

# CT PNS – DO WE REALLY REQUIRE BEFORE FESS?

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## ABSTRACT

There exists a controversy for with regards to the advice of CT for the management of sinusitis and hence, this e study was undertaken to correlate between the CT findings and the endoscopic findings in FESS, the anatomical abnormalities and the mucosal changes in patients with chronic rhinosinusitis and the reliability and validity of CT scan in the management of chronic rhinosinusitis.

This was a time bound cross sectional study design. 45 patients with chronic rhinosinusitis underwent pre operative CT PNS , followed by functional endoscopic sinus surgery (FESS). The parameters which were used for the correlation were paradoxical middle turbinate, concha bullosa, bony destruction , ostiomeatal complex disease, polypoidal changes, mucosal thickening and frontoethmoidal disease.

The correlation was calculated by using the formula for Kappa's agreement. The uncinat process attachment, the agger nasi cells and the, anterior and posterior ethmoid sinuses showed excellent correlation .The maxillary sinus did not show good correlation, but this was acceptable. The middle turbinate anomalies, the hiatus, the infundibulum, the frontal recess and haller's cells showed poor correlation.

The pre operative CT scan evaluation of the patients who have to undergo ing FESS is essential. Most of the anatomical abnormalities can be studied on by CT scan, but however, endoscopy also gives other valuable information.

**Key Words:** CT scan, FESS, sinusitis, correlation

## INTRODUCTION

Sinusitis in its simplest form is an inflammation of the mucous membranes of the sinuses. Rarely the disease may involve other parts of the sinus (bone) or the surrounding structures (nose, orbit and, central nervous system) before the patient consults doctors [1]. During the past two decades, the concepts of sinusitis and its management have undergone tremendous changes. The three important factors on to which the pathophysiology of the sinus disease is related are: the patency of the ostia,, the function of the cilia and the quality of the nasal secretions. Alternation in any one of these factors, alone or in combination, can change the physiology and lead to sinusitis. Of the three factors, the patency of the ostia is the most important in the development of chronic rhinosinusitis. The ostiomeatal complex is the key area to for the pathogenesis of chronic rhinosinusitis [2]. Based on this concept, functional endoscopic sinus surgery (FESS) aims to eliminate the disease in the from its primary site. i.e. the ostiomeatal complex and allow the resolution of secondary infection in from the larger sinuses[3].

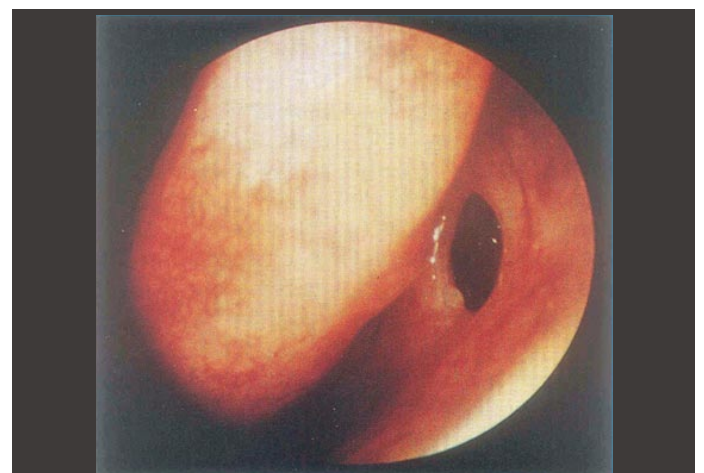
The pre operative diagnosis for these patients is based upon the combination of endoscopy of the lateral nasal wall with CT scan of the paranasal sinuses, but however, the prevalence of the incidental mucosal changes in an asymptomatic population is quite significant. There are various comparative studies of on the imaging modalities , clinical symptomatology, histopathology, culture pattern, anatomical variations and mucosal disease by intranasal endoscopy and there are also imaging studies including CT scan, but a clear correlative study between pre operative CT scan and anatomical defects and mucosal assessment which is found during endoscopic sinus surgery is lacking.

The present study was done to correlate and evaluate between the CT findings and the endoscopic findings in FESS.

