



Original Article

A study on the incidence of Anatomical abnormalities in the osteomeatal complex among chronic rhinosinusitis patients

Authors

Dr (Col.) DS Grewal¹, Dr Ashish Chaturvedi^{2*}

¹Professor & Head, Department of Radiodiagnosis, Varun Arjun Rohilkhand Medical College & Rohilkhand Hospital, Shahjahanpur, UP

²Assistant Professor, Department of Radiodiagnosis, Varun Arjun Rohilkhand Medical College & Rohilkhand Hospital, Shahjahanpur, UP

*Corresponding Author

Dr Ashish Chaturvedi

Assistant Professor, Department of Radiodiagnosis, Varun Arjun Rohilkhand Medical College & Rohilkhand Hospital, Shahjahanpur, UP, India

Abstract

Objective: To find the the incidence of Anatomical abnormalities in the osteomeatal complex among chronic rhinosinusitis patients (CRS).

Methods: This was a cross sectional observational study. All the patients having clinical findings of CRS referred from ENT department for CT PNS were included in the study. Patients with malignancy/ history of trauma and not giving consent/Pregnancy were excluded from the study. All these patient were submitted to detailed clinical examination, routine investigation & subsequently submitted for CT scan of PNS.

Results: Bilateral osteomeatal complex abnormality was seen in 58.7% and unilateral was in 41.3% patients. Deviated nasal septum was found to be most common anatomical variation (78.3%) followed by inferior turbinate hypertrophy (58.7%), septal spur (38%), concha ballosa (32.6%), Retention cyst (29.3%), AggerNasi cells (28.3%) and Paradoxical Middle Turbinate (19.6%). The percentage of other anatomical variations was less than 15%.

Conclusion: This study emphasizes on identification of specific anatomical variations of ostiomeatal complex and its importance when considering as an etiological factor for CRS. Hence, the importance of CT scan and nasal endoscopy is emphasized in patients with persistent symptoms to identify the anatomical variations that may contribute to the development of chronic sinus mucosal disease.

Keywords: Chronic rhinosinusitis, Ostiomeatal complex, Anatomical abnormalities.

Introduction

Chronic rhino sinusitis (CRS) is a very common condition in ENT practice affecting approximately 1/6th of the Indian population. The National Institute of Allergy and Infectious Diseases (NIAID) estimated that 1 in 8 Indians suffer from

CRS and this disease is more widespread than diabetes, asthma or coronary heart disease (Deepthi et al, 2012). The chronic nature and the debilitating symptoms of the disease are a cause of significant morbidity in CRS patients and greatly impair their quality of life. American

Academy of Otorhinolaryngology and Head and Neck Surgery - Rhinosinusitis task force (RSTF) in 1997, defined Rhinosinusitis as the condition manifested by an inflammatory response of the mucous membrane of the nasal cavity and paranasal sinuses, fluids within these cavities and / or underlying bone. Etiology of CRS includes structural anatomical obstruction, recurrent upper respiratory infections, allergies, biofilm formation and less commonly ciliary dyskinesias, mucopolysaccharoidosis and cystic fibrosis (Sandring et al, 2005; Riello and Boasquesvisque, 2008).

CT scan and nasal endoscopy are preferred diagnostic modalities to determine the mucosal abnormalities and bony anatomic variations of paranasal sinus and assess the possible pathogenicity of these findings in patients undergoing evaluation for sinusitis (Aramani et al, 2014).

Anatomical variations like nasal septal deviations, concha bullosa, paradoxical middle turbinate, pneumatized or medially bent uncinate etc. can encroach upon the Ostiomeatal unit and narrow ostiomeatal channels (Shpilberg et al, 2015). This leads to impaired drainage and dysventilation of the paranasal sinuses which are primary predispositions for development of sinusitis. Some less common variations like presence of haller cell, onodi cell can also hinder sinus drainage and contribute to the development of sinusitis. Surgical clearance of these chronically infected sinuses while maintaining their ventilation and drainage is the treatment of choice (Senniappan et al, 2018).

This study was designed to find the incidence of Anatomical abnormalities in the osteomeatal complex among chronic rhinosinusitis patients.

Material and Methods

This was a cross sectional observational study conducted in a tertiary care hospital. All the patients having clinical findings of CRS referred from ENT Department for CT PNS constituted the study population. All the patients having clinical

findings of CRS referred from ENT department for CT PNS were included in the study. Patients with malignancy/ history of trauma and not giving consent/Pregnancy were excluded from the study. All these patient were submitted to detailed clinical examination, routine investigation & subsequently submitted for CT scan of PNS. As per the protocol, chronic sinusitis was defined as nasal blockage anterior nasal discharge, post nasal drip, headache or facial pain, these patient were refractory to medical treatment for more than 3 month duration.

