

The Study of Anatomical Variations In Chronic Rhinosinusitis Patients

Dr. Manish Gudeniya¹, Dr. Abdul Rehman Khan², Dr. Amit Modwal³,
Dr Man Prakash Sharma⁴ Dr. Ritesh Surana⁵

(ENT DEPARTMENT, NATIONAL INSTITUTE OF MEDICAL SCIENCE, INDIA)

(ENT DEPARTMENT, NATIONAL INSTITUTE OF MEDICAL SCIENCE, INDIA)

(ENT DEPARTMENT, NATIONAL INSTITUTE OF MEDICAL SCIENCE, INDIA)

(ENT DEPARTMENT, NATIONAL INSTITUTE OF MEDICAL SCIENCE, INDIA)

(ENT DEPARTMENT, NATIONAL INSTITUTE OF MEDICAL SCIENCE, INDIA)

Abstract:

Background: Sinusitis is one of the leading health care problems nowadays, increasing in both incidence and prevalence. Various articles have been published regarding etiopathogenesis, microbiology, anatomical variations, and management aspects. This study was done in tertiary care center in north india to assess the prevalence of anatomical variations of ostiomeatal complex and its effect on chronic rhinosinusitis.

Material and Method: 100 patients were examined from July 2021 to December 2022. After the patients were chosen, they had an endoscopic examination and a CT scan of the paranasal sinuses to evaluate them.

Results: Most of the patients in our study exhibited multiple anatomical variations. 84% (84) of the 100 patients investigated had more than one anatomical difference; 65.4% (55) of these patients were men and 34.5% (26) were women, in remaining 16%(16) of patients had only one anatomical aberration. Every patient included in this study had at least one anatomical variation. Both bilaterally or unilaterally manifesting anatomical variations were observed. Out of 100 patients in study, 84 (84%) had bilateral structural variance and only 16 patients (16%) had unilateral anatomical variation. The most frequent anatomical difference identified in our investigation is nasal septal deviation.

Conclusion: septal deviation, concha bullosa, and large bulla ethmoidalis account for 90% of anatomic abnormalities. The majority of anatomical differences resulted from ethmoid sinus aerated cells. By properly assessing anatomical anomalies in CRS patients before surgery, we can minimize unexpected complications and achieve the full eradication of the disease.

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I. Introduction

According to the American Academy of Otorhinolaryngology Head and Neck Surgery, sinusitis is defined as a condition manifested by inflammatory response of the mucous membrane of the nasal cavity and paranasal sinuses, fluid within the cavity, and/or underlying bone. It can also be defined as a group of disorders characterized by inflammation of the mucosa of the nose and paranasal sinuses lasting for at least 12 weeks¹. Clinical features, symptoms and signs include nasal obstruction or congestion, nasal discharge (anterior or posterior nasal drip), facial pain or pressure, and/or a decrease in or loss of smell. Diagnosis requires the presence of either two major factors or one major and two minor factors. Symptoms and Signs of Rhinosinusitis¹: Symptoms and signs of the chronic rhinosinusitis are.

Major Symptoms and Signs:

- Facial pain or pressure
- Facial congestion or fullness
- Nasal obstruction/blockage
- Nasal discharge or purulence, discolored posterior drainage
- Hyposmia/anosmia
- Purulence on nasal examination:
- Fever (acute rhinosinusitis only)

Minor Symptoms or Signs

- Headache or Fever
- Halitosis
- Fatigue

- Dental pain
- Cough
- Ear pain/pressure/fullness

The symptoms might be unspecific and mimic those of other diseases e.g., upper respiratory tract infection, allergic rhinitis, migraine etc. Diagnostic nasal endoscopic evaluation of the nose and para nasal sinuses is now a standard part of evaluating patients with evidence of suspected nose and paranasal sinus disease. The introduction of endoscopes has greatly aided us in recognizing lesions or changes that are hidden from the naked eye or even inspection under microscopes. With this, the provisional diagnosis may be confirmed, expanded or revised. It also helps the otorhinolaryngologist in deciding the mode of treatment. Since there are some diseases of the lateral walls of the nose that can't be found with an endoscope, CT is done even when the diagnostic nasal endoscopy shows nothing important, if history and current symptoms point to the presence of a disease. All patients who have significant findings in diagnostic nasal endoscopy are subject to a CT scan for nasal sinus evaluation. CT scan of the nasal sinuses is not routinely recommended in acute sinusitis, except in cases of complication or failure to improve with medical therapy. Whatever the diagnosis, a CT scan of the nasal sinuses is required before performing sinus surgery. To avoid inadvertent complications while performing the procedure.