## MATERIALS AND METHODS

The study was conducted in the Department of ENT of the District

Chigateri General Hospital and Bapuji Hospital which is attached to J.J.M Medical College, Davangere, of in Karnataka State. A total of 45 patients were included in the study and they were all clinically confirmed cases of chronic sinusitis, including recurrent cases, who had undergone pre operative CT and functional endoscopic sinus surgery thereafter. The CT scan findings were discussed with consultant radiologists. Patients with complicated sinusitis, osteomyelitis, aggressive fungal infections and infiltrating tumours were excluded. [Table/Fig 1]

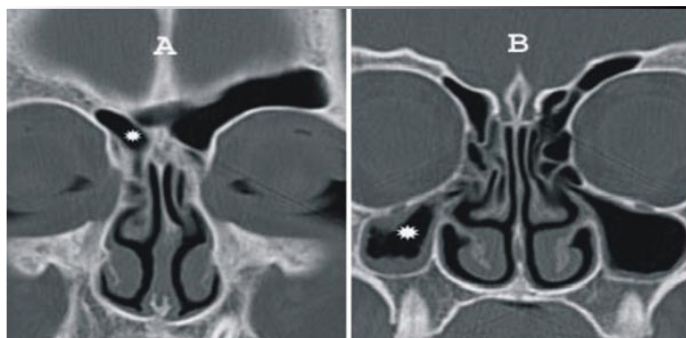


**[Table/Fig 1]:** Endoscopy showing accessory maxillary sinus ostium

The diagnostic validity was used for the correlation between the CT findings and the endoscopic findings. The Kappa's measure of agreement was used for agreements . The parameters which were used for the correlation were: paradoxical middle turbinate, concha bullosa, bony destruction, ostiomeatal complex disease, polypoidal changes, mucosal thickening and frontoethmoidal diseasefron-toethmoidal disease.

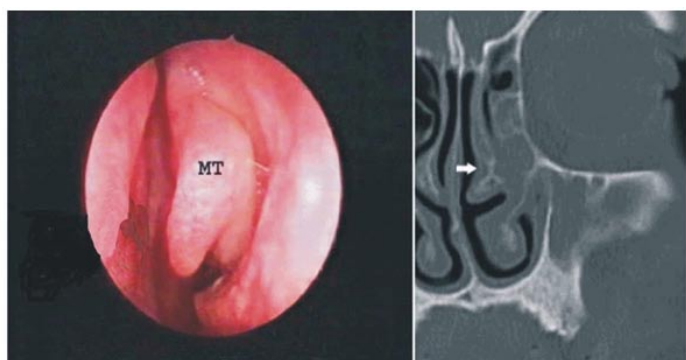
## OBSERVATION AND RESULTS

A total of 45 patients were included in the study. The majority of the patients were males (62%), than as compared to the females (38%). The most common age group of the patients was between 20-40 years and the average duration of the disease was 1 -5 years. The common symptom of presentation was headache (90%), followed by nasal discharge (80%). Concurrent nasal allergy was seen in 9% of the patients. [Table/Fig 2]



[Table/Fig 2]: Coronal CT showing A- Right frontal sinus hypoplasia (\*), B- Right maxillary hypoplasia (\*)

The CT evaluation of these patients was done by consultant radiologists. Concha bullosa was seen in 35% and 42% of the patients on the right and left sides respectively. Paradoxical middle turbinate was seen in 17% and 8% of the patients on the right and left sides respectively. The uncinate process was commonly attached to the lamina (70% on the right, and 66% on the left side), followed by the middle turbinate (24% on the right, 31% on the left side). The hiatus was obstructed in 57% of the patients on the right side and in 59% of the patients on the left side. The infundibulum was found to be obstructed in 57% of the patients on the right side and in 64% of the patients on the left side. In the assessment of mucosal disease, the maxillary sinus was found to be the commonest to get affected (57% on the right and, 46% on the left side), followed by the anterior ethmoid cells (40% on the right and, 37% on the left side), the posterior ethmoid cells (33% on the right and, 28% on the left side), the frontal sinus (28% on the right and, 26% on the left side) and, the sphenoid (20% on the right and, 13% on the left side) respectively. The maxillary sinus was hypoplastic in 13% of the patients on the right and in 15% of the patients on the left side respectively. The frontal sinuses were normal in 88% of the patients, but however, the frontal recess was obstructed in 35% and narrowed in 15% of the patients. The agger nasi cells were present in 37% and 33% of the patients on the right and left sides respectively. Haller's cells were present in 6% and 8% of the patients on the right and left sides respectively. [Table/Fig 3]

