

Anatomical Variations in Nose and Paranasal Sinuses in Patients Presenting with Chronic Rhinosinusitis

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ABSTRACT

Introduction: The anatomy of organs of ENT is a herculean task to understand and evaluate in the whole human anatomy. Knowledge about the possible variabilities is never complete, since there is always a scope to understand better and know more. Many studies have been undertaken in the past to understand better the already existing knowledge about the various anatomical details in the nose and paranasal sinuses causing chronic rhinosinusitis. The present study was carried to know the details of variations in anatomy of nose and paranasal sinuses causing chronic sinusitis.

Material and Methods: A Cross sectional study conducted over a period of two years, in patients presenting to ENT OPD with symptoms and signs and chronic rhinosinusitis, in a setting of tertiary hospital, with the requisite investigative protocols. Patients meeting the inclusion criteria were included in the study and subjected to the prescribed interventions.

Results: Observations gathered from this study are- of the 65 patients included, 86.1% had septal deformities, 58.4% had Concha bullosa, 52.3% had Agger Nasi, 15.3% had Haller Cell, 13% had Paradoxical Middle Turbinate, 4.6% had Everted Uncinate Process, 3% had Enlarged Bulla.

Conclusion: Sinonasal anatomy is different in each individual, with various combined variations also.

Keywords: Anatomical Variations; Nose and Paranasal Sinuses Anatomy; Septal Deviation; Concha Bullosa; Agger Nasi; Haller Cell; Paradoxical Middle Turbinate; Everted Uncinate Process; Concomitant Variations

INTRODUCTION

The anatomy of the nasal cavity and paranasal sinuses has a very wide spectrum of variations. No two lateral walls of nose are the same, as no two nasal septums. This leads the clinician to a doubt regarding the anatomy of nose and paranasal sinuses and the diseases arising out of the variations. Though a clinician can arrive at the accurate diagnosis by clinical examination and adequate endoscopic examination, imaging studies definitely have a role. Anatomical disparities of nose have been reported to predispose to sinusitis.¹ Chronic rhinosinusitis is one of the most common illnesses, and it has been known to negatively impact health-related quality of life² currently, computed tomography (CT) in both coronal and axial planes is the investigation of choice. Of these, more onuses is on the coronal plane is the most common method used by surgeons because of its similarity with the surgical orientation. One of the biggest advantages of CT is that it gives us an accurate idea about the bony landmarks and orientation of various sinuses around the nasal cavity.³ The newer literature has termed the similar clinical scenario

as “anterior ethmoidal syndrome”. Three-dimensional (3D) imaging of paranasal sinuses is mandatory for diagnosis and treatment of the underlying anatomical variations, as these variations could be a cause for sinonasal symptoms, facial pain symptoms, and headache.⁴⁻⁵

The present study was carried to know the prevalence of variations in sinonasal anatomy causing chronic sinusitis.

MATERIAL AND METHODS

The present study was a cross sectional study, done in tertiary hospital, Nellimarla, Vizianagaram, conducted over a period of 2 years from April 2016 to March 2018, in the patients presenting to OPD. The patients included in the study were categorized basing on the age and gender. The whole sample was subjected to thorough clinical examination and were categorized basing on the clinical findings.

The basic complaints and the associated anatomical variant in the nose and paranasal sinuses were tabulated and categorized methodically.

Every patient included in the study was subjected to Diagnostic Nasal Examination (DNE), with single chip Karl Storz camera and 0 degree Karl Storz endoscope. The findings were recorded in Webex format and snapshots were taken for future references.

All the patients were subjected to multi-slice CT PNS, with 2 mm cuts, and data stored and tabulated accordingly. Detailed and informed consent was taken from the subjects before the start of the study. Institutional ethical committee clearance was taken before the study. Study Subjects were patients presenting to ENT OPD, suffering from any complaint regarding nose and paranasal sinuses were included in the study

Inclusion Criteria

1. Patients presenting with symptoms of chronic rhinosinusitis
2. Patients willing to be included in the study
3. Patients willing for the necessary investigations

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Exclusion criteria

1. Patients presenting with Allergic Rhinosinusitis
2. Patients aged <15yrs and >60yrs
3. Pregnant individuals for risk of radiation exposure
4. Patients with any other contraindication for investigations and treatment.