II. Material and Methods

Patients including criteria-

1. All Patients coming to OPD/IPD with clinical features of chronic rhinosinusitis in the Department of otorhinolaryngology,
2. National Institute of Medical Sciences & Research, Shobha Nagar, Jaipur; having normal mental & physical status and are willing to participate in the study.

Exclusion criteria:

1. Patients with nasal mass.
2. Patients with previous sinus surgery.

In our institute, 100 patients were examined from July 2021 to December 2022. After the patients were chosen, they had an endoscopic examination and a CT scan of the paranasal sinuses to evaluate them.

Patients preparation before CT Scan:

A 4-week regimen of antibiotics, nasal decongestant, and antihistaminic medications

15 minutes before the CT scan, use a nasal decongestant (xylometazoline).

The patient was instructed to blow their nose hard right before the CT scan.

A CT scan was done at the National Institute of Medical Sciences in Jaipur.

In all cases, direct coronal slices were performed.

All images are shot without any contrast. the absence of intravenous contrast used.

Parameters:

- Patients position: prone with chin extended
- Gantry angulation: perpendicular to hard palate
- Section thickness: 4 mm
- Scan limits: glabella to the dorsum sella

RESULTS AND ANALYSIS

This study uses computed tomography of the nose and paranasal sinuses and endoscopic evaluation to prospectively analyze the anatomical variations of the ostiomeatal complex that were observed in 100 chronic

sinusitis patients who underwent surgery in the department of Otorhinolaryngology, National Institute of Medical Science, Jaipur.

According to the demographic profile, patients were from the 16 year to 66 year age, the age group between 21 and 30 was having the most no. of patients. In the 100 patients examined, 64% (64) of the patients were men and 36% (36) were women.

Most of the patients in our study exhibited multiple anatomical variations. 84% (84) of the 100 patients investigated had more than one anatomical difference; 65.4% (55) of these patients were men and 34.5% (26) were women, in remaining 16%(16) of patients had only one anatomical aberration. The most frequent anatomical difference identified in our investigation is nasal septal deviation.

Even though the deviated nasal septum is not a member of the ostiomeatal complex, it does contribute to the ostiomeatal complex area being anatomically crowded. About 75 individuals (75%) had a deviated nasal septum. On average, there are 35cases with left-side deviation and 40 with right-side deviation. Concha bullosa, which may present unilaterally or bilaterally in 62 patients out of 100 patients, is our next prevalent anatomical variation. In our analysis, 31 patients with concha bullosa presented unilaterally, these werehaving other anatomical variations. 31 patients with concha bullosa presented bilaterally. The next condition is enlarged bulla ethmoidalis, which affects 50 people (or 50%). There are 37 patients (74%) who present unilaterally, and 13 (26%) who present bilaterally. left side in 19 cases and right side in 18 patients of the unilateral presentation.

AGEWISE DIVISION

Age division	10-20	21-30	31-40	41-50	51-70
	yrs	yrs	yrs	yrs	yrs
No. of person	21	37	25	15	2
proportion %	21 %	37%	25 %	15 %	2 %

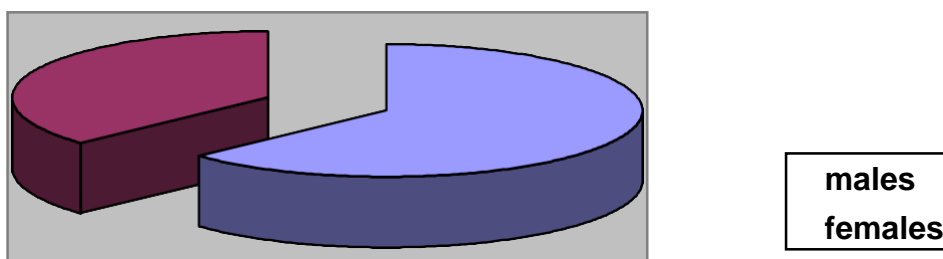
SEXWISE DIVISION

no.of person	100
Male	64(64%)
Female	36(36%)

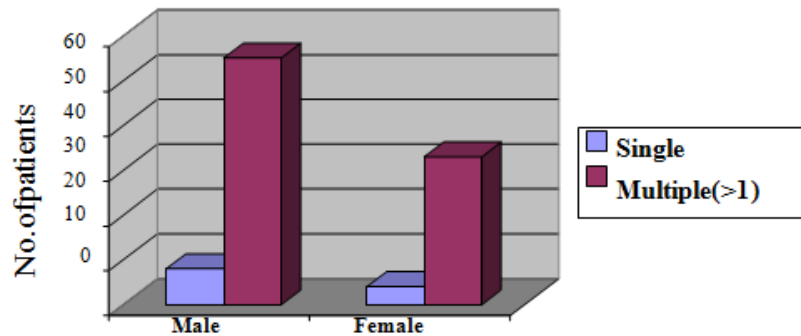
ANATOMICAL VARIATION

Anatomical variations	TOTAL
One anatomical variation	16(16%)
numerous anatomical variations	84(84%)

