

# Anatomical variations of nose and paranasal sinuses in chronic rhino sinusitis patients attending a tertiary care hospital

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## Abstract

**Background:** The anatomy of the nose and paranasal sinuses is complex, and many anatomical variations have been thoroughly studied. There is impact of these variations on the occurrence of sinusitis. Computed Tomography (CT) scan is the modality of choice for evaluation of variable anatomical variations and different forms of sinusitis. The current study was done to determine the prevalence of variations in sinonasal anatomy causing chronic sinusitis by reviewing the computed tomography (CT) scans of patients with chronic rhino sinusitis. **Materials And Methods:** This Cross sectional study was carried out at Tertiary hospital during October 2019 to September 2020. Diagnostic Computed Tomography of nose and Paranasal Sinuses of 100 patients of chronic rhino sinusitis were studied. Radiological findings were reviewed and obtained data was analyzed with SPSS version 16. Descriptive statistics was used to analyse the data. **Result:** of the 100 patients included, 80% had septal deformities, 38% had Concha bullosa, 12% had Uncinate deviation, 9% had Paradoxical Middle Turbinate, 7% had Agger Nasi cell, 5% had onodi cell, 2% had Haller Cell. Most common sinus affected due to infection/ inflammation was maxillary sinus (65%). **Conclusion:** The most anatomical variation in this study is septal deviation. Precise knowledge of anatomic variations of the paranasal sinuses is important in chronic rhino sinusitis to prevent possible complications during surgery. Computed tomography is the modality of choice in evaluation of paranasal sinuses and adjacent structures.

**Keywords:** Paranasal sinuses, Sinusitis, CT, Anatomical variation.

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## INTRODUCTION

The term sinusitis refer to group of disorders characterized by inflammation of mucosa of sinuses. Chronic Rhino sinusitis (CRS) is an episode of inflammation of the nasal cavity and paranasal sinuses lasting more than 90 days, despite medical treatment. Chronic rhino sinusitis (CRS) is

a disease of the nasal and paranasal cavities, which impairs the quality of life, decreases workplace productivity and causes considerable treatment costs. The main pathophysiology of these chronic airway cases is poorly found and seems to be multifactorial.<sup>1-5</sup> Congenital anomalies and normal anatomical variations in the paranasal sinus region, though rare, are important as they may have pathological consequence or may be the source of difficulty during Functional endoscopic sinus surgery.<sup>6</sup> Therefore, precise knowledge of anatomy and anatomic variations of the nose and paranasal sinus complex is essential to help achieve best surgical results and avoid complications.

CT is currently the modality of choice in the evaluation of the paranasal sinuses and adjacent structures. Its ability to optimally display bone, soft tissue, and air facilitates accurate depiction of anatomy and extent of disease in and around the paranasal sinus region.<sup>7</sup> Anatomical description

of the paranasal sinus on a CT scan is the initial condition that must be known before surgery. CT scan is a good method for evaluating anatomical structures because it can clearly show the anatomical structure of the nose and paranasal sinuses such as ostiomeatal complex conditions, anatomic abnormalities, visualization of the presence or absence of pathological tissue in the sinuses and its expansion. CT scan is able to provide an overview of the anatomical structure in the area that is not visible through endoscopy. This examination is very good in showing anterior ethmoid cells, two thirds of the nasal cavity and recessus frontalis. In this area the CT scan can show the location of the causes of chronic sinusitis, namely the osteomeatal complex.<sup>8</sup> Knowing the anatomic variations of the nose and paranasal sinuses in rhino sinusitis is important because it can be used as a reference for proper intervention to treat rhino sinusitis. In the present article, we examined the CT scans of patients suffering from CRS to know the prevalence of variations in sinonasal anatomy causing chronic sinusitis.

**MATERIALS AND METHODS**

A prospective analysis of 100 computed tomography (CT) examinations of patients with chronic rhino sinusitis was conducted to determine the prevalence of clinically significant anatomical variations of the paranasal sinuses. A total of 100 CT scans were included from October 2019 to September 2020. The study was conducted after getting clearance from institutional ethical committee. Written informed consent was obtained from all patients prior to the study procedure or data collection.