All CT scan was performed on spiral scanner 64 slice Somatom Definition AS of Siemens definition AS32 slice MD CT scanner. Patient age, sex and symptoms were recorded in pre-defined proforma. All CT scan were obtained on Siemendefination AS32 Slice MD CT scanner. Axial sections were taken with the patient in supine position and plane of data acquisition was parallel to hard palate. All the scans were evaluated on dedicated Siemens work station in the all three orthogonal planes i.e. axial, sagittal and coronal plane.

Results

Bilateral osteomeatal complex abnormality was seen in 58.7% and unilateral was in 41.3% patients (Table-1).

Deviated nasal septum was found to be most common anatomical variation (78.3%) followed by inferior turbinate hypertrophy (58.7%), septal spur (38%), concha bullosa (32.6%), Retention cyst (29.3%), Agger Nasi cells (28.3%) and Paradoxical Middle Turbinate (19.6%). The percentage of other anatomical variations was less than 15% (Table-2).

The bilateral osteomeatal complex abnormality was found to be higher in the age <20 years (80%) and >40 years (70.4%) than unilateral being 20% and 29.6% respectively. However, unilateral osteomeatal complex abnormality was observed to be higher in the age 20-30 years (57.1%) than bilateral (42.9%). The difference was found to be statistically insignificant ($p>0.05$) (Table-3).

The bilateral osteomeatal complex abnormality was found to be higher in both male (56.6%) and female (61.5%) patients than unilateral being 43.4% and 38.5% respectively. However, the difference was found to be statistically insignificant ($p>0.05$) (Table-4).

Deviated nasal septum anatomical variation was in all the patients of unilateral osteomeatal complex abnormality and in 63% of bilateral osteomeatal complex abnormality. The difference was found to be statistically significant ($p=0.0001$). All the anatomical variations were found to be associated ($p<0.05$) with osteomeatal complex abnormality except uncinata hypertrophy (Table-5).

Multiple anatomical variation was in 89.5% patients of unilateral osteomeatal complex abnormality and in 31.5% of bilateral osteomeatal complex abnormality. Single anatomical variation was observed in 10.5% of unilateral osteomeatal complex abnormality and in 31.5% of bilateral osteomeatal complex abnormality. The association between no. of anatomical variation and osteomeatal complex abnormality was found to be statistically significant ($p=0.0001$) (Table-6).

Statistical Analysis

The results are presented in frequencies and percentages. The Chi-square test was used for comparisons. The p -value <0.05 was considered significant. All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA).

Table-1: Distribution of patients according to osteomeatal complex abnormality

Osteomeatal complex	No. (n=92)	%
Unilateral	38	41.3
Bilateral	54	58.7

Table-2: Distribution of patients according to anatomical variations

Anatomical variations*	No. (n=92)	%
Deviated nasal septum (DNS)	72	78.3
Inferior turbinate hypertrophy	54	58.7
Uncinate process	9	9.8
Uncinate hypertrophy	7	7.6
Septal spur	35	38.0
Concha ballosa	30	32.6
Onodi cells	11	12.0
Paradoxical Middle Turbinate	18	19.6
Retention cyst	27	29.3
Haller cells	10	10.9
AggerNasi cells	26	28.3

*Multiple response

Table-3: Comparison of osteomeatal complex with age of patients

Osteomeatal complex	Age in years								p-value ¹
	<20 (n=15)		20-30 (n=28)		31-40 (n=22)		>40 (n=27)		
	No.	%	No.	%	No.	%	No.	%	
Unilateral	3	20.0	16	57.1	11	50.0	8	29.6	0.06
Bilateral	12	80.0	12	42.9	11	50.0	19	70.4	

¹Chi-square test

Table-4: Comparison of osteomeatal complex with gender of patients

Osteomeatal complex	Gender				p-value ¹
	Male (n=53)		Female (n=39)		
	No.	%	No.	%	
Unilateral	23	43.4	15	38.5	0.63
Bilateral	30	56.6	24	61.5	

¹Chi-square test

Table-5: Comparison of anatomical variations with osteomeatal complex abnormality

Anatomical variations	Osteomeatal complex abnormality				p-value ¹
	Unilateral (n=38)		Bilateral (n=54)		
	No.	%	No.	%	
Deviated nasal septum	38	100.0	34	63.0	0.0001*
Inferior turbinate hypertrophy	34	89.5	20	37.0	0.0001*
Uncinate process	7	18.4	2	3.7	0.01*
Uncinate hypertrophy	5	13.2	2	3.7	0.09
Septal spur	30	78.9	5	9.3	0.0001*
Concha bullosa	20	52.6	10	18.5	0.001*
Onodi cells	9	23.7	2	3.7	0.004*
Paradoxical Middle Turbinate	13	34.2	5	9.3	0.003*
Retention cyst	22	57.9	5	9.3	0.0001*
Haller cells	8	21.1	2	3.7	0.008*
Agger Nasi cells	21	55.3	5	9.3	0.0001*

