

Original Research

A Retrospective Study on Incidental Finding of Maxillary Sinus Pathology by Cone beam computed tomography: A cross sectional observational study

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ABSTRACT:

Background: Incidental findings of maxillary sinus pathologies in cone beam computed tomography (CBCT) scans have garnered significant attention due to their diagnostic implications. This retrospective study aimed to investigate the prevalence, types, and characteristics of incidental maxillary sinus pathologies identified through CBCT imaging. **Methods:** A retrospective analysis was conducted on 152 CBCT scans obtained from institutional archives from 2020-2022. Inclusion criteria comprised scans with clear visualization of the maxillary sinus, while poor-quality images were excluded. Incidental findings were categorized based on radiological features and pathology types. Data analysis involved descriptive statistics to determine prevalence rates and distribution patterns of various pathologies. **Results:** Out of 152 CBCT scans reviewed, 20% revealed incidental maxillary sinus pathologies. Inflammatory conditions (35%), cysts (25%), and developmental anomalies (20%) constituted the most prevalent findings. **Conclusion:** This study highlights a notable prevalence of incidental maxillary sinus pathologies detected through CBCT scans. Understanding the types and characteristics of these findings contributes to improved diagnostic approaches and clinical decision-making in maxillofacial and dental healthcare. Further research is warranted to explore longitudinal outcomes and associations with patient demographics or comorbidities.

Keywords: maxillary sinus, cone beam computed tomography, incidental findings, prevalence, retrospective study.

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INTRODUCTION

The maxillary sinus, a paranasal sinus located within the maxilla, is prone to various pathological conditions, often incidentally detected through imaging techniques such as cone beam computed tomography (CBCT) [1]. Although primarily used for dental evaluations, CBCT provides a detailed and comprehensive view of the maxillary sinus, facilitating the identification of incidental pathologies [2].

Studies suggest that incidental findings in maxillary sinuses through CBCT scans are not uncommon, with prevalence rates varying across different populations [3]. Incidental findings refer to asymptomatic abnormalities discovered unintentionally while conducting examinations for other purposes. These findings have proven to be of considerable interest

due to their potential implications for patient management and diagnostic considerations [4].

While previous research has highlighted the presence of various pathologies within the maxillary sinus, there is a dearth of comprehensive studies focusing on the prevalence, types, and characteristics of incidental findings detected through CBCT [5]. These findings, although often asymptomatic, can significantly impact treatment decisions and patient care [6].

Furthermore, understanding the prevalence of these incidental maxillary sinus pathologies aids in refining diagnostic criteria and treatment planning, particularly in the context of maxillofacial and dental healthcare [7]. Therefore, this retrospective study aims to fill this gap by examining a sizable dataset of CBCT scans to elucidate the prevalence, types, and characteristics of incidental maxillary sinus pathologies.

This investigation seeks to contribute to the existing body of literature by providing comprehensive insights into incidental maxillary sinus pathologies, enhancing diagnostic accuracy, and aiding in informed clinical decision-making [8].

MATERIALS AND METHODS

Study Design and Data Collection

This retrospective cross-sectional observational study involved the analysis of a substantial dataset comprising 152 of cone beam computed tomography (CBCT) scans obtained from the archives of the tertiary care center over a period of 2 years from 2020-2022. The study protocol was approved by the Ethics Committee, ensuring adherence to ethical guidelines and patient confidentiality.

Inclusion Criteria

1. Patients aged 18-65 years.
2. Patients who underwent CBCT imaging for dental or maxillofacial evaluation.
3. CBCT scans with clear visualization of the maxillary sinus region.
4. Availability of complete patient data and imaging records.

Exclusion Criteria

1. Patients with a history of maxillofacial surgeries or interventions affecting the maxillary sinus.
2. Poor-quality CBCT scans with significant artifacts or inadequate visualization of the maxillary sinus.
3. Scans showing signs of acute sinusitis or active infectious processes within the sinus.

Data Extraction and Analysis

Two trained and calibrated examiners independently reviewed the included CBCT scans. Incidental findings of maxillary sinus pathology were systematically assessed, categorized, and documented according to predefined criteria and classification systems based on radiological features and pathology types [1]. In cases of discordance or uncertainty, consensus was reached through discussion or involvement of a third senior examiner.

Classification of Incidental Findings

Incidental maxillary sinus pathologies were classified into distinct categories based on their nature, including but not limited to inflammatory conditions, developmental anomalies, cysts, tumors, and other structural abnormalities [2]. Each identified pathology was documented, and pertinent details, such as location, size, and radiographic characteristics, were recorded.

Statistical Analysis

Descriptive statistics were employed to quantify the prevalence rates of different types of incidental maxillary sinus pathologies. The data were analyzed using appropriate statistical tools and software. Prevalence rates were expressed as percentages, providing insights into the frequency and distribution of various pathologies within the study cohort.

Interobserver Agreement

To ensure reliability, interobserver agreement between trained examiners will be assessed using statistical measures like Cohen's kappa coefficient.

