

VARIATIONS OF MIDDLE TURBINATE IN CHRONIC RHINOSINUSITIS

Anup Dhungana, Sumedh Mishra, Rupesh Raj Joshi, Shivani Shrestha, Bishal Poudel

Department of Otorhinolaryngology and Head and Neck Surgery, Nepal Medical College Teaching Hospital,
Attarkhel, Gokarneshwor-8, Kathmandu, Nepal

ABSTRACT

Chronic rhinosinusitis (CRS) is a prevalent inflammatory condition of the nasal and paranasal sinuses lasting more than 12 weeks. Anatomical variations of the middle turbinate, particularly concha bullosa and paradoxical curvature, have been proposed as potential contributing factors to CRS by affecting sinus ventilation and mucociliary clearance. This study aims to evaluate the prevalence of middle turbinate variations in patients with CRS using computed tomography (CT) imaging. A cross-sectional observational hospital based descriptive study was conducted at Nepal Medical College Teaching Hospital from March to November 2024. A total of 84 adult patients diagnosed with CRS based on clinical and radiological criteria were included. Patients with prior nasal surgery, trauma, or other sinonasal pathologies were excluded. Detailed nasal examinations and coronal CT scans were performed to assess middle turbinate anatomy. Of the 84 patients, 47 (56.0%) were male and 37 (44.0%) female, with a mean age of 38.17 ± 14.26 years. Concha bullosa was observed in 27.0% of patients, paradoxical middle turbinate in 5.0%, while 68.0% showed no variations. Middle turbinate variations were more frequent in males than females; however, the difference was not statistically significant. Middle turbinate variations, particularly concha bullosa, are relatively common in patients with CRS but do not show a statistically significant association with disease occurrence. Although these anatomical features may not independently cause CRS, their identification remains important for accurate diagnosis and surgical planning.

KEYWORDS

Chronic rhinosinusitis (CRS), Concha bullosa, paradoxical middle turbinate.

Received on: May 09, 2025

Accepted for publication: May 30, 2025

CORRESPONDING AUTHOR

Dr. Anup Dhungana,
Assistant Professor,
Department of Otorhinolaryngology and Head and Neck
Surgery,
Nepal Medical College Teaching Hospital,
Attarkhel, Gokarneshwor-8, Kathmandu, Nepal
Email: dhunganaanup@hotmail.com
Orcid No: <https://orcid.org/0000-0003-1480-1178>
DOI: <https://doi.org/10.3126/nmcj.v27i2.80539>

INTRODUCTION

Chronic rhinosinusitis (CRS) is a prevalent condition characterized by inflammation of the nose and paranasal sinuses lasting longer than 12 weeks.¹ In epidemiologic studies the prevalence of CRS is 5.0 to 12.0%.² The anatomical variations of the middle turbinate, a critical structure within the nasal cavity, have been implicated in the pathophysiology of CRS.³

Different variations of middle turbinate are described in literature. Concha bullosa, paradoxical bent, secondary middle turbinate, duplicate turbinates and other variations.⁴ Understanding these variations is crucial for optimizing treatment strategies and surgical outcomes.

These variations are crucial in understanding the pathophysiology of disease and its surgical management. There are different investigation modalities available but among them coronal computed tomography (CT) imaging of nose and paranasal sinus is more useful.^{5,6} This provide the detail anatomy of nose and paranasal sinuses including any anatomical abnormalities in patient with chronic rhinosinusitis and extent of the disease and its associated complications as well, which is also helpful in surgical approach and clearance of disease.^{7,8} So, in our study, the variation of middle turbinate will be evaluated in patient with chronic rhinosinusitis.

MATERIALS AND METHODS

This cross-sectional observational hospital based descriptive study was conducted in Nepal Medical College Teaching Hospital, Department of Otorhinolaryngology and Head and Neck Surgery from March 2024 to Nov 2024. Patients aged 18 years and above diagnosed with CRS based on clinical and radiological criteria willing to give a consent were included in the study. Patients with a history of nasal trauma, nasal surgery and sinonasal pathologies

other than CRS were excluded from the study. Participants underwent detailed nasal examination and CT imaging to assess middle turbinate anatomy. Data on demographics and clinical symptoms were recorded. All the data entered in a standard proforma. Statistical analysis was done with SPSS-16. Chi-square test was used for data analysis. Ethical approval was obtained from from the Institutional Review Committee (IRC) of Nepal Medical College Teaching Hospital.

