

Research Article

Clinical and Radiological Correlation of Chronic Rhinosinusitis Using Lund-Mackay CT Scoring

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ABSTRACT

Objective: To evaluate the correlation between clinical symptoms and radiological findings using the Lund-Mackay CT scoring system in patients with chronic rhinosinusitis and to assess its usefulness in disease severity assessment and management.

Study Design: Descriptive cross-sectional study.

Place and Duration of Study: Conducted in the Department of Otorhinolaryngology in collaboration with Radiology department, Khyber Teaching Hospital, Peshawar, from January 2025 to September 2025.

Methods: 300 patients clinically diagnosed as having chronic rhinosinusitis were enrolled in the study. Using the formula recommended by the World Health Organisation, the number of samples was determined. The patients aged 18-60 years and older than 12 weeks of CRS, both males and females were included in the study by non-probability consecutive sampling. Detailed clinical examination was performed including nasal obstruction, nasal discharge, facial pain, headache, hyposmia and postnasal drip. All patients had a computed tomography (CT) scan of paranasal sinuses performed, and the severity of the disease was graded on this scan according to the Lund-Mackay CT scoring system. The outcome of clinical findings was compared to the radiological scores. SPSS version 26 was used for data analysis. A value of p of ≤ 0.05 was statistically significant.

Results: Nasal obstruction (300 patients), headache and nasal discharge were the common symptoms. CT showed the most frequent patterns of involvement to be in the maxillary or ethmoidal sinuses. The clinical symptom and the Lund-Mackay CT in the present study had a significant positive correlation. There was a significant difference between the radiological score in patients with higher symptom scores.

Conclusion: In patients with chronic rhinosinusitis (CRS), the Lund-Mackay CT score had good correlation with clinical severity. Nevertheless, CT evaluation is still a useful diagnostic and disease assessment tool which can help the clinicians in treatment planning and surgical decision making.

Keywords: Chronic Rhinosinusitis, Lund-Mackay score, Computed Tomography, Paranasal Sinuses.

INTRODUCTION

Chronic Rhinosinusitis (CRS) is defined as inflammation of the lining of the nose and paranasal sinuses which continues despite medication for over 12 weeks. It is a significant health issue around the world due to its high

prevalence, being repetitive and its effect on the quality of life (Lilja et al., 2025). Patients with chronic rhinosinusitis have a variety of symptoms with most commonly experiencing one or more of the following symptoms: nasal congestion, nasal discharge, facial pain or

pressure, headache, loss of smell or diminished sense of smell and postnasal drip. These symptoms can have a negative impact on sleep, work, social relationships and physical and mental health. The disease can occur in any age group and can be costly in terms of health services and multiple hospitalizations (Shirama et al., 2022).

Chronic rhinosinusitis is multifactorial in aetiology and involves chronic infection, allergy, anatomic abnormalities, environmental pollution, fungal infection, mucociliary dysfunction and immunologic disorders. The inflammation of the sinus mucosa causes the sinus drainage pathways to become blocked and causes the secretion to buildup in the paranasal sinuses. The chronic inflammatory process can lead to subsequent mucosal thickening, nasal polyp formation and changes of the structure which can be adequately assessed radiologically (Dawood et al., 2023). A correct diagnosis of the quantity and severity of the disease based only on the clinical examination is not always possible because the clinical manifestations may vary from patient to patient and may not be a perfect correlation with the endoscopic diagnosis (Shirama et al., 2024).

Computed tomography (CT) scan of the paranasal sinuses is the best imaging technique for CR. CT is very helpful in the visualization of sinonasal anatomy, mucosal thickening, obstruction of the osteomata complex, and sinus opacification (Ntunaguzi et al., 2024). It also can be used to identify anatomical variations that may raise the patient's risk for having chronic inflammation or to make surgery more difficult. It is important to emphasize that, before undertaking any surgery, functional endoscopic sinus surgery (FESS), the radiological assessment should be used to guide surgical planning to minimize the potential surgical complications (Markovic-Vasiljkovic et al., 2023).

