

Analytical Cross-Sectional Study Of Anatomical Variations Of Paranasal Sinuses In Ct Pns And Its Subsequent Agreement With Intra-Operative Findings In Patients Of Chronic Sinusitis In Tertiary Care Hospital In North Maharashtra.

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ABSTRACT:

Back ground:

Chronic sinusitis is a common medical condition characterized by inflammation of the paranasal sinuses, often leading to the need for surgical intervention. CT Scan has an important role in diagnosing. One of the tools used to identify and detecting these anatomical variations. in patients is CT scans This study focusses to conduct an analytical cross-sectional investigation into the anatomical variations of paranasal sinuses using Computed Tomography of the Paranasal Sinuses (CT PNS) and to evaluate how well these findings align with what is observed during surgery in patients with chronic sinusitis. The focus is on understanding the agreement between preoperative imaging and surgical findings, which is crucial for improving diagnostic accuracy, optimizing preoperative planning, and ultimately enhancing patient outcomes in the management of chronic sinusitis. The research strives to deepen our understanding of anatomical variations, offering valuable insights into the practical implications and reliability of CT PNS as a diagnostic tool for chronic sinusitis surgery.

Aim & Objective: To identify & list various anatomical variations of paranasal sinuses in radiological imaging (CT PNS) with objectives of to identify & list anatomical variations of paranasal sinuses in intra-operative findings and To find agreement between radiological findings & intra-operative findings in patients of chronic sinusitis.

Material & Method: Analytical cross-sectional study in patients with Chronic sinusitis using Computed Tomography of the Paranasal Sinuses (CT PNS) and intra-operative correlation. Total 106 patients included in the study with Age group - 5 to 60 years and fulfilling inclusion criteria. Age <5 years & > 60 years patients, Patients in whom in CT PNS is contraindicated and Patients who have previously undergone nose surgery for any nasal pathology were excluded. All-important positive findings & normal anatomical variations in CT PNS will be recorded in case proforma.

Result: The study has a higher representation of males (58) compared to females (48) with majority of 38 patients in the age group of 21 -40 years. The most prevalent complaint is nasal obstruction and discharge, reported by 40 patients, constituting 37.74% of the total followed by chronic rhinosinusitis. Anatomical variations observed in CT PNS scans and intra-operative findings in patients with chronic sinusitis. Polyp (56.60%) found in both scan and intra operative in sinusitis. Frontal sinus well

pneumatised 64(60.37%) in CT PNS where as in Intra-op 78(73.58%).

Discussion: Nasal obstruction and discharge are the most common chief complaints, constituting 37.74% of cases, followed by chronic rhinosinusitis at 16.98%. The detailed breakdown of anatomical variations aids in assessing the strengths and limitations of preoperative imaging, crucial for surgical planning and patient management. The study provides a comprehensive understanding of both demographic characteristics and anatomical variations in chronic sinusitis patients.

Conclusion: In conclusion, our study on anatomical variations of paranasal sinuses in patients with chronic sinusitis, incorporating both demographic characteristics and intra-operative findings.

Keywords: Anatomical variations, Paranasal sinuses, Sinusitis, Computerised tomography

INTRODUCTION:

Chronic rhino sinusitis (CRS) is one of the most common illnesses of our times and is a condition that is increasing in epidemic proportions throughout the world.¹ Chronic sinusitis is a common medical condition characterized by inflammation of the paranasal sinuses, often leading to the need for surgical intervention. Its diagnosis relies on clinical judgment based on a number of often vague physical complaints and symptoms and with help of conventional anterior and posterior rhinoscopic examination. The presence of anatomic variations must be noted in order to attain a full understanding of the individual patient as well as to develop an accurate diagnosis^{2,3}. Understanding the complex anatomy of the skull base is crucial for the safe endoscopic sinus surgery; inadvertent violation of the cribriform plate may cause CSF leak, direct penetration trauma to the dura, serious intracranial and intracerebral complications.^{4,5} There are many racial and genetic factors responsible for these anatomical variations, and there is a variation of these in different populations and races.⁶ Computed topography CT) of the paranasal sinuses is required for the diagnosis and subsequent treatment of sinusitis as the underlying anatomical variations could possibly be a cause for sinonasal symptoms. CT demonstrates the extent of disease, significant anatomical variations that may predispose to rhinosinusitis and the nearby vital structures so that iatrogenic damage can be avoided⁷ Along with the axial sections, direct coronal scanning and sagittal reconstructions provide accurate delineation of the micro anatomic locales and disease in the PNS. CT provides a preoperative road map for functional endoscopic sinus surgery. A combination of CT and diagnostic endoscopy has become the corner stone in the management of paranasal sinus diseases. This study focusses to conduct an analytical cross-sectional investigation into the anatomical variations of paranasal sinuses using Computed Tomography of the Paranasal Sinuses (CT PNS) and to evaluate how well these findings align with what is observed during surgery in patients with chronic sinusitis.

