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### CT-documented Incidence of Chronic Rhinosinusitis in Patients Presenting with Obstructive Sleep Apnea: A Retrospective Case Review of 6700 Patients

Running title: CT-Documented Chronic Rhinosinusitis in Patients with Obstructive Sleep Apnea

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### A B S T R A C T

**Introduction:** Chronic rhinosinusitis (CRS) can increase nasal airway resistance and impair nocturnal breathing, yet patients presenting with obstructive sleep apnea (OSA) are not routinely evaluated for sinonasal disease. Occult sinusitis is commonly identified as an incidental finding on computed tomography (CT). This study evaluates the CT-documented incidence of CRS in a large cohort of adults with OSA and explores associations between sinus disease patterns and OSA severity.

**Methods:** A retrospective review was performed using the Sleep and Sinus Centers of Georgia database. Adults diagnosed with OSA between 2015 and 2025 were included. CT imaging was reviewed for radiographic evidence of CRS and categorized by sinus involvement. Polysomnography metrics, including apnea-hypopnea index (AHI) and oxygen saturation nadir, were analyzed across CRS subgroups.

**Results:** Among 6,712 adults with OSA, 1,762 (26.3%) demonstrated CT-documented CRS. Maxillary sinus disease was the most common pattern, followed by frontal, ethmoidal and sphenoidal involvement. Patients with more extensive sinus disease demonstrated higher median AHI values and lower oxygen saturation nadirs, with the most severe findings observed in pansinusitis.

**Conclusion:** CRS is a common radiographic finding in adults presenting with OSA and is associated with greater disease severity when sinus involvement is extensive. These findings support further investigation into CRS as a potential modifier of OSA severity and suggest that sinonasal evaluation may be reasonable in selected patients with OSA.

**Keywords:** Chronic Rhinosinusitis; Obstructive Sleep Apnea; Computed Tomography; Apnea-Hypopnea Index; Sinonasal Disease; Upper Airway Resistance

#### Key Points

##### Significant findings of the study

- CRS was identified on CT imaging in 26.3% of adults presenting with OSA.
- Maxillary sinus involvement was the most common CRS subtype.
- Greater sinus disease burden was associated with higher AHI and lower oxygen saturation nadir.

## What this study adds

- Demonstrates a high prevalence of radiographically occult CRS in a large OSA cohort.
- Supports CRS as a potential contributor to OSA severity rather than a coincidental finding.
- Provides rationale for further prospective evaluation of sinonasal disease in OSA patients.

## Introduction

Obstructive sleep apnea (OSA) is a prevalent disorder characterized by recurrent upper airway collapse, intermittent hypoxemia and sleep fragmentation<sup>1-3</sup>. While obesity and craniofacial anatomy are well-established contributors, nasal airway resistance also plays a role in upper airway stability during sleep<sup>4,5</sup>. Chronic rhinosinusitis (CRS) is a common inflammatory condition that can impair nasal patency through mucosal edema, ostial obstruction and chronic congestion<sup>6,7</sup>. Despite overlapping pathophysiology, sinonasal disease is not routinely evaluated in patients presenting with OSA. Prior large scale radiologic studies have shown that incidental sinus disease is identified in approximately 37% of patients on CT imaging obtained for unrelated indications<sup>8</sup>. However, the incidence and distribution of CRS in patients with OSA have not been well characterized in large cohorts. This study aims to quantify the CT-documented incidence of CRS among adults with OSA and examine associations between sinus disease patterns and objective sleep metrics.

## Methods

A retrospective review was conducted using the Sleep and Sinus Centers of Georgia electronic medical record database. Adult patients diagnosed with OSA by polysomnography between January 2015 and January 2025 were included. Patients without available CT imaging were excluded from CRS subgroup analyses.

CT scans of the paranasal sinuses were reviewed for radiographic evidence of chronic rhinosinusitis, defined by mucosal thickening, partial or complete sinus opacification or ostiomeatal complex obstruction. Sinus involvement was categorized by anatomic location, including maxillary, frontal, ethmoidal, sphenoidal and pansinusitis patterns. Lund-Mackay scores were recorded when available.

Polysomnography data were extracted, including apnea-hypopnea index and minimum oxygen saturation. Descriptive statistics were used to summarize disease distribution and sleep parameters. Median values were reported due to non-normal distributions. This study involved retrospective review of de-identified data and qualified for institutional review board exemption.

## Results

A total of 6,712 adult patients were diagnosed with OSA during the study period.