**Inclusion criteria**

Adult patients presenting with a history of nasal obstruction, nasal discharge, postnasal discharge and headache, clinically diagnosed to have chronic rhino sinusitis (symptoms for a period of 12-week or more despite adequate medical treatment). Patients with age group from 17 years and both sex were included in the study.

Patients giving informed consent for the procedure.

**Exclusion criteria**

Patients with rhino sinusitis less than 12 weeks. Patients with allergic rhinitis. Patients with previous history of sino-nasal surgery. Patients with extensive nasal polyposis. Patients with craniofacial anomalies, facial and head trauma, nasal or facial neoplasms, immunodeficiency or cystic fibrosis. Patients younger than 17 years of age CT scan was done for all patients who had Chronic Rhinosinusitis. The patients had CT scan PNS 5 mm Coronal, Sagittal and axial sections done, they were analyzed for anatomical variations.

**RESULTS**

In this study 100 patients were included, out of which, there were 52 (52 %) males and 48 (48 %) females with ages ranging from 17 to 62 years. Mean age of the study group was 35.48 years (SD=16.15). The distribution of anatomical variants was shown in table 1. The most common variant identified in our study was deviated nasal septum followed by Choncha bullosa. Other variations found were Uncinate Deviation/ Hypertrophy, Aggar Nasi Cell, Paradoxical Middle turbinate, Onodi Cell and Haller cell.

**Table 1: Anatomical variations.**

Anatomical Variation	Frequency	%
DNS	80	80
Choncha bullosa	38	38
Uncinate Deviation/ Hypertrophy	12	12
Paradoxical Middle Turbinate	9	9
Aggar Nasi Cells	7	7
Onodi Cells	5	5
Haller cells	2	2

Mucosal thickening in different anatomical part of sinuses was reported in Table - 2. The Most common sinus affected due to infection/ inflammation was maxillary sinus followed by Ethmoid sinus, Sphenoid sinus and Frontal sinus.

**Table 2: Mucosal thickening in different anatomical part of sinuses**

Involved sinus	Frequency	%
Maxillary	65	65
Ethmoid	48	48
Sphenoid	32	32
Frontal	18	18

**DISCUSSION**

Nasal cavity and paranasal sinuses belong to the same anatomical unit, having common structure and the same covering epithelium.<sup>9</sup> The most common anatomical variation found in this study was a Deviated Nasal septum. Whatever the shape and type of the deviation was found to be occurring, it was consistent with the symptoms presented by the patients. This study showed a prevalence of 80%. This can be compared with the previous studies in the past. Narendra kumar and Subramaniam<sup>10</sup> presented it as 76% whereas Turna *et al.*<sup>11</sup> found it as 59.1%. H Mamatha<sup>12</sup> *et al.* found it to be 65% and K Dua<sup>13</sup> *et al.* 44%. Adeel M<sup>14</sup> *et al.* of Pakistan found it to be prevalent in 26 out of 77 patients, Shpilberg KA<sup>15</sup> *et al.* of USA found it to be in 98 patients out of 192. In the present study, most common sinus affected due to infection/ inflammation was maxillary sinus (65%). This finding corresponds with the studies done by Clement *et al.*,<sup>16</sup> (73%) and Lloyd *et al.*,<sup>17</sup> (83%), whereas, anterior ethmoid

sinus was most commonly affected sinus in the studies done by Bolger *et al.*,<sup>18</sup> (78.2%), Calhoun *et al.*,<sup>19</sup> (84.3%) and Kennedy *et al.*,<sup>20</sup> (78%)

## CONCLUSION

This study proved that there is a strong association between the presence of these variants and development of chronic inflammation in the paranasal sinuses. Nasal septal deviation was the commonest variation reported.

