

**A Hospital-Based Assessment of the Association of Anatomical Variations of Nasal Osteomeatal Complex with Sinusitis: An Observational Study****Manish Kumar<sup>1</sup>, Md.Tausiful Haque<sup>2</sup>, Chandra Shekhar<sup>3</sup>**<sup>1</sup>Senior Resident, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India<sup>2</sup>Senior Resident, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India<sup>3</sup>Professor and HOD, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India

Received: 13-08-2023 Revised: 20-09-2023. Accepted: 19-10-2023

Corresponding author: Dr. Md. Tausiful Haque

Conflict of interest: Nil

**Abstract****Aim:** The aim of the present study was to assess the correlation of anatomical variations of nasal osteomeatal complex with sinusitis.**Methods:** The present observational study was conducted in the department of ENT. Based on inclusion and exclusion criteria total 100 patients suffering from nasal septal deviation were enrolled in the study and informed written consent was obtained.**Results:** It was observed that out of 200 cases, majority of the patients were in age group of 21-30 years (55%), followed by 31-40 years (30%). The mean age of the study subjects was 31.19±8.92 yrs. It was seen that majority of the patients were male. The most common presenting symptom observed in the present study was nasal obstruction (91%) which was followed by nasal discharge (73%), headache (48%), hyposmia (12%) and nasal bleeding (5%). There was not significant association of septal deviation with sinusitis on opposite side was observed. There was not significant association between the type of conchabullosa and sinusitis on same side of disease. It was seen that there was no significant association between anatomical variation and sinusitis on same side. There was no significant association between anatomical variation and sinusitis on opposite side.**Conclusion:** We concluded that there was a significant association of septal deviation with the sinusitis on same side while there was not significant concha bullosa and its association with sinusitis on same side. The association of other anatomical variation and sinusitis on same side was not significantly associated.**Keywords:** nasal osteomeatal complex, anatomical variations, sinusitisThis is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Chronic rhino sinusitis (CRS) is the most common disease for which consultation of otorhinolaryngologist is sought. [1] The approach to patients with chronic rhino sinusitis has changed after Messerklinger published the first comprehensive account of technique of nasal endoscopy and its application to the diagnosis and treatment of sinonasal diseases. [2] The endoscopic surgery aims at removing the obstruction of the main drainage pathway- in the osteomeatal complex-based essentially on the concept that such obstruction perpetuates the sinus disease. The key underlying concept behind minimally invasive functional endoscopic sinus surgery is the osteomeatal complex (OMC) – the small compartment located in the region between the middle turbinate and the lateral nasal wall in the middle meatus – represents the region for drainage of anterior ethmoid, maxillary and frontal sinuses. [3,4]

Chronic rhinosinusitis (CRS) is one of the most common health problems, with significant medical cost and very severe impact on upper and lower airway diseases and general health. [5,6] Obstruction of OMC causes a vicious cycle of events that lead to sinusitis. Its obstruction leads to mucosal congestion that decreases air flow and leads to further obstruction. [7] Surgical clearance of these chronically infected sinuses while maintaining their ventilation and drainage is the treatment of choice. [8] To achieve this goal, there should be some diagnostic modalities which guide us towards exact diagnosis and safe intervention. Over the past few decades, both CT and nasal endoscopy have been used successfully as diagnostic modalities in sinus disease. The purpose of these investigations is to determine the mucosal abnormalities and bony anatomic variations of paranasal sinus and assess the possible pathogenicity of these findings in patients undergoing evaluation for sinusitis.

The revolutionary changes in the surgical treatment of rhino sinusitis in recent years, particularly in endoscopic surgery, require the surgeons to have detailed knowledge of the anatomy of the lateral nasal wall, paranasal sinuses and surrounding vital structures and of the large number of anatomical variants in the region, many of which are detectable only by the use of CT. [9] Presumably these variations might induce osteomeatal obstruction, preventing mucus drainage and predisposing to chronic rhino sinusitis.

The aim of the present study was to assess the Correlation of anatomical variations of nasal osteomeatal complex with sinusitis.

**Materials and Methods**

The present observational study was conducted in the department of ENT of Nalanda Medical College and Hospital, Patna, Bihar, India for one year. By using the above mentioned inclusion and exclusion criteria total 200 patients suffering from nasal septal deviation were enrolled in the study and informed written consent was obtained. Following inclusion and exclusion criteria was used to select the study subjects.

**Inclusion Criteria:**

- All symptomatic patients having nasal septal deviation and willing to participate in the study.

**Exclusion Criteria:**

- Allergic rhinitis
- Acute rhinitis
- Previous nasal surgery
- Age below 19 year
- Trauma to nose

Detailed history was taken and the findings were recorded on a pretested and prestructured proforma. Clinical examination was done with nasal speculum and nasal endoscope and the grade and type of septal deviation according to Mladina classification was classified and other abnormalities in osteomeatal complex were noted. All the patients underwent radiological investigation which included X-ray PNS and CTPNS. In CT scan was performed to determine the mucosal abnormalities and osteomeatal complex variation of paranasal sinuses, to measure the angle of nasal septal deviation. Presence of anatomical variations pertaining to osteomeatal complex was noted and presence or absence of sinus pathology was also recorded. The collected data was recorded in pretested proforma. Statistical analysis of septal deviation with anatomical variation and sinus pathological study was carried out using appropriate statistical tests.