MATERIAL & METHODS:

Analytical cross-sectional study done in patients with Chronic sinusitis using Computed Tomography of the Paranasal Sinuses (CT PNS) and intra-operative correlation. Total 106 patients included in the study with Age group - 5 to 60 years and fulfilling inclusion criteria who are suffering from chronic sinusitis and are to be posted for functional endoscopic sinus surgery will be advised to do CT PNS as a part of pre-operative evaluation. Age <5 years & > 60 years patients, Patients in whom in CT PNS is contraindicated and Patients who have previously undergone nose surgery for any nasal pathology were excluded. All-important positive findings & normal anatomical variations in CT PNS will be recorded in case proforma. Appropriate statistical tests will be applied to analyse collected data.

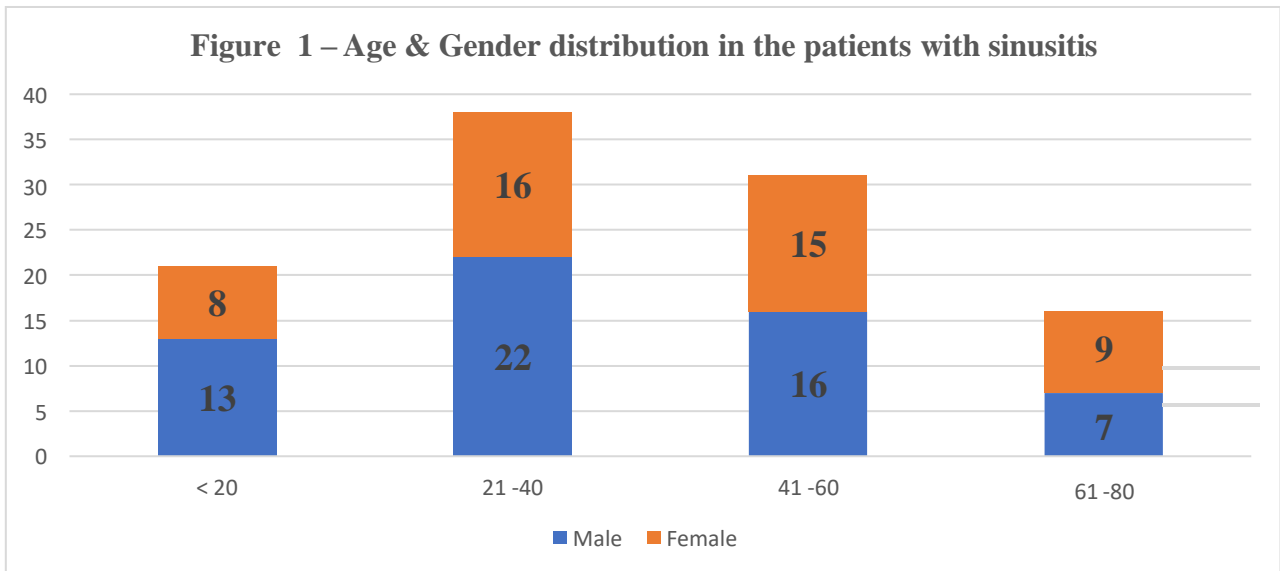
RESULTS:

The demographic distribution of 106 patients in a study on anatomical variations of paranasal sinuses in chronic sinusitis. The study has a higher representation of males (58) compared to females (48) with majority of 38 patients in the age group of 21 -40 years. (Table1) (Fig 1)

Table 1 – Age & Gender distribution in the patients with sinusitis

Age in years	Male	Female	Total
< 20	13	8	21
21 -40	22	16	38
41 -60	16	15	31
61 -80	7	9	16
Total	58	48	106