¹Chi-square test, *Significant

Table-6: Comparison of number of anatomical variations with Osteomeatal complex abnormality

No. of anatomical variations	Osteomeatal complex abnormality				p-value ¹
	Unilateral (n=38)		Bilateral (n=54)		
	No.	%	No.	%	
None	0	0.0	20	37.0	0.0001*
Single	4	10.5	17	31.5	
Multiple	34	89.5	17	31.5	

¹Chi-square test, *Significant

Discussion

In the present study, bilateral osteomeatal complex abnormality was seen in 58.7% and unilateral was in 41.3% patients. The study reported by Earwaker (1993), it was only 51% and the study done by Fadda et al (2012), it was 75% incidence of ostiomeatal unit block.

In this study, the prevalence of DNS was found to be staggeringly high at 78.3% which was lower than the study done by Chakraborty and Jain (2016) in which the prevalence of DNS was 92.6%. A study done in Indian population found out DNS in 65% of patients with headache or nasal symptoms (Mamatha et al, 2010). Another study found out the prevalence of DNS to be 80% which was closer to the result of this study (Pinas et al, 2000).

In the present study, concha bullosa was seen on CT examination in 32.6% cases which was almost in consistent to the study by Chakraborty and Jain (2016) in which concha bullosa was seen on CT examination in 30.4% cases. The finding of this study is comparable to the studies by Zinreich et al (1997), Shroff et al (1996) and Wani et al

(2009). Controversially, in another study, it was said that DNS and Concha bullosa are said not to have any significant correlation in pathogenesis of CRS (Vincent and Gendeh, 2010). But, this study found high prevalence of DNS amongst studied patients (78.3% reported on CT scan). Adeel et al (2013) found the most frequent being the deviated nasal septum (26%) and the Concha bullosa (18.2%).

Paradoxical middle turbinate may block the entrance to the middle meatus (Stamberger and Wolf, 1988). It is a very variable feature, Lloyd (1990) reported it in 17% of cases, 12% by Asruddin et al (2000), 15% by Zinreich et al (1997) and Shroff et al (1996) 16% and Bolger et al (1991) 6.1%. In the present study, on CT scan paradoxical middle turbinate was found in 19.6% which was similar to the study by Chakraborty and Jain (2016) who found paradoxical middle turbinate in 14.6% cases which was comparable to Zinreich et al (1997), Lloyd et al (1990), Shroff et al (1996) and Asruddin et al (2000).

Haller cells protrude from the floor of orbit. These are known to cause narrowing of the maxillary

ostium. In this study, the presence of Haller cells was seen in 10.9% which was similar to the study by Chakraborty and Jain (2016) who found the presence of Haller cells in 9.7%. Lloyd et al (1990, 1991) reported frequency of Haller cells as 2% and 15% cases in two separate studies done in 1990 and 1991. Thus, there is a wide variation in Haller cell frequency. The findings of this study were closer to Zinreich et al (1997) findings who found Haller cells in 10% of cases. Aggernasi cells on the lateral wall represent the most anterior of the anterior extra ethmoid air cells (Mafee, 1993). Aggernasi cells are said to obstruct the frontal recess thereby obstructing frontal.

In this study, aggernasi cells were present in 28.3% of cases which in agreement with the study by Chakraborty and Jain (2016) who found aggernasi were present in 26.8% patients. The presence of aggernasi cells is a variable finding. As Lloyd (1990) reported its presence in 3% cases while Maru et al (2000) found in 88.5% cases.

Benjaporn et al (2005) observed 25% incidence of Onodi cells. While in this study, the incidence of Onodi cells was observed to be 12% which was lower than the study by Benjaporn et al (2005).

In the present study, the bilateral osteomeatal complex abnormality was found to be higher in the age <20 years (80%) and >40 years (70.4%) than unilateral being 20% and 29.6% respectively. No significant association was found between osteomeatal complex abnormality and gender. None of the anatomical variations were found to be associated ($p>0.05$) with gender of patients. All the anatomical variations were found to be associated ($p<0.05$) with osteomeatal complex abnormality except uncinata hypertrophy. The association between no. of anatomical variation and osteomeatal complex abnormality was found to be statistically significant ($p=0.0001$). In the best knowledge of authors, none of the studies have reported these findings, hence, comparisons could not be done.

Conclusion

This study emphasizes on identification of specific anatomical variations of ostiomeatal complex and its importance when considering as an etiological factor for CRS. Hence, the importance of CT scan and nasal endoscopy is emphasized in patients with persistent symptoms to identify the anatomical variations that may contribute to the development of chronic sinus mucosal disease.

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