

CBCT---Absolute Prerequisite Protocol for FESS

BASMA KHAN, ASIM IQBAL, SHAHID WAHEED

Associate Professor Radiology, Associate Professor ENT, Professor of Radiology

Department of Diagnostic Radiology, Fatima Jinnah Medical University/Sir Ganga Ram Hospital, Lahore.

Correspondence to Dr. Basma Khan. Email: basmakhan60@hotmail.com

ABSTRACT

Objective: To describe a radiological approach for evaluation of bony anatomical variants of paranasal sinuses prior to FESS.

Materials and Methods: Patients referred from the Dept of ENT with the diagnosis of chronic sinusitis but who had failed medical treatment and are now candidates for FESS were included. Their CT was conducted to ascertain the bony variations that could complicate FESS. These patients later underwent surgery. The preop radiological findings were compared to operative findings and the results were recorded and later analyzed.

Results: The results of our study showed that CBCT is an absolute pre requisite before FESS.

Conclusion: Study concludes that many catastrophic per operative complications can be avoided by conducting pre operative CBCT.

Key words: FESS, CBCT, bony anatomical variations of PNS

INTRODUCTION:

Chronic Rhinosinusitis is an extremely common condition and is usually treated medically whatever the etiology (allergic, vasomotor, infective as in the common cold, ciliary disorders e.g. Kartagener's syndrome or iatrogenic due to overuse of nasal congestants).¹ Although MRI is the only problem solver which is used to differentiate tumor from inflammation, assess tumor extent and exclude non sinonasal causes of anosmia but bony anatomical variants are better delineated with CT.¹ Low dose CT (Cone Beam CT--CBCT) are indicated when the patient has failed medical treatment and surgery is impending in the form of FESS. At this stage CBCT becomes an absolute pre requisite not only to demonstrate the bony variants but also to set a road map.² Knowledge of anatomical variations of ostiomeatal complex in the etiology of sinonasal disease is important before surgery is planned to avoid damage to surrounding vital structures like the orbit and the brain.³ It is also important to understand the mucociliary drainage pathways as the aim of functional endoscopic sinus surgery (FESS) is to restore these pathways by eliminating the disease from its primary site. i.e. the ostiomeatal complex and allow the resolution of secondary infection from the larger sinuses.⁴

Radiological assessment should include the following³

- Identification of relevant anatomical variants and the presence of anomalous air cells.

- Identification of the extent of disease in relation to the mucociliary pathways—in part or all and any fluid levels to suggest an acute component.
- Identification of bony thickening suggesting chronicity or bony erosion/destruction.
- Identification of dental disease.
- Identification of orbital or intracranial extension.
- Assessment of the postnasal space.

Thus CBCT before FESS can play a pivotal role to prevent post-operative complications secondary to anatomical variations .⁵

MATERIALS & METHODS

Setting: The study was conducted at the Department of Diagnostic Radiology, Fatima Jinnah Medical University/Sir Ganga Ram Hospital, Lahore in collaboration with the Department of Ear, Nose & Throat (ENT) of the same hospital for a period of six months from July 2015 to December 2015.

Research Design was qualitative, descriptive and cross sectional.

Inclusion criteria: patients with a history of recurrent sinonasal polyposis/failed medical treatment/invasive disease

Exclusion criteria: patients who have already undergone endoscopy surgery and those with dental disease.

Sampling Technique: Random/ Non Probability and convenient sampling.

Data Collection

CBCT was performed on Toshiba(Aquilion) MDCT (multi Detector Computed Tomography).Axial images were acquired and from this raw data, coronal and sagittal reconstructions were obtained using both soft tissue and bone window.Due to the high inherent contrast in the paranasal sinuses and nasal cavity, a low-dose technique was used in the axial plane. The anterior ostiomeatal unit is best assessed in the coronal plane, frontal sinus drainage pathway in the sagittal plane and sphenoidal recess in the axial plane. Inferior meatus receives drainage from the nasolacrimal duct and the superior meatus from posterior ethmoidal air cells, the latter then draining into the sphenoidal recess along with the sphenoid sinus. The CT evaluation was done by consultant radiologist and reported the results in a data sheet.

Data Interpretation

SPSS version 18 was used to enter the data and simple percentages were calculated. These were then tabulated and compared with the work done around the world.

RESULTS

A total of 45 patients who had undergone C.T were included in the study.

The majority of these patients were males (62%) as compared to the females (38%).

The most common age group of the patients was between 20-40 years with peak at 30 yrs.

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 only 9% of the patients.

Deviated Nasal Septum was symptomatic when it was obstructing at least half of the nasal cavity,was seen in 80% patients,30% on the right and 70% on the left.

Concha bullosa was seen in 19% patients, 35% on the right and 42% on the left side respectively. Paradoxical turn of the turbinate was seen in 17% and 8% of the patients on the right and left sides respectively in a total of 15%.