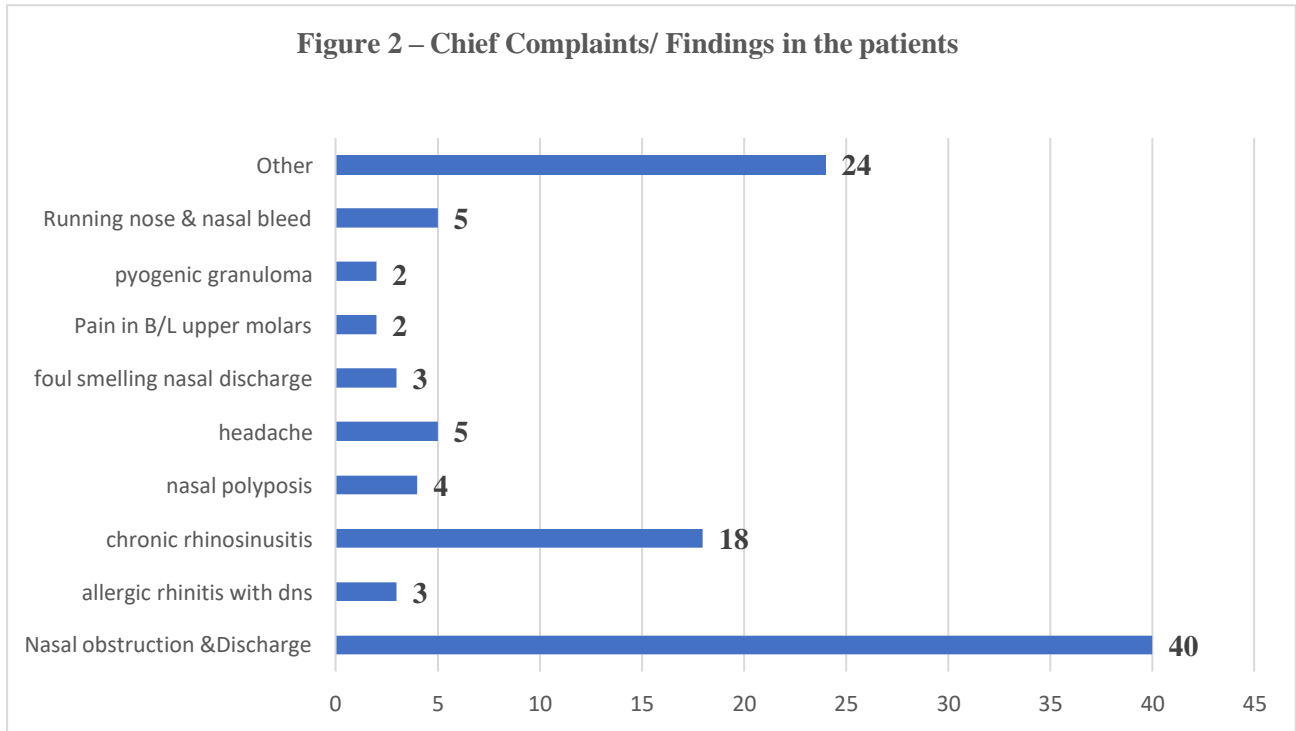
Figure 1 – Age & Gender distribution in the patients with sinusitis



The chief complaints and Nasal Examination Findings of 106 patients in the context of a study on anatomical variations of paranasal sinuses in chronic sinusitis. The most prevalent complaint is nasal obstruction and discharge, reported by 40 patients, constituting 37.74% of the total. This distribution of chief complaints reflects the diverse clinical spectrum of patients involved in the study (Table2 Fig2)

Table 2 – Chief Complaints and Nasal Examination Findings in the patients with sinusitis

Chief Complaints	No of Patients (N)	Percentage (%)
Nasal Obstruction &Discharge	40	37.74
Allergic Rhinitis with DNS	3	2.83
Chronic Rhinosinusitis	18	16.98
Nasal Polyposis	4	3.77
Headache	5	4.72
Foul Smelling Nasal Discharge	3	2.83
Pain In B/L Upper Molars	2	1.89
Pyogenic Granuloma	2	1.89
Running Nose & Nasal Bleed	5	4.72
Other	24	22.64
Total	106	100



A comparative overview of anatomical variations observed in CT PNS (Computed Tomography of Paranasal Sinuses) scans and intra-operative findings in patients with chronic sinusitis. This table serves as a valuable reference for assessing the agreement between preoperative imaging and actual intra-operative observation, contributing to a comprehensive understanding of the accuracy of CT scans in identifying anatomical variations in chronic sinusitis patients. (Table 3)

Table 3 – Study of Anatomical variations in comparison CT PNS & Intra-op in the patients with sinusitis

Variation	CT PNS (N) /%	Intra-op(N)/%
FRONTAL SINUS		
a) Well pneumatised	64(60.37)	78(73.58)
ETHMOID AIR CELLS		
a) Agar nasi cells	10(9.43)	8(7.54)
b) Ethmoid bulla	6 (5.66)	8(7.54)
c)Haller cells	8(7.54)	6 (5.66)
d)Onodi cells	6 (5.66)	6 (5.66)
SPHENOID SINUS		
a) Well pneumatised	18 (16.98)	18 (16.98)
b) septations	74(69.81)	74(69.81)
NASAL SEPTUM		
a) Midline	14(13.20)	14(13.20)
b) Deviated /Not deviated	100(94.33)	99 (93.39)
NASAL TURBINATES		
a) Superior	99 (93.39)	100(94.33)
b) Middle	100(94.33)	99 (93.39)
c) Inferior	100(94.33)	100(94.33)

