ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 11 | November - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPUTED TOMOGRAPHY FINDINGS OF PARA NASAL SINUS IN CHRONIC RHINOSINUSITIS

Otorhinolaryngology

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ABSTRACT

Background: Chronic Rhinosinusitis is an inflammatory condition lasting over 12 weeks, leading to significant economic burden from missed work due to medical visits. Diagnosis relies on subjective symptoms and physical examination findings so Objective data from CT imaging are crucial for assessing disease extent and guiding functional endoscopic sinus surgery.this study was done know role of Computed tomography of paranasal sinus in Chronic Rhinosinusitis. **Methodology:** This retrospective study was conducted in the ENT department at Basaveshwar Teaching and General Hospital, Kalaburagi. A data pertaining to the duration from 1st July 2022 to 30th June 2024 (24 months) was analysed. CT images were reviewed for mucosal thickening, sinus opacification, nasal polyps, anatomical variations and other relevant findings. **Results:** The study included 50 patients with a diagnosis of CRS. Common CT findings included mucosal thickening sinus opacification, and nasal polyps. Maxillary sinuses were most frequently affected, followed by ethmoid, frontal, and sphenoid sinuses. **Conclusion:** CT imaging of the paranasal sinuses plays a crucial role in the diagnosis and management of chronic rhinosinusitis (CRS). It provides high-resolution images of the sinuses and surrounding structures, allowing for a detailed evaluation of anatomical variations that can impact sinus drainage and contribute to the pathogenesis of CRS.

KEYWORDS

CT PNS, chronic rhino sinusitis, anatomical variations

INTRODUCTION

Chronic Rhinosinusitis is an inflammatory process involving paranasal sinus and persisting for at least 12 weeks, It is a common cause of morbidity, social embarrassment, impaired performance at school, work place and in addition to physical discomfort it also causes substantial economic burden to patients in terms of missed work days due to physician or hospital visits[1], A definitive and timely intervention can reduce morbidity of Chronic Rhinosinusitis (CRS). [2]

The diagnosis of Chronic Rhinosinusitis relies on the clinical judgment based on a number of subjective symptoms and few findings in physical examination. These symptoms and signs are inherently vague and because of the uncertainty associated with the diagnosis of Chronic Rhinosinusitis, it is necessary to have the data that are more objective about the extent of the disease[3]

Computerized Tomography (CT) provides essential preoperative information for the assessment of patients undergoing functional endoscopic sinus surgery. It has high sensitivity and provides objective findings regarding the condition of the paranasal sinuses and the presence of fluid and polyps. Furthermore, CT findings are integral part of severity staging system that are used for chronic rhinosinusitis (CRS)[4].

The primary role of imaging is to document the extent of the disease, to provide accurate display of the anatomy of the sinonasal system. Characterization of the lesion can be helpful in ambiguous cases[5].

Present study was conducted to study the role of computed tomography in diagnosis of paranasal sinus disease.

MATERIALAND METHODS

This retrospective study was conducted in the ENT department at Basaveshwar Teaching and General Hospital, Kalaburagi. A data pertaining to the duration from 1st July 2022 to 30th June 2024 was analysed. patients coming to ENT OPD with sinonasal complaints like nasal obstruction, nasal discharge, facial pain/ headache etc, lasting for more than 12 weeks were selected by random sampling method and subjected to **CT PNS,** CT images were reviewed for mucosal thickening, sinus opacification, nasal polyps, anatomical variations and other relevant findings.

Inclusion Criteria:

1. All patients with chronic sinusitis not responding to routine medical line of treatment(more than 3 months)
2. Age 18-70 years

Exclusion Criteria

1. Bronchial asthma, immuno-compromised state, pregnant females,
2. History of sinonasal malignancy
3. Previous surgical procedure is done on nose

Informed Consent:

Written informed consent of the patient was taken in their own vernacular language.

RESULTS

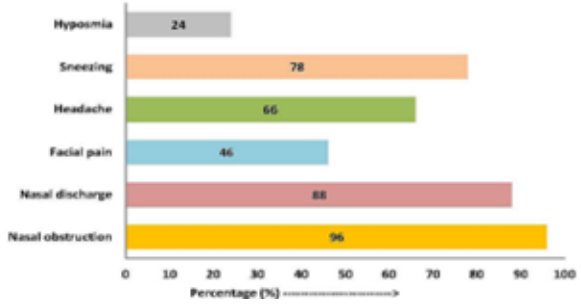
Total of 50 patients with signs and symptoms of chronic rhinosinusitis were studied. In our study both males and females were equal in number, table 1 shows age and sex wise distribution of CRS patients. Majority of the patients were in the age group of 21-30 years (38%) followed by 31-40 years (36%). Most of the patients presented with multiple symptoms as represented in table-2 and the predominant symptoms were nasal obstruction (96%) and nasal discharge (88%), followed by sneezing (78%), headache (66%) and few people complained of facial pain and hyposmia.

