



Original Research Article

ENDOSCOPIC SINUS SURGERY OF ANATOMICAL VARIANTS WITH CHRONIC RHINOSINUSITIS

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Received : 09/02/2026
 Received in revised form : 11/03/2026
 Accepted : 14/03/2026

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DOI: 10.70034/ijmedph.2026.1.537

Source of Support: Nil,

Conflict of Interest: None declared

Int J Med Pub Health

2026; 16 (1); 3128-3133

ABSTRACT

Background: The American Academy of Otorhinolaryngology Head and Neck Surgery has formulated a working definition of Sinusitis and is defined as a condition manifest by an inflammatory response of the mucous membrane of the nasal cavity and paranasal sinuses with fluid within the cavity, and / or underlying bone. The objective is to study the outcome of endoscopic sinus surgery of anatomical variants in chronic rhinosinusitis.

Materials and Methods: This prospective study was conducted among 50 patients attending the ENT OPD at Vinayaka Missions Kirupananda Variyar Medical College & Research Institute, with symptoms and signs suggestive of Chronic Rhinosinusitis. Duration of study was July 2021 to July 2023.

Results: Among 50 cases studied 58 % (29) of patients are male and 42 % (21) of patients are female, The demographic profile shows the most common age group to be between 21 – 25yrs. 44(88%) patients presented with nasal obstruction among which 20(45.4%) patients presented with bilateral nasal obstruction and 24(54.5%) presented with unilateral nasal obstruction. 45(90%) patients presented with nasal discharge. Among which 9(20%) patients having bilateral discharge and 36(80%) patient having unilateral discharge. 47(97%) patients presented with headache, 29(58%) presented with halithosis and 28(56%) patients presented with cough. Concha bullosa is the most common anatomical variation of the osteomeatal complex, present in about 29 (58%) of patients. Of which unilateral presentation seen in 23(79.3%) and bilateral presentation seen in 6(20%) of patients. Among which 17(58.6%) patients are male and 12(41.4%) patients are female. Agger nasi seen in about 2(6%) patients. Of which unilateral presentation seen in 2(4%) patients. Among which 1(50%) are male and 1(50%) are female patients. Onodi cells seen in about 1(2%) patient which is of bilateral presentation. All 50 patients underwent endoscopic sinus surgery and they are followed up in 3 visits among them 45(90%) patients are relieved from symptoms postoperatively. For 2(4%) patients symptoms persists and about 3(6%) didn't come for follow up.

Conclusion: Endoscopic sinus surgery is now one of the commonest surgeries being performed by ENT surgeons. The most common indication for doing Endoscopic sinus surgery is "sinusitis".one should study the pre-operative computerised tomography scan minutely before performing the Endoscopic sinus surgery.

Keywords: Endoscopic Sinus Surgery, Anatomical Variants, Chronic Rhinosinusitis.

INTRODUCTION

Anatomical variations studied on CT scan have been found to obstruct the osteomeatal complex (OMC), leading to chronic sinusitis. Detecting these variants

and hence preventing potential hazards is essential and is an indication for endoscopic sinus surgery.

The anatomical variants are concha bullosa, paradoxical middle turbinate, Haller cells, Agger nasi cells, medialised uncinate process and double

middle turbinate. However, their roles in the pathogenesis of rhinosinusitis are still unclear. Theoretically, these variants could shift and compress the components of the osteomeatal complex, predisposing to an obstruction to the paranasal sinus mucus drainage and further leading to sinusitis. The presence of anatomical variations does not necessarily establish the aetiological basis for rhinosinusitis.

The American Academy of Otorhinolaryngology Head and Neck Surgery formulated certain working definitions. Clinically, "Sinusitis" is defined as the condition manifest by an inflammatory response of the mucous membrane of the nasal cavity and paranasal sinuses, fluid within the cavity, and / or underlying bone. It is also defined as a group of disorders characterized by inflammation of the mucosa of the nose and paranasal sinuses lasting for at least 12 weeks.^[1]

The role of plain sinus x-rays has been the subject of considerable discussion as false-positives and false negatives can occur, particularly in infants and children, making accurate diagnosis difficult.