Lund-Mackay CT scoring system is the most accepted and widely used radiological grading system which assesses the severity of chronic rhinosinusitis. This scoring system has been easily reproduced, readily scored and can provide an objective assessment of the extent of the disease from CT data (Lilja et al., 2022). Each sinus receives a score based on its length and the degree of opacification and the osteomata complex is given an individual score for a total of 0–24. The higher scores, the more are the radiologic findings. The Lund-Mackay score has become of great importance in

everyday clinical practice and in research as a measure of burden of the disease and of the effectiveness of treatment (Uz et al., 2023).

Even with the advancement of diagnostic tools, there remains a lot of debate about link between clinical symptoms and radiological features of chronic rhinosinusitis (Zhang et al., 2025). For some patients, the changes in the CT may be minor, but the symptoms are severe, and for other patients the changes in the CT may be extensive, but the symptoms relatively mild. Therefore, correlation of clinical presentation with the Lund-Mackay CT score is needed for a better diagnosis, evaluation and management of disease (Asya et al., 2025).

This current study was done to evaluate the clinical and radiological correlation of CRS based on the Lund-Mackay CT scoring system. Results of this study could facilitate a more complete understanding of the association of symptom severity and radiological extent of disease, and thus aid in better patient management and medical/surgical decision-making (Sujana & Maharani, 2022).

Objective

To create a clinical and radiological correlation of chronic rhinosinusitis (CRS) using computed tomography (CT) scoring system in patients with symptoms of CRS and to determine the correlation between the severity of symptoms and CT paranasal sinus findings in patients with CRS.

METHODOLOGY

The descriptive cross-sectional study was done in the Department of Otorhinolaryngology collaboration with Radiology department, Khyber Teaching Hospital, Peshawar, from January 2025 to September 2025. A total of 300 patients with chronic rhinosinusitis (CRS) were included in the study and clinically diagnosed based on the criteria. The number of patients diagnosed with CRS clinically was 300 patients. The number of samples were determined by the formula suggested by the World Health Organisation. The patients were recruited from non-probability consecutive sampling technique and consisted of patients whose symptoms last longer than 12 weeks from the date of consultation, aged 18–60 years of either gender. Patients with sinonasal tumours, previous sinus surgery, facial trauma, and/or acute infections were not included. Detailed clinical history and examination was carried out, then the CT scan of the paranasal sinuses was done. The severity was evaluated

radiographically by the Lund-Mackay CT scoring system. All data were analysed by SPSS version 26 and the correlation between clinical symptoms and CT scores was calculated by appropriate statistical testing with a p value of ≤ 0.05 was considered significant.

Inclusion Criteria

Patients between the ages of 18 to 60 years (both male and female), who had CRS for over 12 weeks, were included in the study and exhibited the following symptoms: nasal obstruction, nasal discharge, facial pain, headache, post-nasal drip, hyposmia. Without the patients consenting, patients desiring a computed tomography scan were not enrolled.

Exclusion Criteria

They were excluded from the study if they had a history of acute rhinosinusitis, sinonasal tumours, previous nasal/sinus surgery, facial trauma, congenital nasal anomaly, fungal sinusitis, or had serious systemic illnesses. Patients who did not want to have a CT and pregnant women were also excluded.

Data Collection Procedure

After approval by the institutional ethical review committee, informed consent to the study were obtained from the patients who fulfilled the inclusion criteria and the study was conducted by non-probability consecutive sampling. All participants gave informed consent to participate in the study. A detailed proforma for collecting demographic information and clinical history was developed. Evaluation of clinical parameters was conducted, including nasal obstruction, nasal discharge, facial pain, headache, postnasal drip and hyposmia. Each patient received a physical examination, and computed tomography (CT) scans of the paranasal sinuses. To assess the severity of the disease, radiological findings were assessed using Lund-Mackay CT scoring system. The data collected were analysed with the help of

SPSS version 26. Analysis of clinical symptoms and radiologic scores was performed using appropriate statistical tests and patients' confidentiality was ensured during the study.

