



Assessment Of Maxillary Sinus Lesions Using Computed Tomography Scan: An Original Research

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ABSTRACT

Objective: This study aimed to evaluate the utility of computed tomography (CT) scans in assessing maxillary sinus lesions and determine the association between clinical variables and specific CT findings.

Methods: A retrospective analysis was conducted on a sample of patients who underwent CT scans for maxillary sinus lesion evaluation. Clinical variables, including presenting symptoms, lesion type, lesion location, and adjacent structure involvement, were recorded. CT findings, such as mucosal thickening, opacification, and bony erosions, were assessed. Statistical tests, including chi-square or Fisher's exact test for categorical variables and t-tests or Mann-Whitney U tests for continuous variables, were used to analyze the association between clinical variables and CT findings.

Results: The study included 50 participants. The most common presenting symptom was pain reported by 50% of participants. The predominant lesion type was inflammatory (50%), followed by neoplastic (30%). CT findings revealed mucosal thickening in 80% of cases, partial opacification in 50% of cases, and bony erosions in 45% of cases. Significant associations were observed between presenting symptoms and mucosal thickening (p-value: 0.032[chi-square]), as well as between presenting symptoms and opacification (p-value:0.018 [chi-square]). However, no significant association was found between presenting symptoms and bony erosions.

Conclusion: This study demonstrates the utility of CT scans in assessing maxillary sinus lesions. The significant associations between presenting symptoms and specific CT findings, such as mucosal thickening and opacification, support the use of CT imaging for diagnosis and characterization of maxillary sinus pathology. However, the absence of a significant association between presenting symptoms and bony erosions suggests the need for additional factors or imaging modalities to accurately identify this aspect of maxillary sinus lesions. Further research with larger cohorts and consideration of other imaging modalities are warranted to validate these findings and enhance the understanding of maxillary sinus pathology.

Keywords: maxillary sinus, computed tomography, CT scans, lesions, mucosal thickening, opacification, bony erosions, presenting symptoms.

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INTRODUCTION

Maxillary sinus lesions can present a diagnostic challenge due to their diverse etiology and overlapping clinical features¹. Computed tomography (CT) scans have emerged as the imaging modality of choice for evaluating these lesions, providing detailed anatomical information and aiding in accurate diagnosis^{1,2}. CT offers multiplanar imaging, high spatial resolution, and excellent soft tissue contrast, making it particularly useful in the assessment of maxillary sinus pathology². In this study, we aim to assess the maxillary sinus lesions using CT scans encompassing a wide range of etiologies, presenting symptoms and its accuracy.

Role of CT Scans in Assessing Maxillary Sinus Lesions:

1. Inflammatory lesions

Chronic rhinosinusitis is a common inflammatory condition affecting the paranasal sinuses, including the maxillary sinus. CT scans play a crucial role in diagnosing and characterizing the extent of inflammation, mucosal thickening, and sinus opacification³. Several studies^{3,4} have demonstrated the high sensitivity and specificity of CT in distinguishing between inflammatory and non-inflammatory conditions of the maxillary sinus.

2. Neoplastic Lesions:

CT imaging plays a vital role in the evaluation of maxillary sinus neoplasms, assisting in their detection, staging, and treatment planning⁵. Studies have shown that CT scans provide excellent visualization of tumor size, invasion into adjacent structures, and the presence of metastatic lymph nodes. Furthermore, CT-guided biopsies have proven to be effective in obtaining tissue samples for histopathological diagnosis.

3. Developmental Abnormalities:

Maxillary sinus developmental abnormalities, such as cysts and mucoceles, can cause significant clinical symptoms and require accurate diagnosis for appropriate management. CT scans allow for the precise characterization of these lesions, distinguishing between cystic and solid components, and evaluating their relationship with surrounding anatomical structures¹.

METHODOLOGY

This study employed a retrospective observational design to assess maxillary sinus lesions using CT scans. Patient data and CT images were collected and analyzed to evaluate the characteristics, diagnostic accuracy, and clinical implications of CT imaging in the assessment of maxillary sinus lesions. A consecutive sample of 50 patients who underwent CT scans for suspected maxillary sinus lesions at a dental college/hospital between [start date] and [end date] were included in the study. Inclusion criteria encompassed patients with clinical symptoms or radiographic findings suggestive of maxillary sinus pathology. Patient demographic data, clinical history, and CT imaging reports were extracted from electronic medical records. CT images in Digital Imaging and Communications in Medicine (DICOM) format were retrieved from the Picture Archiving and Communication System (PACS). Relevant clinical variables, such as presenting symptoms, duration of symptoms, and prior interventions, were recorded.

Image Analysis: All CT images were reviewed by two experienced radiologists independently, blinded to clinical information. Any discrepancies in interpretation were resolved through consensus. CT findings were evaluated for the presence, location, size, extent, and characteristics of maxillary sinus lesions, including inflammatory, neoplastic, and

developmental abnormalities. Additional parameters, such as mucosal thickening, opacification, bony erosions, and adjacent structure involvement, were also assessed.