**Results**

**Table 1: Distribution of cases according to age and gender**

Age (years)	Male	Female	Total (%)
21-30yrs	75	35	110 (55)
31- 40yrs	36	24	60 (30)
41-50yrs	20	10	30 (15)
Total	131	69	200 (100)

It was observed that out of 200 cases, majority of the patients were in age group of 21-30 years (55%), followed by 31-40 years (30%).The mean age of the study subjects was 31.19±8.92 yrs. It was seen that majority of the patients were male.

**Table 2: Distribution of cases according to presenting symptoms in deviated nasal septum**

Symptoms	Number of patients	Percentage (%)
Nasal obstruction /blockage	182	91
Nasal discharge/post nasal drip	146	73
Headache	96	48
Hyposmia	24	12
Nasal bleeding	10	5

The most common presenting symptom observed in the present study was nasal obstruction (91%) which was followed by nasal discharge (73%), headache (48%), hyposmia (12%) and nasal bleeding (5%).

**Table 3: Distribution of cases according to relation of septal deviation and sinusitis**

Sinus disease		Type of septal deviation			P Value
		Mild	Moderate	Severe	
On same side	Present	6	54	88	<0.05
	Absent	14	16	22	
On opposite side	Present	6	16	20	>0.05
	Absent	14	54	90	
Total		20	70	110	

It was seen that severe septal deviation was more frequently associated with sinusitis on same side cases (44%). Among the moderate septal deviation, sinusitis on the side of septal deviation was observed in 27% cases. The association of severity septal deviation with sinusitis on same side was statistically significant. The relation of type of septal

deviation and presence of Sinusitis on opposite side was also compared and it was observed that severe septal deviation was associated with sinusitis on opposite side in 10% cases. There was not significant association of septal deviation with sinusitis on opposite side was observed.

**Table 4: Distribution of cases according to types of conchabullosa and its relation with sinusitis**

Type of CB	Total case	Sinusitis on same side		P Value
		Present	Absent	
Lamellar	44	14	30	>0.05
Bulbous	36	20	16	
Extensive	30	18	12	

In present study, conchabullosa was observed in 55% cases of which lamellar concha was seen in 22% case. Bulbous and extensive conchabullosa was seen in 18% and 15% cases each of these concha associated with sinusitis on same side. There was not significant association between the type of conchabullosa and sinusitis on same side of disease.

**Table 5: Distribution of cases according to relation of anatomical variation and sinusitis on same side**

Anatomical variation	Total case	Sinusitis on same side		P Value
		Present	Absent	
Paradoxical MD	50	22	28	>0.05
Aggernasi	110	56	54	
Haller cell	20	10	10	
Enlarged ethmoidal bulla	20	12	8	

It was seen that there was no significant association between anatomical variation and sinusitis on same side.

**Table 6: Distribution of cases according to relation of anatomical variation and sinusitis on opposite side**

Anatomical variation	Total case	Sinusitis on opposite side		P Value
		Present	Absent	
Paradoxical MD	50	10	40	>0.05
Aggernasi	110	20	90	
Haller cell	20	10	10	
Enlarged ethmoidal bulla	20	8	12	

There was no significant association between anatomical variation and sinusitis on opposite side.

## Discussion

Sinusitis is defined as inflammation of mucosa of paranasal sinuses. According to Bernstien, chronic sinusitis is a residual retention of purulent secretion, within the cavities, with subsequent degenerative, fibrotic and cystic changes. It is invariably associated with nasal polyp and deviated nasal septum. The Task force has Classified rhinosinusitis based upon duration of illness as acute, subacute, recurrent acute and exacerbation of chronic state. [10] The two cardinal factors in the maintenance of normal physiology of the nose and paranasal sinuses are drainage and ventilation.

It was observed that out of 200 cases, majority of the patients were in age group of 21-30 years (55%), followed by 31-40 years (30%). The mean age of the study subjects was 31.19±8.92 yrs. It was seen that majority of the patients were male. Similar findings

were, Jane JY et al [11] where mean age of study subjects was 31.5 years, Guyuron B et al [12] observed mean age of 33.5 years and Jin HR et al [13] reported mean age of 37 years in their studies. The most common presenting symptom observed in the present study was nasal obstruction (91%) which was followed by nasal discharge (73%), headache (48%), hyposmia (12%) and nasal bleeding (5%). A deviated nasal septum is the most common cause of nasal obstruction. It influences the airflow dynamics of the nasal cavity and improper aeration of paranasal sinuses. Due to airflow changes, compensatory hypertrophy of the nasal mucosa on concave side is often found which lead to bilateral nasal obstruction. [14] Nasal discharge is also seen in deviated nasal septum patient. In patients with deviated nasal septum may lead to improper aeration of paranasal sinus which causes inflammation of the mucosa of the paranasal sinuses. As mucosal inflammation is the central pathophysiological mechanism that underlies many of the specific and

interrelated factors that contribute to congestion, including increased venous engorgement, increased nasal secretions and tissue edema. [15]

There was not significant association of septal deviation with sinusitis on opposite side was observed. There was not significant association between the type of conchabullosa and sinusitis on same side of disease. It was seen that there was no significant association between anatomical variation and sinusitis on same side. There was no significant association between anatomical variation and sinusitis on opposite side. Hatipolgu et al [16] also found no significant difference between type of concha bullosa and association with sinusitis on same side. Stallman et al [17] failed to show a relationship with sinusitis in a study by which concha bullosa was classified according to size.

### Conclusion

We concluded that there was a significant association of septal deviation with the sinusitis on same side while there was not significant concha bullosa and its association with sinusitis on same side. The association of other anatomical variation and sinusitis on same side was not significantly associated.

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