Intervention: All the patients included for this study were subjected to CT Paranasal sinuses, and evaluated for any anatomical variation and categorized accordingly. Microsoft Excel was used to tabulate and categorize.

RESULTS

In this study 65 patients were included, out of which, there were 49 males and 16 females with ages ranging from 15 to 60 years.

Age wise distribution showed that out of 65 patients, 13 belonged to 15-25yrs; 23 to 25-35 yrs; 15 to 35-45 years; 14 in the age group 45-60 years, as shown in table 1.

Each group were further categorized as males and females, viz. out of the 49 male patients included in the study, 10 belonged to 15-25 years, 18 to 25-35 years, 11 to 35-45 years; 10 to 45-60 years, as shown in table 2.

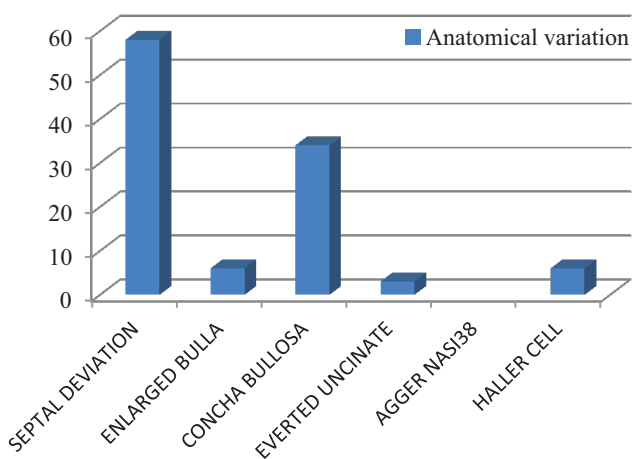


Figure-1: Bar Diagram showing distribution of Anatomical variations

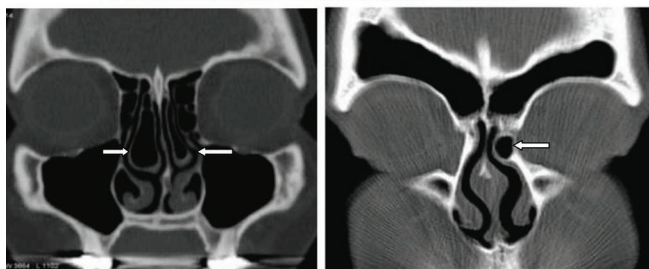
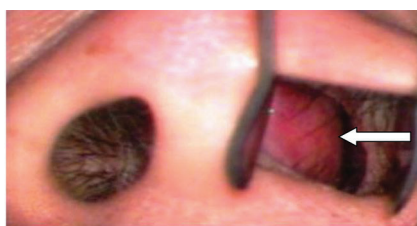


Figure-2: Clinical Photograph showing Deviated Nasal Septum to the left on Anterior Rhinoscopy; **Figure-3:** CT PNS showing Concha Bullosa; **Figure-4:** CT PNS showing Agger Nasi

Males	Females	Total
49	16	65

Table-1: Table showing sex-wise distribution

Age	Males	Females	Total
15-25 years	10	3	13
25-35 years	18	5	23
35-45 years	11	4	15
45-60 years	10	4	14
	49	16	65

Table-2: Table showing Age-wise distribution

Variability	Number
Septal Deviation	58
Enlarged Bulla	6
Concha Bullosa	34
Everted Uncinate	3
Agger Nasi	38
Haller Cell	6

Table-3: Table showing Anatomical Variations

Every patient underwent CT PNS and searched for any underlying anatomical abnormalities.

As quoted earlier, various anatomical variations considered for this study were septal deviation, concha bullosa, enlarged ethmoid bulla, everted uncinata, agger nasi, and haller cell.

Some patients had the concomitant presence of more than one variation, making many different combinations of the existing variations possible.

Septal deviation was seen in 58 patients, Concha bullosa in 34 patients, Enlarged bulla in 6 patients, Everted Uncinate in 3 patients, Agger Nasi in 38 patients, and Haller Cell in 6 patients.

The various percentages are hereby depicted in tabular form in table 3, and as a bar diagram in figure 1.

DISCUSSION

Nasal cavity and paranasal sinuses belong to the same anatomical unit, having common structure and the same covering epithelium.⁷ Complete and thorough knowledge of the sinonasal anatomy is a must for accurate diagnosis and management of a patient presenting to rhinological OPD.