Agger nasi cells were present in 55% and 45% patients on the right and left sides respectively in nearly all patients.

Haller's cells were present in 2% and 4% of the patients on the right and left sides respectively in about 10% of the population studied.

Hiatus was obstructed in 57% of the patients on the right side and in 59%of the patients on the left side and was present in nearly all patients studied

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 nearly all the patients. Uncinate process was commonly attached to the lamina papyracea (70% on the right, and 66% on the left side), followed by the middle turbinate (24% on the right, 31% on the left side) and the variation was reported in 5% patients.

Onodi cells seen in 8% of the total ,4% on the right,6% 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) 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.

After the functional endoscopic sinus surgery, the findings were recorded as follows:

DNS was seen in 26% on the right side and 74% on the left side.

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.

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.

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

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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, however, the frontal recess was obstructed in 37% on right and

narrowed in 15% of the patients in left. The maxillary sinus was hypoplastic in 33% patients on the right side and in 15% patients on the left side.

Variations	Patient Percentage preoperative	CBCT		FESS		Axial Images	Coronal images	Sagittal Images
		Right	Left	Right	Left			
Deviated Nasal Septum	80%	30%	70%	26%	74%	+	+	
Concha Bullosa	19%	35%	42%	33%	40%	+	+	
Paradoxical turn of turbinate	15%	17%	8%	26%	31%		+	+
AggerNasi cells	100%	55%	45%	33%	28%		+	
Heller cells	10%	6%	8%	2%	4%		+	
Hiatus semilunaris obstruction	98%	57%	59%	53%	61%		+	+
Ethmoid infundibulum	99%	57%	64%	59%	66%		+	+
Uncinate process attached to lamina papyracea	5%	70%	66%	71%	69%		+	+
attached to middle turbinate		24%	31%	26%	31%			
Onodi cells	8%	4%	6%	1%	3%		+	+
Involvement of sinuses								
Maxillary sinus		57%	46%	46	40	+	+	+
Anterior Ethmoid		40%	37%	33	42	+	+	+
Posterior Ethmoid		33%	28%	33	28	+	+	+
Frontal Sinus		28%	26%	37	15	+	+	
Sphenoid Sinus		20%	13%					
Under development of maxillary sinuses	35%	13%	15%	33	15		+	+

DISCUSSION

Extensive external approaches and prolonged hospital stays have been replaced by a minimally invasive procedure called functional endoscopic sinus surgery (FESS).³ This involves opening the obstructed ostia to provide normal ventilation with preservation of adjacent mucosa and removal of disease.⁶ Literature has reported excellent results with FESS.^{6,7} Many different anatomical variations were observed in Sinonasal region and although their role in the development of sinusitis remained unclear, but complete knowledge of these variations was important before the surgical procedure to avoid dreadful complications. Similar observations were also made by Adeel et al.³ Genetic and environmental factors seem to be the best explanation for these variations.³Deviated Nasal Septum was defined in our study as any deviation that blocked at least half of the nasal cavity. It may be cartilaginous, osteocartilaginous or osseous. It was present in 80% of our patients thus requiring septoplasty along with FESS.

Severe DNS may result in compression of the inferior or middle turbinate, causing obstruction of the normal mucous flow and, consequently, secondary inflammation and infection was the observation made by Eryilmaz in his study.⁸ We found Aggernasi cells in 100% of the patients and post operatively they were compromising the patency of the frontal recess and the anterior middle meatus.⁹ Haller cells were reported in 10% of the patients on CBCT and 4% post operatively. They were compromising the ostium of the maxillary sinuses. Similar observations were made by Laine and Stammberger.^{10,11}Some authors define concha bullosa as any degree of middle turbinate pneumatization.¹² Following this criterion, Conchae bullosa was reported in 19% of the patients preoperatively and almost a similar number postoperatively. Paradoxical middle turbinate was seen in 15% of the total patients out of which 17% was on right and 8% on left side. Post operatively observation was 26% on right and 31% on left side. Some patients in Kennedy's study showed paradoxical curves anteriorly and

normal curves posteriorly The abovementioned statement explains for low frequency of paradoxical middle turbinate in our patients with inadequate anterior coronal cuts in paranasal sinus CT scan.¹² Lloyd reported that obtaining an accurate image of paradoxically curved middle turbinated was related to the level of the coronal CT scan.

Our findings correspond with results of other studies with regard to frequency of Aggernasi cells, Haller cells and septal deviation but the frequency of concha bullosa and paradoxical middle turbinate in our patients was less.^{12,13,14}

CONCLUSION

A thorough understanding of the paranasal sinus anatomy and its variations is important and essential for FESS surgeons. The radiologist plays a vital role in providing the road map required by the surgeons.

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