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COMPUTED TOMOGRAPHIC STUDY OF NASAL CAVITY

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ABSTRACT: BACKGROUND: Chronic Sinusitis/Rhino sinusitis is one of the most common and most distressing diseases. Chronicity may be due to blockade of the concerned para nasal sinuses drainage channels due to anatomical variation of thin bones of nasal cavities. Nowadays investigation like Limited Coronal CT scanning will provide detailed anatomy of these bones with least radiation. Surgical Correction of these variations may give permanent relief of symptoms. **AIMS:** The main aim of this study is to determine the incidence of the Deviated Nasal Septum of the nasal cavity in a group of patients suffering from chronic rhino sinusitis. **METHODS AND MATERIAL:** 100 cases of the clinically suspected cases of sinusitis were subjected to Limited coronal CT scanning in radiology department of Osmania General Hospital, A Government teaching hospital, Hyderabad, Telangana State. **RESULTS:** Out of 100 cases CT scanning confirmed the deviated nasal septum in 50% of cases. **CONCLUSION:** Coronal CT study for the nasal cavity and para nasal sinuses should be done for all the cases of chronic Sino-nasal inflammatory disease, wherever possible as this diagnostic procedure, will disclose in greatest details, the anatomical variation if any is found, which is causing or precipitating the sinusitis. Permanent relief to patient will occur when it is corrected by FESS (Functional Endoscopic Sinus Surgery) in majority of patients.

KEYWORDS: Para nasal sinuses, Rhino sinusitis, Osteo meatal unit, deviated nasal septum, Limited Coronal Computed tomography, FESS.

INTRODUCTION: The aim of this study is to determine the incidence of the anatomical variants in the bones of the nasal cavity in a group of patients suffering from chronic rhino sinusitis. Sinusitis/Rhino sinusitis is one of the most common and most distressing disease of mankind and treating physicians. Para nasal sinuses and nasal cavity contain very thin and delicate bones some time less than 1(one) millimeter thickness with thick mucous membrane. Permanent blockade of the draining channels (Osteo Meatal Unit) by this Deviated Nasal Septum may cause chronic persisting disease. The CT scan, that too the limited coronal screening sinus CT (SSCT) is the best investigation of choice now available among all the available imaging techniques to detect the anatomy, variation in architecture of these thin bones precisely, which may be responsible for chronicity of the disease and surgical correction of them will cure permanently in majority of patients.

MATERIAL AND METHODS: 100 cases of the clinically suspected cases of sinusitis were studied to find the Deviated Nasal Septum of the nasal cavity as a cause of the chronic sino nasal disease. CT morphology of the nasal cavity is done in two planes i.e., coronal plane and axial planes. Coronal scanning of the para nasal sinuses (SSCT) alone is usually sufficient in most of the inflammatory cases. But some prefer both the planes i.e. axial and coronal (Full Sinus CT). It gives 3 dimensional information and also gross information about the temporal bones of skull, which may be some times diseased in association with the para nasal sinus pathology.

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The present study has been done in the department of the Radiology, Osmania General Hospital, Hyderabad. It is oldest, 1000 bedded Teaching hospital of Telangana State.

- a) THE LIMITED CORONAL CT STUDY:** Evaluation of the bone and the soft tissues are picturized in detail. These coronal CT studies will show the osteomeatal unit with mucociliary drainage system.

CT TECHNIQUE FOR CORONAL SECTION: The procedure is discussed here.

1. **PATIENT'S POSITION:** The patient is kept in the prone position, with head hyper-extended and the chin resting on the table. In patients, who cannot maintain the prone position, the supine position with head hyper extended over the edge of the table can be used.
2. **SECTION THICKNESS:** Routinely 5 mm, contiguous sections are taken and with 2 mm sections at the osteomeatal unit for finer details
3. **EXPOSURE:** 125 KVp & 80-160 mAs low exposure is used because of the bone algorithm.

a) THE AXIAL CT STUDY: This study compliments the coronal study particularly

1. When there is severe disease (opacification),
2. For the posterior walls of the sinuses.
3. For better visualization of fronto-ethmoid junction and the spheno-ethmoid recess and
4. When tumors are suspected.

C.T. TECHNIQUE FOR AXIAL SECTIONS: With the patient placed supine position, the sections are taken perpendicular to the inferior orbito meatal (IOM) line as 5mm or 8 mm contiguous sections to include all the paranasal sinuses from the floor of the maxillary sinuses to the roof of the frontal sinuses.

PATIENT PREPARATION FOR CT SCANNING: The scanning is undertaken after taking necessary following measures.

- a) Completion of the antibiotic course.
- b) Oral antihistamines and decongestants.
- c) Sympathomimetic nasal sprays and nose blowing before subjecting to the scanning to clear the airways.
- d) Short course of steroids in allergic patients.

OBSERVATIONS: The following are the observations. The male, female, sex ratio and the percentage of individual anatomical variations is calculated as per the following formula.

$$\text{Percentage} = \frac{\text{The total number of variations}}{\text{The total number of cases}} \times 100$$

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1. DISTRIBUTION:

Total no. of cases	CT's without Anatomical variations	CT's with Anatomical variations
100	50	50

Table 1: Distribution

This study was conducted in the age group ranging from 4 years to 70 years. Anatomical variations are more common in the age group of 21 to 40 years – 53%, least commonly observed are in the age group of more than 61 years – 2% (Table.3).