Computed tomography (CT scan) has now supplemented plain radiographs because endoscopic sinus surgery requires much greater anatomic detail and precision. The anatomy of the osteomeatal complex in detail as displayed by CT scan helps surgeons immensely prior to endoscopic sinus surgery, helping to identify the presence of significant anatomic abnormalities, the location and severity of the disease and the exact location of the obstruction. Imaging assessment must be based on identification of variants, definition of their dimensions, as well as on their association with obstruction of drainage ostia and tomographic signs of sinus disease.

The approach to patients with chronic rhinosinusitis has seen major changes with the arrival of functional endoscopic surgery of paranasal sinuses and the nose. Functional endoscopic sinus surgery (FESS) addresses these anatomical variations and mucosal disease and restores the normal physiology of the paranasal sinus. The aim of endoscopic surgery is the removal of obstruction to the main drainage pathway (the osteomeatal complex), based upon the concept that such an obstruction perpetuates the sinus disease.^[2]

MATERIALS AND METHODS

This prospective study was conducted among 50 patients attending the ENT OPD at Vinayaka Missions Kirupananda Variyar Medical College & Research Institute, with symptoms and signs suggestive of Chronic Rhinosinusitis. Duration of study was July 2021 to July 2023

Inclusion Criteria

1. Patients with complaints suggestive of chronic sinusitis including those with acute exacerbation of chronic sinusitis.

2. Patients who fulfill the criteria for chronic sinusitis clinically.

Exclusion Criteria

1. Patients with acute sinusitis
2. Patient with nasal mass or polyps
3. Patients who were previously operated

Methodology: Detailed history and clinical examination was done for all the 50 patients and a diagnosis of Chronic Rhinosinusitis was made and the findings were recorded on a proforma. After obtaining informed and written consent from the patients, plain radiographs of paranasal sinuses (Water's view) was taken and the patients underwent Diagnostic Nasal Endoscopy. Following this, CT scan Paranasal sinuses were taken, and blood investigations were sent. The patients were treated with antibiotics, antihistamines and topical nasal decongestants.

Anaesthetic fitness was obtained and the patients were subsequently taken up for Functional Endoscopic Sinus Surgery. Post-operatively, daily saline nasal douching and topical decongestant drops (0.1% Xylometazoline) were given to keep the nasal cavities clear and patent. Regular follow up was done upto 6 months and findings were recorded on the proforma.

The monitored parameters included clinical examination findings, X-ray Paranasal sinuses (Water's view), Diagnostic Nasal Endoscopy and CT scan Paranasal sinuses Coronal view findings.

Blood investigations: Preoperative blood investigations included estimation of Complete Blood Counts, Bleeding Time, Clotting Time, Random Blood Sugar, Blood Urea and Serum Creatinine.

Plain Radiograph Paranasal Sinuses (Water's View): This is performed with the patient seated facing the skull unit cassette holder and the patient's nose and chin are placed in contact with the midline. The head is adjusted to a 45 degree angle to the cassette holder. It is ensured that the median sagittal plane is at right angles to the cassette holder by checking that the outer canthi of eyes and external auditory meatuses are equidistant.

The patient should open his mouth as wide as possible before exposure.

Mucosal thickening of more than 5mm is taken as significant and turbinate hypertrophy is taken into account.

Diagnostic nasal endoscopy: The nasal endoscope used for diagnostic nasal endoscopic examination was 4mm Hopkins rod endoscopes with 0° and 30° angulation. With these endoscopes, first, second, and third pass evaluation of nasal cavity was done.

- 4% xylocaine as topical anaesthetic is used to anesthetise the nasal cavity prior to the procedure.
- About 8 ml of 4% xylocaine is mixed with 10 drops of xylometazoline. Cotton pledgets dipped in the solution are squeezed dry and are used to pack the nasal cavity.

