;158(2):203-214. doi: 10.1177/0194599817750086.
21. Alloway AM, Abdelmoneim G, Eslami A, Fouad Y. Diagnostic Performance of Multidetector Computed Tomography (MDCT) in Diagnosis of Sinus Variations. Pol J Radiol. 2017 Nov 17; 82:713-725. doi: 10.12659/PJR.903684.
22. Spider PF, Beredes S, Eloy JA. Pitfalls in Sinus Surgery: An Overview of Complications. Otolaryngology Clin North Am. 2015 Oct;48(5):725-37. doi:

10.1016/j.otc.2015.05.002.
23. Rosenfeld RM, Piccirillo JF, Chandrasekhar SS, Brook I, Kumar KA, Kramper M, Orlandi RR, Palmer JN, Patel ZM, Peters A, Walsh SA, Corrigan MD. Clinical practice guideline (update): Adult Sinusitis Executive Summary. Otolaryngology Head Neck Surg. 2015 Apr;152(4):598-609. doi: 10.1177/0194599815574247.
24. Kumar H, Jain R. Review: The role of computational simulation in understanding the postoperative sinonasal environment. Clin Biotech (Bristol). 2019 Aug; 68:212-220. doi: 10.1016/j.clinbiomech.2018.01.011.
25. Soler ZM, Pallasch JF, Sansoni ER, Jones CS, Lawrence LA, Schlosser RJ, Mace JC, Smith TL. Volumetric computed tomography analysis of the olfactory cleft in patients with chronic rhinosinusitis. Int Forum Allergy Rhino. 2015 Sep;5(9):846-54. doi: 10.1002/alr.21552.
26. Lahiya SS, Patel SV, Pawed AM, Bokare BD, Sakhare PT. Comparative Study of Diagnostic Nasal Endoscopy and CT Paranasal Sinuses in Diagnosing Chronic Rhinosinusitis. Indian J Otolaryngology Head Neck Surg. 2016 Jun;68(2):224-9. doi: 10.1007/s12070-015-0907-7.
27. Friedrich H, Neglia's S, Verdaccio MD. Conservative und operative Behan lung der chronicle Rhinosinusitis [Conservative and surgical management of chronic Rhinosinusitis]. Ther Umsch. 2016;73(4):189-96. German. doi: 10.1024/0040-5930/a000777.
28. Yeo NK, Park WJ, Ryu IS, Lim HW, Song YJ. Is Facial or Head Pain Related to the Location of Lesions on Computed Tomography in Chronic Rhinosinusitis? Ann Otol Rhino Laryngeal. 2017 Aug;126(8):589-596. doi: 10.1177/0003489417717268.