Table 1: Age And Sex Distribution

Age group(years)	Female(%)	Male(%)	Total(%)
<20	1(2%)	3(6%)	4(8%)
21-30	10(20%)	9(18%)	19(38%)
31-40	10(20%)	8(16%)	18(36%)
41-50	2(4%)	3(6%)	5(10%)
>50	2(4%)	2(4%)	4(8%)
Total	25(50%)	25(50%)	50(100%)

Table 2 : Symptom Wise Distribution

Symptoms	No of patients	percentage
Nasal obstruction	48	96
Nasal discharge	44	88
Facial pain	23	46
Headache	33	66
Sneezing	39	78
Hyposmia	12	24

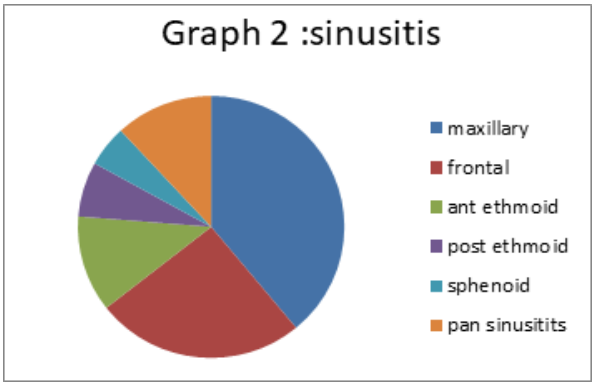


Graph 1: Symptom Wise Distribution

Among 50 patients, the most frequently affected sinus was the maxillary, involving 23 patients (46%). This was followed by the frontal sinus, affected in 15 patients (30%). The anterior ethmoidal sinus was involved in 7 patients (14%), the posterior ethmoidal sinus in 4 patients (8%), and the sphenoid sinus in 3 patients (6%). Pansinusitis was observed in 7 patients (14%) (table 3)

Table 3: Frequency Of Sinus Involved

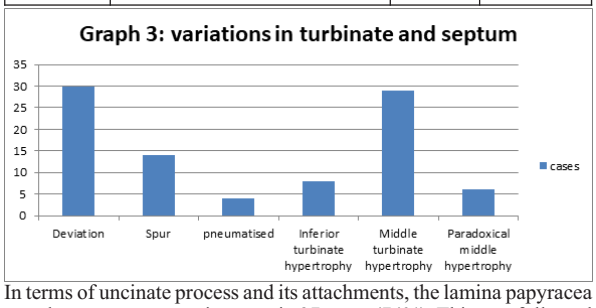
Sinusitis	No cases (%)
Frontal	15 (30%)
Maxillary	23 (46%)
Ant ethmoidal	07 (14%)
Post ethmoidal	04 (08%)
Sphenoidal	03 (06%)
Pan sinusitis	07 (14%)



In our study, regarding the septum and turbinates, the following findings were observed: Nasal septal deviation was the most common anatomical variation, affecting 30 patients (60.0%). Spur was observed in 14 patients (28.0%), and septal pneumatization was present in 4 patients (8.0%). Concha bullosa was identified in 29 patients (58.0%). Additionally, a paradoxical middle turbinate was noted in 6 patients (12.0%), inferior turbinate hypertrophy in 8 patients (16.0%). (Table 4)

Table 4 Variations In Septum And Turbinates

		No of pts	Percentage (%)
Septum	Deviation	30	60
	Spur	14	28
	pneumatised	04	08
Turbinates	Inferior turbinate hypertrophy	08	16
	Middle turbinate hypertrophy	29	58
	Paradoxical middle turbinate	06	12



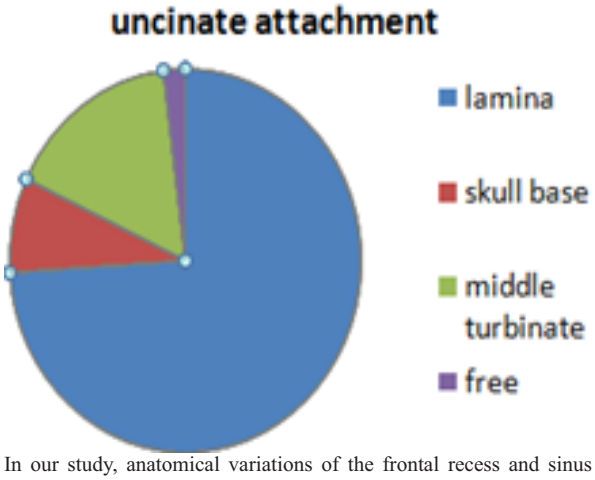
In terms of uncinate process and its attachments, the lamina papyracea was the most common site, seen in 37 cases (74%). This was followed by the middle turbinate in 8 cases (16%), the skull base in 4 cases (8%), and a free in 1 case (2%), Pneumatized/curved uncinate was seen in 13 (26%) of patients,as shown in table 5.