- The pledgets are placed in the inferior, middle and superior meati of the lateral wall of nose. The packs are left in place for about 5 minutes.
- First pass: Here, the endoscope is introduced and passed along the floor of the nasal cavity. The middle turbinate is the first structure that is seen. The superior attachment and Inferior surface of the middle turbinate are studied. As the endoscope reaches the posterior aspect, the adenoid tissue is seen. The pharyngeal end of eustachian tube can be identified on the lateral surface of the nasopharynx.
- Second pass: The endoscope is then passed medial to the middle turbinate. The medial and lateral surfaces of the middle turbinate is visualised. The endoscope is then gently slipped medial to the middle turbinate. The sphenoid ostium is then visualised. Secretions from the ostium is noted, if any.
- Third pass: In this pass, the endoscope is used to study the middle turbinate area. The middle turbinate is evaluated in terms of its shape and size and its relationship to the lateral nasal wall and septum. Enlarged agger nasi cells are seen as a bulge just above and anterior to the attachment of the middle turbinate. A paradoxical middle turbinate appears concave medially rather than laterally. Concha bullosa is an enlarged middle turbinate due to the presence of a large air cell inside the middle turbinate. The attachment of the uncinat process is carefully visualised and noted. Discharge from this area is also recorded. If accessory ostium is present it is visualised and noted. Accessory ostia are present more posteriorly.

treatment

Pre-operative Preparations

- Xylocaine test dose was given with 0.1 ml of 2 % xylocaine injected intradermally on the left forearm in the supine position.
- Preparation of parts:** Shaving of hair moustache & beard. The patient was advised to take a full body & head bath with shampoo.
- Informed & written consent of the patient & guardians were taken.
- Patient was kept on empty stomach overnight.
- Pre – operative dose of suitable antibiotic was given.

Anaesthesia

- Patients were operated both under General Anaesthesia & Local Anaesthesia depending upon the age of the patient & also by clinically assessing their co-operation for the procedure under local anaesthesia.

- Irrespective of whether the procedure was being done under Local anaesthesia or General anaesthesia the following composition was used for local infiltration.
- 2% xylocaine with adrenaline (1 in 2,00,000) & cotton balls soaked in a solution of 4% xylocaine with adrenaline (10 ml of 4% xylocaine with 0.2 ml of adrenaline) was used for local anaesthesia to achieve haemostasis of nasal mucosa during surgical procedures.

Surgical Procedure

Endoscopic Sinus Surgery: Uncinectomy is usually the first step in endoscopic sinus surgery. It is followed by middle meatal antrostomy. The next step is anterior ethmoidectomy. For limited pathologies these steps are sufficient. Posterior ethmoidectomy and sphenoid sinusotomy should be done only by an experienced surgeon as these are potentially dangerous procedures. Frontal recess work is technically the most challenging one. “axillary flap technique” is gaining popularity for dealing with pathologies in the frontal recess.

Post operative management

- Patients were started on suitable antibiotics. Antibiotics were given for one week along with Analgesics, Antihistamine & Multivitamins.
- Nasal pack has to be removed after 24hrs of surgery.
- Patients are reviewed 2 weeks after discharge & consecutive review on 1st, 3rd and 6th month post operatively.

RESULTS

Among 50 cases studied 58 %(29) of patients are male and 42 %(21) of patients are female.

The demographic profile shows the most common age group to be between 21 – 25yrs.

[Table 1] shows distribution of our study patients according to their symptoms. 44(88%) patients presented with nasal obstruction among which 20(45.4%) patients presented with bilateral nasal obstruction and 24(54.5%) presented with unilateral nasal obstruction.

45(90%) patients presented with nasal discharge. Among which 9(20%) patients having bilateral discharge and 36(80%) patient having unilateral discharge.

47(97%) patients presented with headache, 29(58%) presented with halitosis and 28(56%) patients presented with cough.