MIDDLE TURBINATE VARIATIONS		
a) Paradoxical curve	2 (1.88)	2 (1.88)
b) Concha bullosa	24(22.64)	23 (21.69)
OMU'S		
a) Blocked /not blocked	72 (67.92)	72 (67.92)
INFLAMMATORY DISEASE		
a) Present /absent	60 (56.60)	74(69.81)
INTRASINUS CONTENT		
a) polyp	60 (56.60)	60 (56.60)
b) mucous retention cyst	4 (3.77)	2 (1.88)
c) fungal colonisation	10(9.43)	12 (11.32)
d) pus	34 (32.07)	44 (41.50)

DISCUSSION:

The present study presents a diverse patient population in terms of age and gender. Our study findings are consistent with the research by Multazar in 2008 that 20.61% of CRS patients fell into the early adulthood category. Thomas (2020) stated that CRS patients aged 40-64 years (late adult and seniors) were 48.5%.⁸ Based on this research and earlier studies ones, it was found that CRS patients were generally adult and the elderly. Although there are little variations in the age distribution, it is likely attributed to differences in the research population, sample size, and the specific age categories used for classification.

The study has a higher representation of males (58) compared to females (48). The Korea National Health and Nutritional Examination Survey in 2011 also reported a higher prevalence of CRS in males than females. And in similar to studies by Dewi PKY.⁹ and Sitinjak N¹⁰. However, data from The Longitudinal Health Insurance Database of Taiwan in 2014 showed a slightly higher prevalence of CRS in females (51%) than males (49%).

Nasal obstruction, a common symptom in CRS patients, can be attributed to various factors, including septal deviation and different degrees of inferior concha hypertrophy. Inferior concha hypertrophy is a physiological compensation mechanism to protect the nasal mucosa from dry air and excessive crusting caused by increased airflow. In our study Nasal obstruction and discharge are the most common chief complaints, constituting 37.74% of cases, followed by chronic rhinosinusitis at 16.98%.

The study provides a comprehensive understanding of both demographic characteristics and anatomical variations in chronic sinusitis patients Findings suggest that while CT PNS scans generally align well with intra-operative observations, there are instances of discrepancies, particularly in estimating the extent of frontal sinus pneumatization. This finding is in accordance with the research conducted by Shivaprakash in 2018, which reported complete-type sphenoid sinus pneumatization in 76.6%¹¹ a research conducted by Basti in 2018 reported that the majority of CRS patients had Keros type I, accounting for around 62%¹² The detailed breakdown of anatomical variations aids in assessing the strengths and limitations of preoperative imaging, crucial for surgical planning and patient management. **Image 1-** Cross Sectional Anatomy of Paranasal sinus, **Image 2:** CT PNS, coronal view, shows a septate Onodi cell (O) extending superiorly and laterally to the sphenoid sinus (S). **Image 3:** Coronal CT scan shows that the ethmoid roofs are almost in the same plane as the cribriform plate (double arrow) – Keros type I, **Image 4:** Coronal CT reveals the olfactory fossae are deeper and the lateral lamellae are longer (double arrow) – Keros type II, **Image 5:** Coronal CT images reveals a prominent agger nasi cell (A) inferior and lateral to the nasofrontal recess (solid curved line). The medial relationship of the recess is formed by the middle turbinate (MT), **Image 6:** Coronal CT shows

ethmoid bulla (arrow) superior to the ethmoid infundibulum (star), **Image 7:** Coronal CT showing pneumatized bulbous portion of middle turbinate—concha bullosa—bilaterally (arrows), **Image 8:** Coronal CT shows right Haller cell (star).

CONCLUSION:

In conclusion, our study on anatomical variations of paranasal sinuses in patients with chronic sinusitis, incorporating both demographic characteristics and intra-operative findings, provides valuable insights into the clinical landscape of this condition. The diverse patient population, with a spectrum of chief complaints, underscores the multifaceted nature of chronic sinusitis presentations. Analysis of anatomical variations comparing CT PNS scans to intra-operative observations reveals generally good concordance, indicating the reliability of preoperative imaging in identifying variations across various sinuses and nasal structures. These results contribute to understanding of the anatomical intricacies in chronic sinusitis patients, aiding clinicians in preoperative planning and enhancing the overall management of this condition.