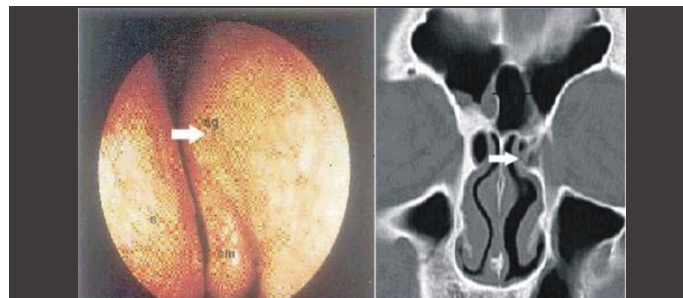


[Table/Fig 3]: Endoscopy showing left sided congested middle meatal mucosa with paradoxically curved middle turbinate (MT) and middle meatal obstruction, corresponding CT shows left sided mucosal disease with paradoxical middle turbinate (Thick white arrow)

Some of the parameters were studied only on by CT scan and were not explored during FESS. The ethmoidal fovea was symmetrical in 84% and asymmetrical in 15% of the patients. Kero's type II was the commonest type (77%) of olfactory fossa, followed by type I (20%). The internal carotid artery bulge was dehiscence in 2% and

the optic nerve canal was dehiscence in 2% of the cases. The sphenoid sinus was asymmetrical in 84% of the cases. The vomer was pneumatized in 13% of the cases. In abnormal sphenoid pneumatization, the anterior clinoid was commonly pneumatized in 14%, followed by the posterior clinoid in 2% of the cases.

After the functional endoscopic sinus surgery, the findings were noted. The concha bullosa was seen in 33% and 40% of the patients on the right and left sides respectively. The uncinate process was commonly attached to the lamina papyracea (71% on the right and, 69% on the left), followed by the middle turbinate (26% on the right and 31% on the left). The hiatus was obstructed in 53% patients on the right and in 61% patients on the left side. The infundibulum was found to be obstructed in 59% patients on the right and in 66% patients on the left side. In the assessment of mucosal disease, the maxillary sinus was found to be the commonest to get affected (46% on the right and, 40% on the left), followed by the anterior ethmoidal cells (33% on the right and, 42% on the left side) and, the posterior ethmoidal cells (33% on the right and, 28% on the left side). The frontal sinus was not seen in all the patients, but however, the frontal recess was obstructed in 37% and narrowed in 15% of the patients. The maxillary sinus was hypoplastic in 33% patients on the right side and in 15% patients on the left side. The agger nasi cells were present in 33% and 28% patients on the right and left sides respectively. Haller's cells were present in 2% and 4% of the patients on the right and left sides respectively. [Table/Fig 4]



[Table/Fig 4]: Endoscopy showing left sided Agger nasi cell, with corresponding CT demonstration of infected Agger nasi cell (White thick arrows)

Some of the parameters were seen only in by endoscopy. In the assessment of the sphenoid-ethmoidal recess, purulent discharge was present in 20% and 24% patients on the right and left sides, followed by mucoid discharge in 13% and 17% patients on the right and left sides respectively. The sphenoid sinus ostium was not seen in most of the cases. But among those which were seen, the oval shape was common (46%), followed by the slit shape (3%). The lateral sinus was present in only one case. The accessory maxillary ostium was present in 13% and 11% patients on the right and left sides respectively.