Table 1: Symptoms

Nasal Obstruction	Total 44(88%)	Bilateral 20(45.4%)	Unilateral 24(54.5%)
Nasal Discharge	45(90%)	9(20%)	36(80%)
Headache		47(97%)	
Halitosis		29(58%)	
Cough		28(56%)	

Table 2: Distribution of Anatomical Variation

Concha bullosa	29(58%)	B/L 6(20%)	U/L 23(79.3%)
Medialized uncinata	11(22%)	3(27.2%)	8(72.7%)
Paradoxical middle turbinate	6(12%)	1(16.6%)	5(83.3%)
Agger nasi	2(4%)	2(4%)	-----
Haller cell	1(2%)	1(2%)	-----
Onodi cell	1(2%)	1(2%)	-----

Table 3: Concha Bullosa

Concha Bullosa	Right	Left	Bilateral	Total
Male	8	5	4	17
Female	6	4	2	12

[Table 3] shows that Concha bullosa is the most common anatomical variation of the osteomeatal complex, present in about 29 (58%) of patients. Of which unilateral presentation seen in 23(79.3%) and

bilateral presentation seen in 6(20%) of patients. Among which 17(58.6%) patients are male and 12(41.4%) patients are female.

Table 4: Medialized Uncinate

Medialized uncinata	Right	Left	Bilateral	Total
Male	3	2	2	7
Female	2	1	1	4

[Table 4] shows Our next common anatomical variation medialized uncinata present in 11(22%) patients. Of which unilateral presentation seen in

8(72.7%) patients and bilateral presentation seen in 3(27.2%) patients. Among which 7(63.6%) patients are male and 4(36.3%) of patients are female.

Table 5: paradoxical middle turbinate

Paradoxical middle turbinate	Right	Left	Bilateral	Total
Male	2	1	1	4
Female	1	1	0	2

Paradoxical middle turbinate comes next seen in about 6(12%) patients. Of which unilateral presentation seen in 5(83.3%) patients and bilateral

presentation seen in 1(16.6%) patients. among which 4(66.6%) patients are male and 2(33.4%)patients are female. [Table 5]

Table 6: Aggar Nasi

Aggar nasi	Unilateral	Bilateral	Total
Male	-----	1	1
Female	-----	1	1

Agger nasi seen in about 2(6%) patients. Of which unilateral presentation seen in 2(4%) patients.

Among which 1(50%) are male and 1(50%) are female patients.

Table 7: haller cells

Haller cells	Unilateral	Bilateral	Total
Male	-----	1	1
Female	-----	-----	0

Haller cells seen in about 1(2%) patients which is of bilateral presentation. [Table 7]

Table 8: Onodi Cells

Onodi cells	Unilateral	Bilateral	Total
Male	-----	1	1
Female	-----	-----	0

Onodi cells seen in about 1(2%) patient which is of bilateral presentation. [Table 8]
According to CT SCAN findings 34(68%) patints are having maxillary sinusitis, 10(20%) Patients are

having ethmoidal sinusitis, 5(10%) patients are having frontal sinusitis and 1(2%) patient is having sphenoidal sinusitis.

Table 9: comparison table of pre operative and post operative period

Symptoms	Pre operative period	Post operative period
Nasal obstruction	44(88%)	2(4%)
Nasal discharge	45(90%)	1(2%)
Headache	47(97%)	2(4%)
Halitosis	29(58%)	-----

Cough	28(56%)	-----
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All 50 patients underwent endoscopic sinus surgery and they are followed up in 3 visits among them 45(90%) patients are relieved from symptoms postoperatively. For 2(4%) patients symptoms persists and about 3(6%) didn't come for follow up.

DISCUSSION

Stammberger et al,^[3] stated that stenosis of the osteomeatal complex, either due to the anatomical configuration or due to hypertrophied mucosa, may cause obstruction and hence, stagnation of secretions that may thereby, become infected or perpetuate infection.

Mackay and Lund,^[4] proposed that the osteomeatal complex acts as a drainage pathway for the maxillary, anterior ethmoid and frontal sinuses. They considered the posterior osteomeatal unit to be a part of the sphenoid sinus. In various regions of the osteomeatal complex, overcrowding due to anatomical variation occurs, and thus, two mucosal layers come into contact with each other, thus increasing the likelihood of obstruction to mucociliary clearance. Thus, secretions may then be retained at these sites, producing increased potential for infection, even without ostial closure. The most likely areas of mucosal contact anatomically are in the narrow mucosa lined channels of the middle meatus and the ethmoidal infundibulum.