2. DEVIATED NASAL SEPTUM:

Sl. No.	Anatomical variations.	Total no. of cases	%	Case numbers
1.	Deviated nasal septum	50	50%	1,2,3,4,6,7,8,10,12,13, 14, 16, 18, 21, 23, 26, 29, 30, 33, 35, 36, 37, 39, 40, 41, 45, 49, 50, 52, 53, 35, 56, 57, 58, 59, 61, 62, 63, 68, 71, 72, 75, 78, 80, 85, 87, 88, 89, 93, 98.

Table 2: Deviated nasal septum – case number

The most commonly observed variation is the deviated nasal septum – 50%, (Table 2).

3. DEVIATED NASAL SEPTUM:

Sl. No.	Age	Total No. of cases	Deviated nasal septum	Percentage
1.	<20 years	18	8	44.4%
2.	21-40 years	53	31	58.4%
3.	41-60 years	27	9	33.3%
4.	61 and above	2	2	100.0%
	TOTAL	100	50	

Table 3: Age distribution

The variations observed are, the deviated nasal septum -50%.

Sl. No.	Anatomical Variation	Total No. of cases	Male	Female	Ratio
1.	Deviated nasal septum	50	30	20	50.1: 48.7

Table 4: Sex distribution Male, Female Sex ratios

The above table reveals that the incidence of the Deviated nasal septum is more in the males. (Table. 4)

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50% of cases are the deviation of the nasal septum and most of all cases (31) are in the age group below 40 years. Only 9 cases are observed in above 41 years age. 8 cases are observed below 20 years of age. Males outnumber the female (Table.4)

DISCUSSION:

ANATOMY OF THE NASAL CAVITY¹: The nasal anatomy differs from person to person, and certain variations are observed commonly in general population and see more often in patients with the chronic sinus inflammatory disease. The significance of a particular variation is determined by its relationship with the osteomeatal unit and nasal airways. The ability of the variation to obstruct the air passages implies a role in the recurrent sinusitis.

THE NASAL SEPTUM: The medial wall of each nasal fossa is formed by the nasal septum. It extends between the roof and the floor. It is a thin sheet of bone and presents a wide deficiency in front, occupied by the septal cartilage. It is formed almost entirely by two bones, the vomer and the perpendicular plate of the ethmoid. The vomer extends from the interior surface of the sphenoid bone to the palate and forms the lower and posterior part of the septum, including its posterior border. It is marked by small furrows for vessels and nerves. The perpendicular plate of the ethmoid forms the upper and anterior septum, and it is continuous above with the cribriform plate. The septum is often deflected to one side and the deviation occurs most commonly in the line of the vomero-ethmoidal suture.

The lateral wall of the nasal cavity communicates with the para nasal sinuses, has a complex structure. The hiatus semilunaris is the prominent structure of the lateral wall of the nasal cavity. The hiatus semilunaris is inverted crescent shaped, bounded inferiorly by a sharp concave ridge produced by the uncinate process of the ethmoid bone, which leads upwards and forwards into a curved canal named the ethmoidal infundibulum.

FUNCTIONAL ANATOMY²: The antero lateral nasal wall, has functionally important structures that make up the drainage system for the frontal, maxillary, ethmoid, sphenoid sinuses and is designated as the osteomeatal unit (OMU) also known as osteomeatal complex or osteomeatal channels.

OSTEOMEATAL UNIT:

1. COMPONENTS:

1. The middle concha and middle meatus.
2. The maxillary sinus ostium.
3. The ethmoid infundibulum.
4. The uncinate process of the ethmoid.
5. The ethmoid bulla.
6. The hiatus semilunaris.

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2. CHANNELS: Osteomeatal unit has two channels:

DEVIATED NASAL SEPTUM: (FIG. 2): Normal Coronal CT is shown Figure no.1. The nasal septum is usually present in midline. Septum deviation is common. Anterior deviated nasal septum is a cartilaginous deviation. It has only cosmetic significance. Posterior deviated nasal septum is bony origin. It is found normally in about 30% of normal population. In patients suffering from chronic sinusitis it is found in 33%. Deviated nasal septum usually occurs at the junction of cartilaginous and bony parts. When severe it will reduce the critical area of osteomeatal channel and cause obstruction and related complications.(Fig.no.2)

SUMMARY AND CONCLUSION: Out of 100 clinical cases of chronic sinusitis Limited coronal CT scanning confirmed the deviated nasal septum in 50% of cases. Three of the earlier studies also favored DNS.^{3, 4, 5.}

Hence coronal CT study for the nasal cavity and para nasal sinuses should be done for all the cases of chronic sino-nasal inflammatory disease, wherever possible as this diagnostic procedure, will disclose in greatest details, the anatomical variation if any is found, which is causing or precipitating the sinusitis. Permanent relief to patient will occur when it is corrected by FESS in the majority of patients.

Fig. 1: NORMAL CORONAL CT

Fig. 2: Deviated nasalseptum limited coronal ct scan showing deviated nasalseptum obstructing right maxillary sinus

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