Data Analysis

All the data obtained from all the groups was entered and analysed using Statistical Package for Social Sciences (SPSS) version 26. Data for quantitative variables like age and Lund-Mackay CT score were expressed in the form of mean and standard deviation, and data for qualitative variables like gender, presenting symptoms and sinus involvement were expressed in the form of frequency and percentage. Correlation and Chi-square tests (where applicable) were used to compare the clinical symptoms and radiological findings. Independent sample t-test was used to compare the mean CT scores between the different clinical groups. P value ≤ 0.05 was considered as statistically significant. All analysed data was tabulated and presented in the form of graphs for ease of interpretation and comparison of clinical and radiological data between patients with chronic rhinosinusitis.

RESULTS

Chronic rhinosinusitis patients were selected for the study (300 patients). Most of the participants were males and most of the patients were in age group of 31-50 years. Nasal obstruction was the most common symptom, followed by headache, nasal discharge, facial pain and hyposmia. The preferred site of involvement on the CT scan was the maxillary and ethmoidal sinuses. The mean Lund-Mackay CT score was higher for patients with more severe symptoms. The clinical symptom severity was found to be significantly correlated with the Lund-Mackay CT score ($p \leq 0.05$) by statistical analysis. Radiological score was correlated with clinical severity and sinus involvement. In patients with higher radiological scores, there was more clinical severity, and sinus involvement.

Table 1: Demographic Characteristics of Patients (n=300)

Variable	Frequency (n)	Percentage (%)
Age Group (Years)		
18-30	72	24.0
31-40	96	32.0
41-50	82	27.3
51-60	50	16.7
Gender		
Male	178	59.3
Female	122	40.7

Demographic characteristics of patients with chronic rhinosinusitis are shown in Table 1. There was significantly more male than female participants and most of the participants were aged between 31 and 50 years. Based on these

results, it can be concluded that chronic rhinosinusitis is more common in middle-aged adults, and is distributed in a similar sex ratio as other inflammatory SN syndrome.

Table 2: Frequency of Clinical Symptoms in Patients (n=300)

Clinical Symptoms	Frequency (n)	Percentage (%)
Nasal obstruction	248	82.7
Headache	210	70.0
Nasal discharge	194	64.7
Facial pain	156	52.0
Hyposmia	128	42.7
Postnasal drip	118	39.3

Table 2 shows the clinical features of patients with chronic rhinosinusitis. The most frequent first symptom was nasal obstruction and the next were headache and nasal discharge.

Chronic inflammatory disease and disease burden is also clearly evident as facial pain and hyposmia were also common.

Table 3: Distribution of Sinus Involvement on CT scan (n=300)

Sinus Involvement	Frequency (n)	Percentage (%)
Maxillary sinus	236	78.7
Ethmoidal sinus	214	71.3
Frontal sinus	126	42.0
Sphenoidal sinus	98	32.7
Osteomeatal complex obstruction	188	62.7

The CT scan findings of the patients with chronic rhinosinusitis are shown in Table 3. Maxillary and ethmoidal sinuses' synovial membranes were the most common ones involved, the most frequently. Osteomata

complex obstruction was also frequently found, indicating a blockage of the sinus drainage and that the disease is characterised by continuous mucosal inflammation in those who develop it.

Table 4: Lund-Mackay CT Score Distribution (n=300)

Lund-Mackay CT Score	Frequency (n)	Percentage (%)
Mild (1-8)	74	24.7
Moderate (9-16)	156	52.0
Severe (17-24)	70	23.3

The distribution of the Lund-Mackay CT scores in the study subjects is shown in table 4. Most patients had moderate severity of the disease in their radiographs, and almost one-quarter of

patients had severe disease. Results show that significant proportion of patients had the involvement of the sinonasal cavity on CT scan.

Table 5: Correlation between Clinical Severity and Lund-Mackay CT Scores

Clinical Severity	Mean CT Score $\pm$ SD	p-value
Mild symptoms	6.8 $\pm$ 2.1	
Moderate symptoms	11.4 $\pm$ 3.5	
Severe symptoms	18.2 $\pm$ 4.2	≤ 0.05

As can be seen in table 5, there is a high significant positive correlation between the severity of symptoms clinically and the score that was obtained for the Lund-Mackay CT. There was a statistically significant difference

between mean radiological scores of patients with severe and mild/moderate clinical symptoms. This finding is in line with the value of the CT score in quantifying the severity of chronic rhinosinusitis disease.