Table 5: Uncinate Attachment

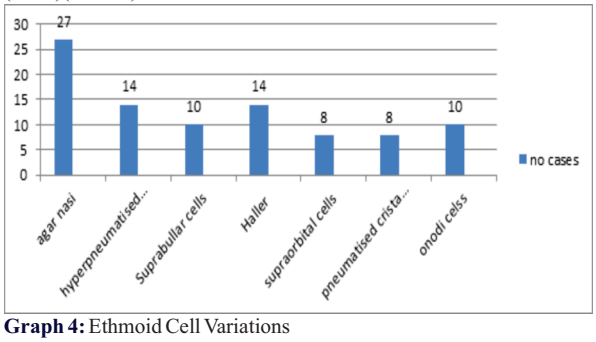
Uncinate attachment		No cases(%)
	Lamina papyracea	37(74%)
	Skull base	04(8%)
	Middle turbinate	08(16%)
	Free	01(2%)
Pneumatised or curved uncinate		13(26%)

Table 6: Frontal Cells

Frontal sinus/recess		No of cases(%)
Frontal/khun cells	Type 1	4(8%)
	Type 2	6(12%)
	Type 3	12(24%)
	Type 4	18(36%)
Interfrontal septal pneumatisation		7(14%)
Hypoplasia		1(20%)



In our study, anatomical variations of the frontal recess and sinus included frontal sinus hypoplasia in 1 patient (2%) and interfrontal septal pneumatization in 7 patients (14%). The most common type of Khun cells was type 4, observed in 18 cases (36.0%), followed by type 3 in 12 cases (24.0%), type 2 in 6 cases (12.0%), and type 1 in 4 cases (8.0%)(Table 6).



Graph 4: Ethmoid Cell Variations

Table 7: Ethmoid Cell Variations

Sl no	Ethmoid air cells	No of case(%)
1.	Agar Nasi	27(54%)
2.	Hyperpneumatised bulla	14(28%)
3.	Suprabullar cells	10(20%)
4.	Haller cells	14(28%)
5.	Supraorbital cells	08(16%)
6.	Pneumatised crista gali	08(16%)
7.	Onodi cells	10(20%)

Regarding ethmoid cell variations in our study, the agger nasi cell was present in 27 cases (54.0%). Hyperpneumatized bulla was observed in 14 cases (28.0%), while Haller cells were found in 14 cases (28.0%). The supraorbital cell appeared in 08 cases (16%), and suprabullar cells were noted in 10 cases (20%). Pneumatized crista galli was identified in 8 cases (16.%), and Onodi cells were seen in 10 cases (20.0%). (Table 7, graph 4)

Anatomical Variations In Maxillary And Sphenoid Sinus

In our study,variations in the maxillary and sphenoid sinuses were as follows: maxillary hypoplasia was observed in 3 cases (6%) and maxillary septations in 5 cases (10%). Among the sphenoid sinus pneumatization types, the presellar type was present in 4 cases (8%), the sellar type in 22 cases (44%), and the postsellar type in 19 cases (38%). Anterior clinoid process pneumatization was noted in 12 cases (24%), while the lateral recess was identified in 7 cases (14%). (**Table 8**)

Table: 8 Variations In Maxillary And Sphenoid Sinus

Variations			No of cases (%)
Maxillary sinus	Hypoplasia		3(6%)
	Septations		5(10%)
Sphenoid sinus	pneumatization	Presellar	4(08%)
		Sellar	22(44%)
		Post sellar	19(38%)
Pneumatized clinoid process			12(24%)
Lateral recess			07(14%)

DISCUSSION:

In the present study, 50 patients with clinically diagnosed chronic rhinosinusitis (CRS) were in the age range of 18 — 60 years. The youngest patient was 18 years old, while the eldest was 60 years old. These patients were categorised into various age groups as detailed in table-1 Maximum patients of CRS were in the age group of 21-30 years, followed by the age group 31-40 years. Both male and female were equal in number, The findings of various age ranges of patients with CRS in our study were similar to the findings of Nathan K. et. al [6] wherein the youngest patient was 18 years old and the eldest patient of CRS was 56 years old. Majority of the patients of CRS were in the age group of <30 years.