In this study, out of the total 65 patients included, 49 were males and 16 were females. Maximum age group was of 25-35 yrs age group, followed by the age group of 35-45yrs. These were similar to the findings of Perez et al.⁸

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 58 patients out of 65. This is similar to various literatures in the past. Narendra kumar and Subramaniam⁹ who

Presented it as 76% whereas Turnaet al¹⁰ found it as 59.1%. H Mamatha¹¹ et al found it to be 65% and K Dua¹² et al 44%.

Adeel M¹³ et al of Pakistan found it to be prevalent in 26 out of 77 patients, Shpilberg KA¹⁴ et al of USA found it to be in 98 patients out of 192.

A gross DNS to left is depicted below, in an anterior rhinoscopy image, in fig 2.

The term Concha bullosa was coined by Zuckerkandl in 1862. It is defined as the pneumatized middle turbinate. It is one of the most common variants in sinonasal anatomy¹⁵ This study showed a prevalence of 58.4%, correlating with the studies of Bolger¹⁶ et al and Khojastepour¹⁷ et al. The CT PNS of such a patient included in this study is shown below in fig 3.

Agger Nasi cells are defined as the anterior-most Anterior Ethmoidal cell, Located anterior to the nasolacrimal duct. The plane of maxillary sinus infundibulum lies posterior to it¹⁸ Pneumatisation of the agger nasi may extend up to frontal recess, narrowing the recess. It has got much clinical implications, as defined by Bruner et al¹⁹ which include persistent and considerable frontoethmoid pain and chronic frontal sinusitis²⁰

These findings were almost consistent with those of Talaiepouret al²¹ Kaygusuz²² et al of turkey found out 61 patients had agger nasi out of their sample size of 99 patients A Middle turbinate that is oriented in such a way as to a bend into the middle meatus is not pathology in itself unless it blocks the osteomeatal complex. Calhoun²³ reported the prevalence as 7.9% and Lusk²⁴ et al As 8.5%. This study showed a prevalence of 13%. An example of one of the patients included in this study is shown in fig 4.

Haller or infraorbital ethmoid air cells are the pneumatisation of the ethmoid bone below the orbit. They project along the medial roof of the maxillary sinus and into the lamina papyracea, below the ethmoid bulla, lateral to the uncinat process. It was described by Albert Haller²⁵ in 1765. Jaiger²⁶ et al showed 8% prevalence whereas Tiwari²⁷ et al's study had a prevalence of 3.5%. This study showed a prevalence of 15.3%

An Everted Uncinate Process may cause an obstruction to the osteomeatal complex leading to chronic sinusitis and persistent headaches. Pradeep Kumar²⁸ et al of India showed a prevalence of 82% whereas Aramani²⁹ et al of India had a prevalence of 16%. In this study 4.6% patients had a uncinat variant.

An Enlarged Bulla ethmoidalis creates difficulty in the ventilation of the middle meatus as well as during surgery, preoperatively. A Study by Gouripur³⁰ et al had a prevalence of enlarged bulla as 15%, whereas this study showed a prevalence of 3%.

The strengths of the study are along with a study of incidence of various individual anatomical variants, detailed knowledge was gained about concomitant existence of two or more variations in the same patient.

Limitations being, since it included only those people who presented to the ENT OPD with complaints regarding nose and paranasal sinuses, there might be a bias in extending the results to the general population. A degree of human error is always possible.

CONCLUSION

Knowledge about the variations in Sinonasal Anatomy is very important for thorough follow up and diagnosis, and to avoid surprises during functional endoscopic sinus surgeries. Sinonasal variations are more seen in patients suffering from chronic rhinosinusitis, and vice versa, these anatomical variations lead to chronic Rhinosinusitis.

This study shows a prevalence of the different anatomical variations as follows:-

- 58 patients showed Septal deformities
- 34 patients showed Concha bullosa
- 38 patients showed Agger Nasi
- 6 patients showed Haller Cell
- 3 patients showed Everted Uncinate Process
- 6 patients showed Enlarged Bulla

Some of the variations are seen concomitantly occurring in various combinations, making it extremely important for us to identify and document them, to let us correct it and do the needful to the patient.

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