SEXWISE DISTRIBUTION



Anatomical variations



DNS: Deviated nasal septum CB: Concha bullosa
 AN: Agger nasi BE: Bulla ethmoidalis
 OC: Onodi cell PMT: Paradoxical middle turbinate
 MUP: medialised uncinat process HC: Haller cell

DISTRIBUTION OF ANATOMICAL VARIATION

Anatomical variation	Male	Female	Total
DNS	52	23	75
Concha bullosa	41	21	62
Prominent bulla ethmoidalis	30	20	50
Paradoxical middle turbinate	40	10	50
Medialised uncinat process	15	8	23
Pneumatise septum	3	1	4
Agger nasai cell	0	0	0
Frontal cell	0	0	0
Onodi cell	0	0	0
Haller cell	0	0	0

DEVIATED NASAL SEPTUM

Deviated nasal septum	To right	To left	Total
Male	30 (58.8%)	22(42.3%)	52
Female	10(45.5%)	13(56.5%)	23

CONCHABULLOSA

Concha bullosa	unilateral	Bilateral	Total
Male	20	21	41
Female	11	10	21

PARADOXICAL MIDDLE TURBINATE

Paradoxical middle turbinate	unilateral	Bilateral	Total
Male	26	14	40
Female	5	5	10

PROMINENTBULLAETHMOIDALIS

Prominent bulla ethmoidalis	unilateral	Bilateral	total
Male	24	6	30
Female	13	7	20

Medialised uncinat process	unilateral	bilateral	total
Male	11	4	15
Female	5	3	8

The most frequent anatomical variation in our study is septal deviation of the ostiomeatal complex. these septal deviations also cause the lateral wall of the nose to compress, which further lead to causes the ostiomeatal complex to narrow through the paradoxical middle turbinate, lateralized uncinat process, etc.

III. Discussion

According to Stammberger⁶¹ and Stammberger et al.⁶², ostiomeatal complex stenosis can result from either anatomical configuration or hypertrophied mucosa and can impede and stagnate secretions, which can lead to infection. According to Mackay and Lund ⁷⁰, the maxillary, anterior ethmoids, and frontal sinuses drain through the ostiomeatal complex.

The ostiomeatal posterior unit is regarded as a component of the sphenoid sinus. Due to anatomical variance and overcrowding in numerous locations of the ostiomeatal complex, two mucosal layers come into contact with one another, raising the risk of localised mucociliary clearance impairment.

Infection may then develop even in the absence of ostial closure if secretions are not removed from the area. Anatomically, the ethmoidal infundibulum and the middle meatus, which have tiny passages lined with mucus, are where mucosal contact is most likely to occur. The essential area of the ostiomeatal unit is reduced as a result of a deviated nasal septum or bony spur, which increases the risk of blockage and associated problems.

The most anatomical variation in our study was discovered in 75 of 100 participants (75%).

In a study by Maru⁶⁴ and Asruddin⁶⁵, it was higher than the reported 38% rate and the 55.7% rate. Concha bullosa (pneumatized middle turbinates) has been suggested as a potential etiological factor in the development of chronic sinusitis that recurs on a regular basis. According to Tonai⁶⁷, it is because of its detrimental effect on middle esophageal mucociliary clearance and paranasal sinus ventilation. The incidence of concha bullosa was 60%, which is greater than the incidences reported by Bolger et al. ⁶³, Maru et al.⁶⁴, Asruddin et al. ⁶⁵, and Llyod (24%) combined. Nouraei SA et al. and Azila A et al. suggested that the concha bullosa was the most common anatomical variation, which played a huge role as an etiological factor in CRS. Discussion 35 It is possible for the central turbinates to be paradoxically curved or bent the other way.

This could result in sinusitis and impingement of the middle meatus. In our investigation, it was discovered in 40% of cases. The incidence is higher than the 12% reported by Asruddin et al. in 1965, 15% by Llyod in 1966, and 27% by Bolger et al.⁶³ Asif A. wani et al(2009) study showed that Concha bullosa was the commonest anatomic variation and was seen in 45 (30%) patients.

The other anatomic variations noted were: paradoxical middle turbinate in 9.33% of patients, uncinat process variations in 25% of patients, agger nasi cells in 9.33%, Haller cells in 8.66% and posterior septal deviations in 25.33% of patients. Zinreich was the first to notice that the uncinat process could be bent or curled. Particularly in the anterior ethmoid, frontal recess, and infundibulum regions, it can impede sinus breathing.