## REFERENCES

1. Van Crombruggen K, Zhang N, Gevaert P, Tomassen P, Bachert C. Pathogenesis of chronic rhinosinusitis: Inflammation. *J Allergy Clin Immunol.*, 2011; 128: 728-32.
2. Ramakrishnan JB, Kingdom TT, Ramakrishnan VR. Allergic rhinitis and chronic rhinosinusitis: their impact on lower airways. *Immunol Allergy Clin North Am.*, 2013; 33: 45-60.
3. Pynnonen MA, Venkatraman G, Davis G. Macrolide Therapy for Chronic Rhinosinusitis: A Meta-analysis. *Otolaryngol Head Neck Surg.*, 2013 Jan 11. [Epub ahead of print].
4. Hashemi SA, Abediankenari S, Madani SA, Akbari M. Comparison of salivary IgA, tear IgA and serum IgE in patients suffering from chronic rhinosinusitis. *Int J Med Invest.*, 2012; 1: 31-7.
5. Hashemi SA, Abediankenari S, Madani SA. Evaluation of systemic allergy in infectious and inflammatory disorders of upper respiratory tract. *Int J Med Invest.*, 2013; 2: 15-20.
6. Kantarci M, Karasen RM, Alper F, Onbas O, Okur A, Karaman A. Remarkable anatomic variations in paranasal sinus region and their clinical importance. *European journal of radiology.* 2004 Jun;50(3):296-302
7. Aygun N ZS. Radiology of the nasal cavity and paranasal sinuses. Philadelphia: Mosby Elsevier; 2010. 662 p.
8. Zinreich SJ, Gotwald T. Radiographic Anatomy of the Sinuses. In: Kennedy DW, Bolger WE, Zinreich SJ, editor. *Diseases.* Hamilton BC Decker Inc. 13-26 (2001).
9. Lingaiah RKN, Putturaj NC, Chikkaswamy HA, Nagarajaiah PKC, Purushottama S, Prakash V, Booma P, Ismail M. Anatomical Variations of paranasal sinuses on coronal CT-scan in subjects with complaints pertaining to PNS. *IJARS DOL:10.7860/IJARS/2016/21554:2192*
10. Narendrakumar V, Subramaniam V. Anatomical variations in osteomeatal complex among patients undergoing functional endoscopic sinus surgery. *ClinRhinolInt J* 2016;9:28-32.
11. Turna O, Aybar MD, Karagoz Y, Tuzcu G. Anatomical variations of the paranasal sinus region: Evaluation with multidetectorCT. *Istanbul Med J* 2014;1:104-109.
12. Mamatha H, Shamasundar NM, Bharathi MB, Prasanna LC. Variation of osteomeatal complex and its applied anatomy: a CT scan study. *Indian J OF Science and technology.* 2010; 3:904-7.
13. Dua K, Chopra H, Khurana A, Munjal M. CT scan variations in chronic sinusitis. *Indian J Radiol imaging* 2005;15:315-20.
14. Adeel M, Rajput MS, Akhter S, Ikram M, Arian A, Khattak YJ. Anatomical variations of nose and paranasal sinuses; cccCT scan review. *J pak Med Assic* 2013;63:317-9.
15. Shpilberg KA, Daniel SC, Doshi AH, Lawson W, Som PM. CT of anatomic variants of the paranasal sinuses and Nasal cavity- poor correlation with Radiologically significant Rhinosinusitis but Importance in Surgical Planning. *Neuroradiology/Head and neck Imaging AJR.* 2015;2014:1255-60.
16. Clement PA, Van der Venker PJ, Iwen P, Buisseret T. Xray,CT-scan, MRI-imaging. In: *Allergic and non-allergic rhinitis: clinical aspects.* Mygind N, Naclerio RM, Eds. Copenhagen: Munksgaard 1993:58-65.
17. Llyod GA, Lund VJ, Scadding GK. CT of the paranasal sinuses and functional endoscopic surgery: a critical analysis of 100 symptomatic patients. *J Lar Oto* 1991;105:181-85.
18. Bolger WE, Butzin CA, Parsons DS. Paranasal sinus bony anatomic variations and Mucosal abnormalities: CT analysis for endoscopic sinus surgery. *Laryngoscope* 1991;101:56-4.
19. Calhoun KH, Wagenspack GA, Simpson CB, HokansonJA, Bailey BJ. CT evaluation of The paranasal sinuses in symptomatic and asymptomatic population. *Otolaryngol Head Neck Surg* 1991; 104: 480-3.
20. Kennedy DW, Zinreich SJ. Functional endoscopic approach to inflammatory sinus Disease: current perspectives and technique modifications. *Am J Rhinol* 1988;2:89-6.

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