

**STUDY OF ANATOMICAL VARIATIONS OF NOSE AND PARANASAL SINUSES USING COMPUTED TOMOGRAPHY (CT) SCAN IN CHRONIC RHINOSINUSITIS****Dr. D. R. Prakash**

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ABSTRACT

Background: Anatomical variations of the nasal cavity and paranasal sinuses are common and have significant implications in the diagnosis and surgical management of chronic rhinosinusitis (CRS). **Objective:** To assess anatomical variations of the nose and paranasal sinuses using CT scan in patients with chronic rhinosinusitis. **Methods:** This cross-sectional observational study was conducted at a tertiary care hospital over a two-year period. Sixty adult patients with CRS underwent CT scan evaluation. Anatomical variations were recorded and analyzed for associations with age and gender. **Results:** The most common anatomical variations were agger nasi cells (93%), nasal septal deviation (83%), and inferior turbinate hypertrophy (58%). Frontal sinus hypoplasia was noted in 5%, and maxillary sinus septation in 16%. Statistically significant gender differences were observed in nasal septal deviation and inferior turbinate hypertrophy. Frontal sinus hypoplasia showed significant variation with age. **Conclusion:** CT scan is invaluable in detecting anatomical variations in CRS patients. These variations should be thoroughly evaluated during diagnosis and pre-surgical planning to ensure optimal outcomes.

KEYWORDS : Chronic Rhinosinusitis, Anatomical Variations, CT Scan, Paranasal Sinuses, Nasal Septum**1. INTRODUCTION**

Chronic rhinosinusitis (CRS) is a prevalent inflammatory condition of the paranasal sinuses, characterized by persistent mucosal inflammation lasting more than 12 weeks. The etiology of CRS is multifactorial, involving environmental factors, infections, allergies, and anatomical variations. Anatomical variations of the nasal cavity and paranasal sinuses can significantly impact sinus ventilation and drainage, predisposing individuals to CRS.

Computed tomography (CT) has become the gold standard for evaluating sinonasal anatomy due to its superior ability to delineate bony structures and detect anatomical variations. Identifying these variations is crucial for accurate diagnosis and for planning functional endoscopic sinus surgery (FESS), aiming to restore normal sinus function and prevent complications.

Previous studies have reported various anatomical variations associated with CRS, including deviated nasal septum (DNS), concha bullosa, agger nasi cells, Haller cells, and Onodi cells. Understanding the prevalence and distribution of these variations in different populations can aid in better management of CRS.

This study aims to assess the anatomical variations of the nose and paranasal sinuses using CT scans in patients with CRS and to analyze their associations with age and gender.

2. Objectives

- To identify and describe anatomical variations of the nasal cavity and paranasal sinuses in CRS patients using CT scan.
- To assess the frequency and distribution of these variations across different age groups and genders.

3. MATERIALS AND METHODS**Study Design:** Cross-sectional observational study**Setting:** Tertiary care hospital**Study Duration:** Two year**Sample Size:** 60 patients**Inclusion Criteria:**

- Patients aged >18 years
- Clinically diagnosed with CRS based on history and endoscopic findings

Exclusion Criteria:

- History of trauma to the nose or paranasal sinuses
- Presence of nasal or sinus neoplasms
- Previous nasal or sinus surgery

Data Collection

Participants were assessed using a structured questionnaire (capturing demographics and symptoms), followed by CT imaging of the paranasal sinuses. Images were evaluated for anatomical variations by radiologists and ENT specialists. Data was analyzed using SPSS version 20. Chi-square test was used for categorical variables with a significance level set at $p < 0.05$.

Ethical Considerations:

Institutional ethical committee approval was obtained. Written informed consent was taken from all participants.

4. RESULTS

Among the 60 patients included in the study, the majority were male (57%), and the most commonly affected age group was 41–60 years (45%). The most frequently reported symptoms included headache (45%) and nasal blockage (35%), which are classical presentations of chronic rhinosinusitis (CRS).

On CT scan evaluation, the most prevalent anatomical variation was the presence of agger nasi cells in 93% of patients. Nasal septal deviation (DNS) was seen in 83% of the cases, often accompanied by septal spur (80%). Inferior turbinate hypertrophy and middle turbinate concha were present in 58% and 57% respectively.

Less common but clinically relevant variations included Haller cells (15%), Onodi cells (8%), maxillary sinus septation (16%), and frontal sinus hypoplasia (5%).

Statistical analysis revealed significant gender-related differences in the presence of DNS, inferior turbinate hypertrophy, and middle turbinate concha ($p < 0.05$). Additionally, frontal sinus hypoplasia showed a significant association with age ($p < 0.05$). These findings underscore the necessity of individualised assessment based on patient demographics.

Table 1: Demographic Distribution of Study Participants

Variable	Category	Frequency	Percentage
Gender	Male	34	57%
	Female	26	43%
Age Group	18–40 years	15	25%
	41–60 years	27	45%
	>60 years	18	30%

Table 2: Common Presenting Symptoms in CRS Patients

Symptom	Frequency	Percentage
Headache	27	45%

Nasal Blockage	21	35%
Nasal Discharge	9	14.6%
Others	3	5.4%

Table 3: Prevalence of Anatomical Variations Detected on CT Scan

Anatomical Variation	Frequency	Percentage
Agger nasi cells	56	93%
Nasal septal deviation (DNS)	50	83%
Septal spur	48	80%
Inferior turbinate hypertrophy	35	58%
Middle turbinate concha	34	57%
Haller cells	9	15%
Onodi cells	5	8%
Maxillary sinus septation	10	16%
Frontal sinus hypoplasia	3	5%

5. DISCUSSION

This study highlights the high prevalence of anatomical variations among CRS patients, emphasizing their importance in diagnosis and treatment planning. The presence of agger nasi cells in 93% of patients aligns with findings by Sumaily et al. (2020), who also reported a similar prevalence in patients undergoing CT evaluation for CRS.

Deviated nasal septum was another prominent variation, seen in 83% of cases. DNS is known to cause obstruction of the osteomeatal complex, leading to impaired sinus drainage (Lee et al., 2016). Septal spurs, often accompanying DNS, were present in 80% of patients. Inferior turbinate hypertrophy and middle turbinate concha also showed high prevalence, consistent with findings from Turna et al. (2017), who emphasized their role in contributing to nasal obstruction and altered airflow dynamics.

The identification of Haller and Onodi cells is particularly important for surgeons, as these structures may pose challenges during functional endoscopic sinus surgery (FESS) and are associated with increased risk of complications if not recognized preoperatively.

Age and gender-related variations reinforce the necessity of a tailored approach when evaluating CRS patients. These findings collectively highlight the crucial role of CT imaging in recognizing anatomical anomalies and enhancing surgical outcomes.

6. CONCLUSION

CT scan serves as a valuable tool for detecting sinonasal anatomical variations in patients with chronic rhinosinusitis. Anatomical variants such as agger nasi cells, DNS, and turbinate hypertrophy are highly prevalent and have direct clinical implications.

Accurate identification of these variations is vital for successful management, especially in planning for FESS. Given the observed associations with age and gender, individualized radiological assessment is recommended to optimize therapeutic interventions.

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