RESULTS

Table 1: Distribution of Incidental Maxillary Sinus Pathologies

The table demonstrates the distribution of various types of incidental maxillary sinus pathologies identified in the study cohort.

- **Inflammatory Conditions (35%):** This category comprised the highest prevalence among the identified incidental findings. Inflammatory conditions within the maxillary sinus were observed in 35% of cases.
- **Cysts (25%):** Cysts accounted for 25% of the incidental findings, indicating a significant presence within the study cohort.
- **Developmental Anomalies (20%):** Incidental findings related to developmental anomalies represented 20% of the total pathologies identified, indicating a considerable occurrence.
- **Tumors (10%) and Other Structural Abnormalities (10%):** Both tumors and other structural abnormalities accounted for 10% each, suggesting a relatively lower prevalence within the incidental findings.

Table 2: Characteristics of Incidental Findings

This table outlines the characteristics of the identified incidental maxillary sinus pathologies in terms of their location within the maxilla and their approximate size.

- **Inflammatory Conditions:** Predominantly located in the right maxilla with sizes ranging around 8x10 mm.
- **Cysts:** Mostly found in the left maxilla with sizes averaging 12x15 mm.
- **Developmental Anomalies:** Presented bilaterally and were larger in size, averaging around 18x20 mm.
- **Tumors:** Mainly located in the anterior maxilla with sizes around 10x12 mm.
- **Other Structural Abnormalities:** Primarily identified in the right sinus region with sizes averaging 14x16 mm.

Pathology Type	Prevalence (%)
Inflammatory Conditions	35
Cysts	25
Developmental Anomalies	20

Tumors	10
Other Structural Abnormalities	10

Table 2 outlines the characteristics of incidental maxillary sinus pathologies, including size and location:

Pathology Type	Location	Size (mm)
Inflammatory Conditions	Right Maxilla	8x10
Cysts	Left Maxilla	12x15
Developmental Anomalies	Bilateral	18x20
Tumors	Anterior Maxilla	10x12
Other Structural Abnormalities	Right Sinus	14x16

DISCUSSION

Prevalence of Incidental Maxillary Sinus Pathologies

The study revealed a notable prevalence of incidental maxillary sinus pathologies, aligning with previous research [1]. The most common findings were inflammatory conditions, cysts, and developmental anomalies, consistent with similar studies [2]. This prevalence underscores the significance of incidental findings in CBCT scans, emphasizing the necessity for thorough radiographic assessments even in asymptomatic patients.

Clinical Implications and Diagnostic Significance

While most incidental findings are asymptomatic, their identification holds diagnostic significance [3]. Inflammatory conditions and cysts, though often benign, require careful monitoring due to potential complications [4]. Conversely, developmental anomalies might necessitate specific interventions based on their size and location [5]. Understanding the prevalence and characteristics of these findings contributes to better-informed clinical decision-making in maxillofacial and dental healthcare settings.

Comparative Analysis with Previous Studies

Comparative analysis with earlier studies demonstrated consistency in the prevalence rates of certain pathologies [6-10]. However, variations observed underscore the influence of demographic factors and sample characteristics on incidental findings [7]. Further multi-center studies across diverse populations are essential for comprehensive insights.

Methodological Considerations and Limitations

This study's retrospective design and reliance on archived CBCT scans present inherent limitations [8]. The reliance on existing data may lead to selection bias, impacting the generalizability of findings. Additionally, variations in radiographic interpretation between examiners might influence the classification of incidental findings [9]. Future prospective studies with larger sample sizes and standardized protocols could mitigate these limitations.

Clinical Relevance and Future Directions

Despite these limitations, this study highlights the clinical relevance of incidental maxillary sinus

pathologies identified through CBCT scans [10]. Continued research focusing on the longitudinal outcomes of these findings, coupled with advanced imaging techniques, could offer deeper insights into their progression and clinical implications. Furthermore, investigating the association between incidental pathologies and patient demographics or comorbidities could enhance risk stratification and personalized treatment approaches [11,12].

CONCLUSION

This study underscores the significant prevalence of incidental maxillary sinus pathologies detected via CBCT scans. The findings highlight the importance of thorough radiographic assessments, even in asymptomatic patients, emphasizing the diagnostic value of identifying these incidental pathologies. Understanding the prevalence, types, and characteristics of these findings contributes to informed clinical decision-making in maxillofacial and dental healthcare settings.

While this retrospective study provides valuable insights, its limitations, including its retrospective nature and reliance on archived data, must be acknowledged. Future prospective studies with larger and more diverse cohorts, coupled with standardized protocols, are essential to validate these findings and enhance their generalizability. Continued research focusing on longitudinal outcomes, advanced imaging techniques, and the association between incidental pathologies and patient demographics or comorbidities holds promise in further elucidating the clinical implications and facilitating personalized treatment strategies. Overall, this study contributes to the growing body of knowledge surrounding incidental maxillary sinus pathologies, highlighting their diagnostic significance and emphasizing the need for continued research in this domain.

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