In the present study, most of the patients presented with multiple symptoms as detailed in table-2 and represented in graph-1, the predominant symptoms were nasal obstruction (96%) and nasal discharge (88%), followed by sneezing (78%), headache (66%) and few people complained of facial pain and hyposmia. In a similar study done by Sheetel et. al [7] the commonest complaints were headache seen in 90% followed by nasal discharge seen in 80%. The other complaints such as sneezing were seen in 9% of the patients. A study done by Tegnoor MS. et. al [8] reveals nasal obstruction and headache as the commonest symptoms which was present in 37 (74%) and 39 (78%) cases respectively the next frequently occurring complaint was nasal discharge present in 20 (40%) cases. The research indicated that the primary symptoms observed were nasal discharge, headache, and nasal congestion.

In our study the CT findings in chronic rhinosinusitis revealed that, the Nasal septum was deviated in 30 (60%) of the patients, "Pneumatized" in 4 (8%) of the patients and spur was seen in 14 (28%) of the patients. The inferior turbinate hypertrophy was seen in 8 (16%) of the patients, and the lateral wall of nose had curved/pneumatised uncinate in 13 (26%) patients. The Middle turbinate showed choncha bullosa in 29 (38%), and was paradoxical in 6 (12%) patients. Most of the attachment of uncinate were seen in "Lamina papyracea, followed by middle turbinate 8 (16%), and the skull base 4 (8%). The frontal sinus shows frontal cells/Kuhn cells in 23 (46%) patients and non-central interfrontal septum in 7 (14%), of the patients. The ethmoidal air sinus shows agger nasi in 27 (54%), and hyperpenumatized bulla in 14 (28%), the maxillary sinus shows haller cells in 14 (28%), and septations in 5 (10%) of the patients.

Regarding sinusitis, maxillary sinusitis was the most common, affecting 23 patients (46%). This was followed by frontal sinusitis in 15 patients (30%). Anterior ethmoidal sinusitis and pansinusitis were each observed in 7 patients (14%) and nasal polyps were present in 20 patients (40%).

Among the anatomical variations observed in our study, the deviated nasal septum was the most prevalent. This was comparable with Rashi et al, Devraj et al, M kaya et al [9,10,11]

On comparing literature, the incidence of septal deviation was high in studies like M kaya et al[9] 89.7% ,Devraj [10] et al 83.4%, Ahmet kaygusuz et al[12] 72.7%. Next common variation with higher incidence observed in other studies were agger nasi cell, which was 84% in study by Allan keast et al[13], 78.3%Wenrol et al[14] .concha bullosa was noted among 67.5%in the study by Ufukdasar et al[15], 51%M kaya et al[11] ,septal spur was found in 60% patients in study by Allan keast et al[13], 49%Devraj et al[10] ,42.3%Ufukdasar et al[15].

Incidence of haller cells in Wenrol et al[14] ,Allan keast et al [13], were 41.6% ,28%,respectively. Incidence of onodi cells in the study by Ufukdasar et al [15] , Allan keast et al[13] were 25.3 % and 24 % respectively, hyperpneumatized bulla was observed as 31.3 % in the studies conducted by Ahmet kaygusuz et al[12] .paradoxical middle turbinate noted as 26%,15.8% in studies like M kaya et al[11] and Ufukdasar et al[15]. pneumatized crista galli was observed in study by Ahmet kaygusuz et al[12] 22.2% and Devraj et al[10] 43%.

On comparing our study with studies done by **Chakraborty P et al[16] and Lohiya S. S. et al[17]** similarities was found with respect to septal deviation, spur, polyp, concha bullosa, various ethmoid and frontal cells, The commonest finding was DNS, commonest sinus involved is maxillary sinus followed by frontal sinus, most common anatomical variation was found to be concha bullosa.

Our study revealed a higher incidence of anatomical variations in patients with chronic rhinosinusitis (CRS). Notably, variations in and around the narrow drainage pathways of the anterior sinuses, especially at the osteomeatal complex and infundibular level, significantly affect the drainage of the frontal and maxillary sinuses, contributing to chronic mucosal disease. This association between anatomical variations at the infundibular level and chronic mucosal disease is consistent with Messerklinger's mucosal contact theory.

Consequently, CT imaging of the paranasal sinuses (PNS) is essential for assessing anatomical variations in CRS patients. It helps identify potential links between these variations and mucosal inflammation, and assists surgeons in addressing variations that narrow the drainage pathways during functional endoscopic surgery.

CONCLUSION

CT imaging of the paranasal sinuses plays a crucial role in the diagnosis and management of chronic rhinosinusitis (CRS). It provides high-resolution images of the sinuses and surrounding structures, allowing for a detailed evaluation of anatomical variations such as nasal septal deviation, concha bullosa, and variations in the osteomeatal complex. These variations can impact sinus drainage and contribute to the pathogenesis of CRS.

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