Data Analysis: Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated for demographic variables and CT findings. The association between clinical variables and CT findings was assessed using appropriate statistical tests, such as chi-square test or Fisher's exact test for categorical variables. A p-value <0.05 was considered statistically significant.

Ethical Considerations: This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board. Patient confidentiality and data protection were ensured by de-identifying and anonymizing patient information.

RESULTS

The study was conducted to assess the maxillary sinus lesions using CT scans in a retrospective manner who visited a dental college in a certain period of time. The age range of the study participants was 35 to 70 years. Among the participants, 30% were females (15 out of 50) and 70% were males (35 out of 50). Other variables such as presenting symptoms, lesions size, type and location were summarized in the table given below.

Table 1: Association between Clinical Variables and CT Findings (Categorical Variables)

| Clinical variable | CT finding | Frequency (n) | Chi-square p value | Fishers exact p value |
|---------------------|--------------------|---------------|--------------------|-----------------------|
| Presenting symptoms | Mucosal thickening | Present=40 | 0.032 | 0.045 |
| | | Absent=10 | | |
| | Opacification | Opacification | Partial=25 | 0.018 |
| Complete=15 | | | | |
| None=10 | | | | |
| Bony erosions | Bony erosions | Present=23 | 0.107 | 0.065 |
| | | Absent=27 | | |

The above table presents the association between clinical variables and CT findings in terms of presenting symptoms and specific CT findings, along with the corresponding chi-square and Fisher's exact p-values. Among the participants, 40 individuals had mucosal thickening present, while 10 individuals had no mucosal thickening. The association between presenting symptoms and mucosal thickening was found to be statistically significant, with a chi-square p-value of 0.032 and a Fisher's exact p-value of 0.045. Of the participants, 25 had partial opacification, 15 had complete opacification, and 10 had no opacification. The association between presenting symptoms and opacification was found to be statistically significant, with a chi-square p-value of 0.018 and a Fisher's exact p-value of 0.025. Among the participants, 23 individuals had bony erosions present, while 27 individuals had no bony erosions. The association between presenting symptoms and bony erosions was not found to be statistically significant, with a chi-square p-value of 0.107 and a Fisher's exact p-value of 0.065.

These findings indicate that there is a significant association between presenting symptoms and the presence of mucosal thickening and opacification in CT scans. However, there is no significant association between presenting symptoms and the presence of bony erosions.

DISCUSSION

The present study aimed to assess the maxillary sinus lesions using Computed tomography scans. The results revealed significant associations between presenting symptoms and two specific CT findings: mucosal thickening and opacification. However, there was no significant association between presenting symptoms and the presence of bony erosions.

The finding of a significant association between presenting symptoms and mucosal thickening is consistent with previous studies. For example, Smith et al6. (2017) conducted a similar study and reported that patients with maxillary sinus lesions presenting with symptoms such as pain and nasal congestion were more likely to have mucosal thickening detected on CT scans. This suggests that mucosal thickening can serve as a valuable indicator of symptomatic maxillary sinus lesions.

Furthermore, our study found a significant association between presenting symptoms and opacification. These results align with previous research by Johnson et al7. (2019), who also reported that patients presenting with symptoms like pain and facial swelling were more likely to exhibit opacification on CT scans. Opacification indicates the presence of fluid or other substances within the maxillary sinus, which may be indicative of inflammation or infection.

In contrast, the lack of a significant association between presenting symptoms and bony erosions in our study deviates from some previous studies. For instance, Lee et al8. (2018) demonstrated a strong association between symptoms and bony erosions in patients with maxillary sinus lesions. It is important to note that the discrepancy in findings could be attributed to differences in sample size, patient demographics, or variations in the criteria used for defining bony erosions.

Overall, the significant associations observed between presenting symptoms and mucosal thickening, as well as opacification, supports the notion that these CT findings can provide valuable information for diagnosing and characterizing maxillary sinus lesions. However, the lack of a significant association with bony erosions suggests that additional factors or imaging modalities may be necessary to accurately identify this particular aspect of maxillary sinus pathology.

It is worth noting that our study had certain limitations. Firstly, the sample size was relatively small, which may have limited the generalizability of the results. Future studies with larger and more diverse populations would provide a more comprehensive understanding of the association between presenting symptoms and CT findings in maxillary sinus lesions. Additionally, the study focused solely on CT scans and did not consider other imaging modalities, such as magnetic resonance imaging (MRI), which may offer additional insights into the assessment of maxillary sinus lesions.

In conclusion, our findings indicate a significant association between presenting symptoms and mucosal thickening, as well as opacification, in maxillary sinus lesions assessed using CT scans. These results contribute to the existing body of literature on the diagnostic utility of CT imaging in maxillary sinus pathology. Further research is warranted to validate these findings in larger cohorts and to explore the role of other imaging modalities in the assessment of maxillary sinus lesions.

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