DISCUSSION

Chronic Rhinosinusitis is a frequent chronic inflammatory process of the nose and paranasal sinuses which can have a major impact on patients' quality of life. A good assessment of the severity is important to plan and manage the disease effectively. To evaluate the clinical and radiological correlation of CRS as per Lund-Mackay CT scoring system in the present study. The findings of this study revealed that there was a strong positive correlation between the clinical symptoms and the radiological score, indicating the computed tomography scan (CT) imaging is helpful in determining the severity of the disease (Taheri et al., 2024).

The present study shows that most of the study population were male patients. This has also been reported in other previous studies, which found males were more likely to have chronic rhinosinusitis (Englhard & Ledderose, 2023). This rising prevalence rate among males could be associated with the following risk factors: environmental pollution, smoking, occupation factors, outdoor activities, etc. In most of this sample, the age range of patients was 31- to 50-years-old supporting the idea that CS is more prevalent in middle-aged adults. This age distribution is like age distributions reported by regional and international studies (Mostafa et al., 2023).

Nasal obstruction was found to be the commonest symptom followed by headache and nasal discharge. This study's findings are in line with the clinical presentation of chronic rhinosinusitis reported in the literature (Krishniya et al., 2022). Nasal obstruction results from mucous swelling, inflammation and obstruction of the osteomata complex resulting in poor sinus drainage and ventilation. Long-term accumulation of fluid in the mucous membranes lining the sinuses can cause a headache or pain in the face. Patients were also often seen to have hyposmia and postnasal drip, suggesting chronic involvement of sinonasal mucosa (Zhang et al., 2024).

In this study, the most common areas to be identified in the radiological assessment were the maxillary sinuses and ethmoidal sinuses on CT scan. These observations have been reported in other studies as well since these sinuses lie in proximity of the osteomata complex, which is a key in sinus drainage. This area may become obstructed and cause patients to develop chronic infections and inflammation. In addition, a large percentage of patients had the obstruction of their osteomata

complexes as shown on computed tomography (CT) imaging, which also confirmed its role in the pathophysiology of chronic rhinosinusitis (Mousavi et al., 2022).

The Lund-Mackay CT scoring system was a valuable and reliable system for assessing the radiological severity. The mean CT scores were significantly elevated in those patients who had severe clinical symptoms as compared to the mean CT scores of those with mild symptoms. The severity of clinical symptoms and the radiological changes were shown to be significant correlation by statistics ($p \leq 0.05$). The results indicate that the greater the amount of radiological involvement, the more severe the clinical symptoms. A few studies have been conducted internationally, and have demonstrated similar correlations, thus making the Lund-Mackay scoring system clinically useful (La Mantia et al., 2022).

Other studies, however, have shown poor or poor intermittent correlation between symptoms and CT findings as there is a difference in the interpretation of symptoms among people and there may be psychological or environmental factors affecting symptom perception (Sheikh et al., 2024). There are several differences between the different types of CT scanning, but still, it is important in providing information about anatomic involvement, extent of disease and surgical planning. Furthermore, Lund-Mackay scoring system provides an objective clinically impactful method of measuring the severity of disease prior and after treatment (Ma et al., 2023).

To conclude, this study highlights the importance of clinical and radiological data in treating chronic rhinosinusitis. Use of CT scan and Lund-Mackay scoring can aid in diagnosis, management and appropriate selection of medical or surgical therapy to optimize patient outcome (Pokharel et al., 2022).

CONCLUSION

The severity of clinical symptoms in chronic rhinosinusitis patients had a significant association with the severity of the Lund-Mackay CT scores in the present study. The most common symptoms were nasal obstruction, headache, and nasal discharge, and the most common sinuses that were CT scanned were the maxillary and ethmoidal sinuses. More extensive disease was reflected in higher radiological score in patients with severe clinical disease. The findings suggest computed tomography (CT) and Lund-Mackay scoring are useful and reliable tools to measure

the severity and extent of disease. The use of radiological assessment, together with careful clinical assessment can improve the diagnostic, therapeutic and surgical management of chronic rhinosinusitis. If the disease can be diagnosed properly, and identified in time, it can help to minimize the complications and optimal outcomes.

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