RESULTS

A total of 84 patients were enrolled in the study, comprising 47 males (56.0%) and 37 females (44.0%), with a male-to-female ratio of 1.3:1. The age range was 20–84 years, with a mean age of 38.17 ± 14.26 years.

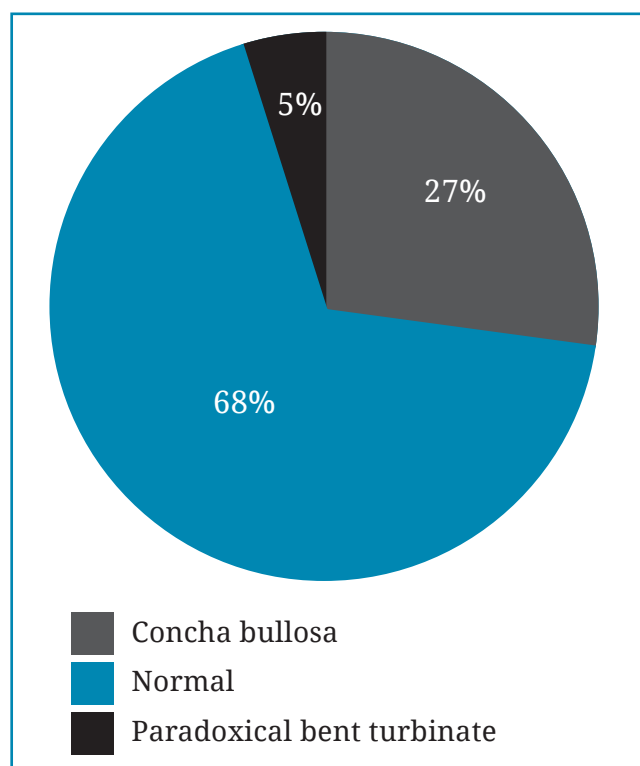


Fig. 1: Distribution of middle turbinate variation

Table 1 : Genderwise distribution of variation of middle turbinate

		Type of middle turbinate			Total	Chi-square test (p-value)
		Concha bullosa	Paradoxical bent turbinate	Normal		
Gender	Female	7	1	29	37	0.183
	Male	16	3	28	47	
Total		23	4	57	84	

Middle turbinate variations observed included concha bullosa in 27.0% of cases and paradoxical curvature in 5.0%, while 68.0% showed no anatomical variation (see Fig. 1). Among male patients, concha bullosa was present in 16 (34.0%), paradoxical turbinate in 3 (6.0%), and normal turbinate in 28 (60.0%). Among females, 7 (19.0%) had concha bullosa, 1 (3.0%) had paradoxical turbinate, and 29 (78.0%) had normal anatomy. Although variations were more common in males, the difference was not statistically significant using chi-square test (Table 1).

DISCUSSION

Chronic rhinosinusitis is a commonly diagnosed otolaryngologic disease occurring after 12 weeks duration of sinonasal symptoms and usually resulting from repeated episodes of acute or subacute sinusitis. Understanding the anatomy of the middle turbinate is essential for diagnosing and treating various nasal and sinus conditions.^{9,10}

Concha bullosa is a pneumatized middle turbinate which has been implicated as a possible aetiological factor in the causation of recurrent chronic sinusitis due to its negative influence on PNS ventilation and mucociliary clearance in the middle meatus region.

In this study, out of 84 patients, 34.0% had concha bullosa and 6.0% had paradoxical bent turbinate. This was similar to study by Singh *et al.*¹¹ where they found 26.0% of concha bullosa and 11.0% of paradoxical bent middle turbinate. Similarly, Swain *et al.*¹² and Espinosa *et al.*¹³ also found concha bullosa in 36.0% and

33.0% and paradoxical middle turbinate in 11.0% cases which is similar to our study.

Kalaierasi *et al.*¹⁴ also found no statistically significant association between any type of middle turbinate concha with sinusitis. Out of the 202 scans studied, the prevalence of concha bullosa was 31.7% which is similar to our study. Malayil *et al.*¹⁵ also concluded that the presence of anatomical variants in middle turbinate alone does not mean a predisposition to sinus pathology where they found concha bullosa in 32.0% of the patients and paradoxical bent middle turbinate in 10.0%.