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Image 1: Cross Sectional Anatomy of Paranasal sinus

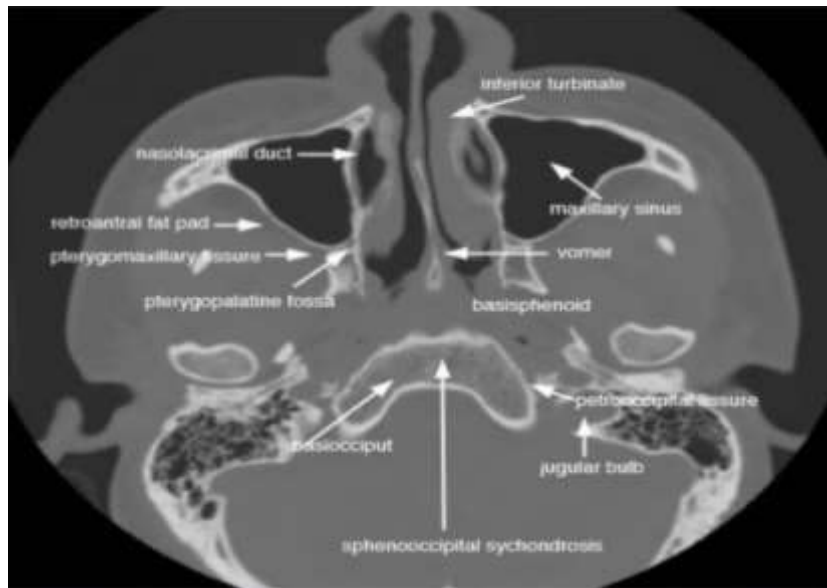


Image 2: CT PNS, coronal view, shows a septate Onodi cell (O) extending superiorly and laterally to the sphenoid sinus (S).



Image 3: Coronal CT scan shows that the ethmoid roofs are almost in the same plane as the cribriform plate (double arrow) – Keros type I



Image 4: Coronal CT reveals the olfactory fossae are deeper and the lateral lamellae are longer

(double arrow) – Keros type II



Image 5: Coronal CT images reveals a prominent agger nasi cell (A) inferior and lateral to the nasofrontal recess (solid curved line). The medial relationship of the recess is formed by the middle turbinate (MT)

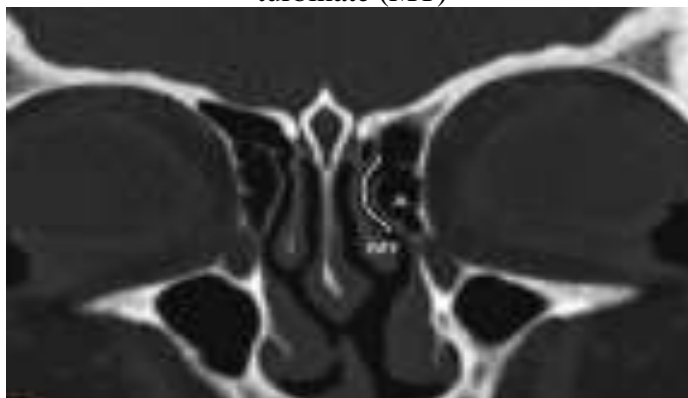


Image 6: Coronal CT shows ethmoid bulla (arrow) superior to the ethmoid infundibulum (star)

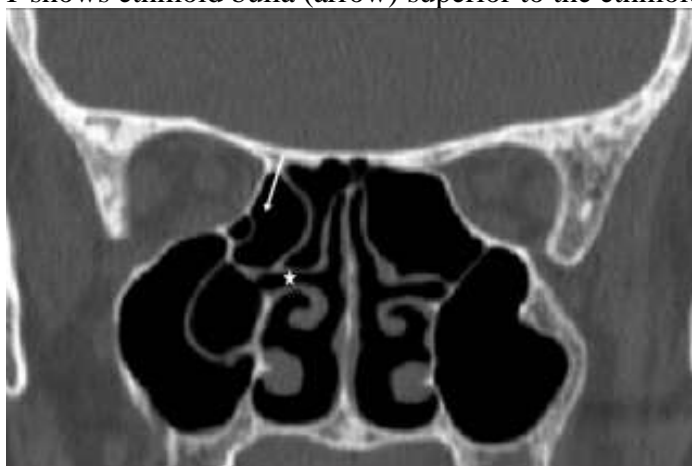


Image 7: Coronal CT showing pneumatized bulbous portion of middle turbinate—concha bullosa—bilaterally (arrows)



Image 8: Coronal CT shows right Haller cell (star)