A medialized uncinat was discovered. In our study, 21% of the patients. It exceeds the 2.5% reported by Bolger ⁶³, the 2% given by Asruddin⁶⁵, and the 9.8% recorded by Maru et al. ⁶⁴. It was discovered that the ostiomeatal unit was involved in all of the patients in our investigation. In our study, the maxillary sinus was the most often affected by chronic sinusitis. In 72% of the patients with chronic sinusitis, Zinreich et al⁵⁸. discovered middle meatus opacification, and of these, 65% had thickened mucoperiosteal sinuses in the maxilla. Yousem et al. discovered that 84% and 82%, respectively, of the maxillary and ethmoid sinuses had inflammatory alterations when the middle meatus was opacified. In another study, 84% of patients with OMC opacification had frontal or maxillary sinus illness.

Therefore, these results are consistent with the hypothesis that the structural heterogeneity in the ostiomeatal complex will result in obstruction of the constrained drainage channels, which will then result in sinus inflammation.

IV. Conclusion

Structure of the paranasal sinuses can be seen very clearly with the help of computed tomography, which also allows for a more accurate assessment of paranasal sinus pathology. It assesses the detailed anatomy of the ostiomeatal area, which is not achievable at this level with simple radiography.

The anatomical anomalies obstruct the ostiomeatal complex, it prevents the paranasal sinuses from draining properly and result in chronic sinusitis which is seen on computed tomography scan. This study of anatomical variation in CRS patients disclose many points:

- Patients with chronic sinusitis who are not responding to medical therapy are more prone to have a variety of anatomical abnormalities of the ostiomeatal complex.
- Nasal septal deviation is the most prevalent abnormality among patients with chronic sinusitis,
- while the Haller cell and agger nasi are the rarest variations identified in this study.
- According to the findings, there was a strong correlation between unilateral Concha bullosa and contralateral septal deviation. However, septal deviation, concha bullosa, and large bulla ethmoidalis account for 90% of anatomic abnormalities.

The majority of anatomical differences resulted from ethmoid sinus aerated cells. By properly assessing anatomical anomalies in CRS patients before surgery, we can minimize unexpected complications and achieve the full eradication of the disease.

References

- [1]. Benninger MS, Sedory Holzer SE, Lau J. Diagnosis and treatment of uncomplicated acute bacterial rhinosinusitis: Summary of the Agency for Health Care Policy and Research evidence-based report. *Otolaryngology - Head and Neck Surgery*. 2000;122(1):1–7.
- [2]. DeConde AS, Soler ZM. Chronic rhinosinusitis: Epidemiology and burden of disease. *Am J Rhinol Allergy*. 2016 Mar-Apr;30(2):134-9. doi: 10.2500/ajra.2016.30.4297. PMID: 26980394.
- [3]. Swain S. A Study of Anatomical Variations in Patients with Chronic Rhinosinusitis. *Ann. Int. Med. Den. Res*. 2018; 4(2):EN01-EN05
- [4]. Lee-Yee Chong, PatornPiomchai, Steve Sharp, KornkiatSnidvongs, Katie E Webster, Carl Philpott, Claire Hopkins, Martin J Burton. (2021) Biologics for chronic rhinosinusitis. *Cochrane Database of Systematic Reviews* 2021: 10.
- [5]. Keir, J., Pedelty, L., & Swift, A. (2011). Biofilms in chronic rhinosinusitis: Systematic review and suggestions for future research. *The Journal of Laryngology & Otology*, 125(4), 331-337. doi:10.1017/S0022215111000016
- [6]. White, P., MacLennan, A., Connolly, A., Crowther, J., & Bingham, B. (1996). Analysis of CT scanning referrals for chronic rhinosinusitis. *The Journal of Laryngology & Otology*, 110(7), 641-643. doi:10.1017/S0022215100134498
- [7]. *Otolaryngologic Clinics of North America : chronic sinusitis ; vol.38 December 2005 issue*.page no.: 1144-1145
- [8]. Stammberger H. *Functional endoscopic sinus surgery: the Messer klinger technique*. Philadelphia, PA: BC Decker; 1991
- [9]. Davis WB. *Nasal accessory sinus in man*PA:WBSaunders;1914.
- [10]. Hall GW. Embryology and abnormal anatomy of the maxillary sinus. *NorthwestMed*1969;68:1010–1.
- [11]. Schaeffer JP. The sinus maxillaris and its relations in the embryo, child and adult man. *AmJAnat*1912;10:313–67.
- [12]. SchaefferJP. The genesis, development and adult anatomy of the naso frontal duct region in man. *AmJAnat*1916;20:125–45.

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