Concha bullosa (pneumatized middle turbinate) is noted as the possible aetiological factor in the causation of chronic sinusitis. It is due to its negative influence on paranasal sinus ventilation and mucociliary clearance in the middle meatus region as quoted by Tonai.^[5] The incidence of concha bullosa was 58 %, which is higher as compared to the reported incidence of 53.6% by Bolger et al, 28% by Asruddin et al.^[6,7]

The middle turbinate may be paradoxically curved (i.e) bent in the reverse direction. Which may lead to the obstruction of the middle meatus and thus to sinusitis. It was found in 12 % in our study. The incidence is same to that of 12% by Asruddin et al, Bolger et al (27%).6,15% by Llyod.^[7,8]

Uncinate process may be bent or curved as observed by zinreich. Which can lead to impairment of sinus ventilation especially in the frontal recess, anterior ethmoid, and infundibulum regions. The medialised uncinata was found in 22 % patients in our study. It is higher than that of 2.5% reported by Bolger and 2% by Asruddin.^[6,7]

Onodi cells are posterior ethmoid cells that extend laterally, posteriorly, and rarely superior to sphenoid sinus, medially lying to the optic nerve. onodi cells are found in 2 % of patients in our study. More higher incidence was found by Arslan in 12/200 patients and higher than the study by Jones in 8/ 200 patients.^[9]

Haller cells are ethmoid air cells that extends beyond the limits of the ethmoid labyrinth into the

maxillary sinus. Haller cells are considered as ethmoid cells that extends into the floor of orbit and which causes narrowing of the adjacent ostium of the maxillary sinus mostly if they become infected.^[8]

The incidence of Haller cells in our study was 2%. It was less than that reported by Bolger 45.9%6, Asruddin 28%.7.

The osteomeatal unit was found to be involved in all the patients in our study. Maxillary sinus is the most common sinus involved in chronic sinusitis in our study. Zinreich et al,^[10] noted middle meatus opacification in 72% of the patients with chronic sinusitis, and of these patients 65% had mucoperiosteal sinus thickening of maxillary region. According to Yousem et al when the meatus was opacified, the ethmoid sinuses and maxillary shows inflammatory changes in 82% and 84% respectively. Another study shows frontal or maxillary sinus disease in 84% patients having OMC opacification.^[11] Thus these findings support the contention that the anatomical variation in osteomeatal complex will lead to obstruction of the narrow drainage pathways, which in turn lead to subsequent sinus inflammation.

The evidence found in several studies following the outcomes of endoscopic sinus surgery supports an improvement in the quality of life in most patients post operatively. In our study 90% of patients show symptomatic relief. Whereas study conducted by Gliklich and Metson shows symptomatic relief in about 82% of patients. Welch and Stankiewicz⁵⁸ shows symptomatic relief in about 85% of patients. Lazar and colleagues found improvement in 80% of adult patients.^[12,13]

CONCLUSION

Visualization of paranasal sinus anatomy is more improved by the use of computerized tomography para nasal sinus. It helps in evaluating the exact osteomeatal complex anatomy which is not possible to evaluate in plain radiographs. Anatomical variations found on the computerized tomography scan leads to impaired drainage of paranasal sinuses by blocking the osteomeatal complex and thus causing chronic sinusitis.

In our study the most common anatomical variation of the osteomeatal complex is concha bullosa seen in 29(58%) patients with chronic sinusitis. And the second most common anatomical variation noticed is medialized uncinata in 11(22%) patients with chronic sinusitis. Most of the anatomical variations originates from aerated cells of ethmoid sinus.

Endoscopic sinus surgery is now one of the commonest surgeries being performed by ENT surgeons. The most common indication for doing Endoscopic sinus surgery is "sinusitis".one should study the pre-operative computerised tomography scan minutely before performing the Endoscopic

sinus surgery. A good postoperative care is as necessary for successful outcome as is a good surgery.

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