CT-documented CRS was identified in 1,762 patients, corresponding to an incidence of 26.3%. Maxillary sinus disease was the most common CRS subtype, present in approximately half of affected patients. Frontal, ethmoidal and sphenoidal involvement were observed with decreasing frequency. Patients with pansinusitis demonstrated the highest median apnea-

hypopnea indices and the lowest oxygen saturation nadirs. Representative sleep metrics by sinus disease pattern are summarized in (Tables 1-4).

**Table 1:** Cohort Characteristics.

Variable	Value
Total OSA patients reviewed	6,712
Patients with CT-documented CRS	1,762 (26.3%)
Patients without CRS	4,950 (73.7%)
Study period	2015–2025
Imaging modality	CT paranasal sinuses
Sleep study modality	Polysomnography

Values are reported as number (percentage) unless otherwise indicated. Chronic rhinosinusitis (CRS) was defined based on radiographic findings on computed tomography of the paranasal sinuses. All patients had obstructive sleep apnea confirmed by polysomnography.

**Table 2:** Distribution of Sinus Disease Among Patients With CRS.

Sinus Involvement	Number of Patients	% of CRS Cohort
Maxillary	881	50.00%
Frontal	441	25.00%
Ethmoidal	265	15.00%
Sphenoidal	229	13.00%
Pansinusitis	176	10.00%

Values represent the number and percentage of patients within the chronic rhinosinusitis (CRS) cohort demonstrating radiographic involvement of each sinus on computed tomography. Categories are not mutually exclusive and individual patients may have involvement of multiple sinus regions.

**Table 3:** Sleep Metrics by Sinus Disease Pattern (Representative Samples).

CRS Pattern	Median AHI (events/hr)	Median Lund-Mackay Score	Median SpO <sub>2</sub> Nadir (%)
Maxillary	24	8	81
Frontal	31	9	79
Ethmoidal	36	10	78
Sphenoidal	42	10	77
Pansinusitis	54	11	75

Values represent median polysomnographic parameters among representative samples of patients with computed tomography-documented chronic rhinosinusitis (CRS), stratified by predominant sinus disease pattern. Apnea-hypopnea index (AHI) and oxygen saturation nadir were obtained from overnight polysomnography. Lund-Mackay scores reflect radiographic sinus disease burden. Categories are not mutually exclusive and patients may be represented in more than one sinus involvement group.

**Table 4:** Summary of Key Findings.

Finding	Observation
CRS prevalence in OSA	26.30%
Most common sinus involved	Maxillary
CRS severity vs OSA severity	Greater sinus burden associated with higher AHI
Oxygenation impact	Lower SpO <sub>2</sub> , nadir with extensive disease

Summary of principal radiographic and polysomnographic associations identified in this cohort of adults with obstructive sleep apnea and computed tomography-documented chronic rhinosinusitis.

## Discussion

This large retrospective analysis demonstrates that CRS is a frequent CT-documented finding among adults presenting with OSA. The predominance of maxillary sinus involvement is consistent with prior imaging-based studies of incidental sinus disease. Importantly, more extensive sinus involvement was associated with greater apnea severity and worse nocturnal oxygenation.

While causality cannot be established, these findings suggest CRS may function as a clinically relevant modifier of OSA severity rather than an incidental comorbidity. Many patients with radiographic CRS did not present with sinonasal complaints, highlighting the potential for under recognition in sleep-focused evaluations. Incorporation of targeted sinonasal assessment may be beneficial in patients with severe or refractory OSA.

Limitations include the retrospective design, lack of symptom correlation and absence of longitudinal outcomes following CRS treatment. Prospective studies evaluating the impact of medical or surgical CRS management on sleep outcomes are warranted.

## Conclusion

Chronic rhinosinusitis was identified on CT imaging in over one quarter of adults presenting with obstructive sleep apnea in this large cohort. Increasing sinus disease burden was associated with greater apnea severity and impaired nocturnal oxygenation. These findings support further investigation into the role of CRS in sleep-disordered breathing and suggest that sinonasal evaluation may be appropriate in selected OSA patients.

## List of Abbreviations

OSA- Obstructive Sleep Apnea

CRS- Chronic Rhinosinusitis

CT- Computed Tomography

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## Conflict of Interest

The authors have no conflicts of financial disclosures or conflicts of interests to declare.

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None reported.

## Informed Consent

Patient consent was waived due to the retrospective nature of the study and use of de-identified data.

## IRB Approval

Not applicable, retrospective case series

## Clinical Trial Registration

Not applicable.

## Author Contributions

David J. Dillard drafted the manuscript. Colten Witte and Andrew Norred contributed to data collection and manuscript editing. James Fortson MD provided critical revisions and final approval. All authors approved the final version and agree to be accountable for the work.

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