In our study, 37 (44.0%) were female and 47 (56.0%) were male with male to female ratio of 1.3:1. Out of 47 male patients, concha bullosa was present in 16 (34.0%), paradoxical bent turbinate in 3 (6.0%) and normal in 28 (60.0%) whereas in 37 female patients, concha bullosa was present in 7 (19.0%), paradoxical bent turbinate in 1 (3.0%) and normal in 29 (78.0%). The middle turbinate variations were seen more in males than females but the difference was not statistically significant. This was similar to a study done by Reeti *et al.*¹⁶ The age of patients ranged from 20 to 84 years with a mean age of 38.17±14.26 years in our study which was similar to Espinosa *et al.*¹³ and Swain *et al.*¹²

Based on these observations, we conclude that middle turbinate variations alone do not predispose individual to chronic rhinosinusitis. Other contributing factors may also play a role in disease development. Nevertheless, surgeons should be aware of middle turbinate variations to minimize surgical complications.

Conflict of interest: None

Source of research fund: None

REFERENCES

- Benninger MS, Ferguson BJ, Hadley JA *et al.* Adult Chronic rhinosinusitis: definitions, diagnosis, epidemiology and pathophysiology. *Otolaryngol Head Neck Surg* 2003; 129: 1-32.
- DietzdeLoos D, Lourijen ES, Wildeman MAM *et al.* Prevalence of chronic rhinosinusitis in the general population based on sinus radiology and symptomatology. *J Allergy Clin Immunol* 2019; 143: 1207-1214.
- Liu L, Chen Q, Pan M *et al.* Roles of anatomical abnormalities in localized and diffuse chronic rhinosinusitis. *Indian J Otolaryngol Head Neck Surg* 2023; 75 (Suppl 1): 966-72.
- Lund VJ. Anatomy of the nose and paranasal sinus. Scott Brown Otolaryngology, 6th edition; vol.1 Butterworth and Heinemann: 1997; 1/5/4-7.
- Zinreich S. Rhinosinusitis: Radiologic diagnosis. *Otolaryngol Head Neck Surg* 1997; 117: 27-34.
- Yousem DM. Imaging of sinonasal inflammatory disease. *Radiology* 1993; 188: 303-14.
- Fokkens W, Lund V, Mullol J. European position paper on rhinosinusitis and nasal polyps group. European position paper on rhinosinusitis and nasal polyps 2007. *Rhinol Suppl* 2007; 20: 1-136.
- Kalish LH, Arendts G, Sacks R, Craig JC. Topical steroids in chronic rhinosinusitis without polyps: a systematic review and meta-analysis. *Otolaryngol Head Neck Surg* 2009; 141: 674-83.
- Yanagisawa E, Weaver EM. Anatomical variations of the middle turbinate. *Ear Nose Throat J* 1996; 75: 194-7.

10. Dalgorf DM and Harvey RJ. Chapter 1: Sinonasal anatomy and function. *Am J Rhinol Allergy* 2013; 27 (Suppl 1): S3-6
11. Singh P, Singh A, Sahni D, Bhagat S, Kaur R, Kaur A. A study of sinonasal anatomy and its variations in chronic rhinosinusitis patients. *Natl J Physiol Pharm Pharmacol* 2023; 13: 1650-6.
12. Swain S. A study of anatomical variations in patients with chronic rhinosinusitis. *Ann Int Med Den Res* 2018; 4: 1-5.
13. Espinosa W, Genito R, Ramos RZ. Anatomic variations of the nasal cavity and paranasal sinus and their correlation with chronic rhinosinusitis using Harvard staging system. *J Otolaryngol ENT Res* 2018; 10: 190-3.
14. Kalaiarasi R, Ramakrishnan V, Poyyamoli S. Anatomical variations of the middle turbinate Concha Bullosa and its relationship with chronic sinusitis: a prospective radiologic study. *Int Arch Otorhinolaryngol* 2018; 22: 297-302
15. Malayil VJ, Pinto GJO, Shivaraj R. Anatomical variations in the middle turbinate in patients with chronic rhinosinusitis: a radiological study. *Int Recent Sci Res* 2016; 7: 12914-6.
16. Raag R, Akhtar MJ, Kumar A *et al.* CT scan evaluation of prevalence of Concha Bullosa in adult Eastern Indian population. *Int J Anat Res* 2020; 8: 7669-73.