## DISCUSSION

The diagnosis of inflammatory sinus disease can often be difficult to be made, ke as the nasal symptoms are neither sensitive nor specific in predicting the underlying pathology. Pfeleiderer et al (1986) demonstrated only a 44% correlation between the plain maxillary sinus X-rays and the sinusoscopic findings. Mass et al (1989) demonstrated a 90% correlation between the endoscopic and the CT findings. Indeed, endoscopy sometimes provides information that CT would cannot demonstrate [4]. Lloyd reported an incidental sinus abnormalities in 39% of the asymptomatic sinus group [5]. Cooke and Hadley showed 37.5% of their cases and Havas et al reported the abnormal appearance of the paranasal sinus on CT scan in their series, in 42.5% of the asymptomatic adults [6]. Till date, only one study has shown a correlation between endoscopy and CT scan in the diagnosis of surgical sinusitis in 50 patients, but a detailed correlation of between the pre operative endoscopic findings and CT scan is has not been reported [7].

In our study preoperative, the CT findings were correlated with the

operative endoscopic findings in a total of 45 patients who underwent functional endoscopic sinus surgery.

The middle turbinate abnormalities (concha bullosa, paradoxical middle turbinate, medial displacement, etc) showed a poor correlation ( $K=13.3\%$ ). In our study, the concha bullosa didn't show good correlation ( $K=59.7\%$ ). In various studies, the incidence of the concha bullosa was reported to be between 9-20% [8].

The endoscopic evaluation of the uncinate process variations in various studies ranged from 0.4-15% [8]. In our study, the uncinate process attachment showed excellent correlation ( $K=84.97$ ). The assessment of the hiatus semilunaris and the infundibulum showed poor correlation ( $K=0$  & 24 respectively). But during FESS, a good correlation was seen between the disease at the hiatus semilunaris, the infundibulum and the mucosal disease in the maxillary sinus. In our study, the frontal recess showed poor correlation ( $K=10\%$ ) and the agger nasi cells showed excellent correlation ( $K=79.95\%$ ). These associations are not reported till o date. All the cases of maxillary sinus hypoplasia were confirmed during the FESS.

Some parameters were studied only on by CT scan. Kero's classification figures the incidence of the olfactory fossa as type I-11.59%, of 450 skulls, type II-70.16% and type III-18.25% of 450 skulls [9]. Our study showed type I-20%, type II-77% and type III-2%. Both studies showed type II as the commonest type of the olfactory fossa. The sphenoid sinus was found to be symmetrical in 15% and asymmetrical in 84% of the cases on CT scan. Bolger et al showed anterior clinoid pneumatization in 13.3% of the patients and, pterygoid pneumatization in 43.6% of the cases [8]. Our study showed anterior clinoid pneumatization in 3% patients unilaterally and in 8% patients bilaterally, posterior clinoid pneumatization in 2% patients unilaterally and in none bilaterally, and pterygoid process pneumatization in 3% patients unilaterally and in 6% patients bilaterally. The optic canal indenting on the lateral wall of the sphenoid varied from in 7-88% of of the cases [10]. Our study showed optic canal dehiscence in 6% of the cases. The bulging of the internal carotid artery, consequent to extreme pneumatization of the sphenoid sinus, varied from in 4-7% of the cases [11].

Our study showed internal carotid artery bulging in 2% of the cases. Some parameters were seen only during FESS. The lateral sinus was seen in 1 case on the right side. The accessory maxillary ostium was present in 13% patients on the right and in 11% patients on the left side. The sphenoid sinus ostium was not seen in most of the cases. Among the infundibular disease and the intrasinus mucosal diseases, the maxillary sinus did not show a good correlation, but this was acceptable ( $K=47.63\%$ ), where as the anterior and the posterior ethmoid sinuses showed excellent correlation ( $K=83\%$  and 100%).

There were few limitations in our study, like there was no control group for correlating the anatomical variations with normal individuals, all the landmarks shown on CT were not revealed during FESS unless they were diseased or pathological and also, the CT scan was not interpreted by a single radiologist.

## CONCLUSION

CT scan is mandatory as a pre operative work up in patients who have to undergo ing FESS; as it provides a map on by the help of which to the operation can be done. e. However, endoscopy and CT scan are complimentary in the assessment of various anatomical variations in the ostiomeatal complex and in intrasinus mucosal disease.

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