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ENDOSCOPIC AND RADIOLOGICAL FEATURES OF CHRONIC RHINOSINUSITIS AMONG SMOKERS- A CROSS SECTIONAL STUDY AT TERTIARY CARE HOSPITAL.

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ABSTRACT **Introduction-** Chronic Rhinosinusitis (CRS) is a chronic inflammatory disease of the Sino nasal mucosa and prevalent condition that has a significant health and economic impact. Among all forms of CRS, smoking is known to contribute to disease burden. Cigarette smoking has several pathologic effects on the Sino nasal mucosa, including increased airway resistance, decreased mucociliary clearance, and enhanced symptoms of nasal irritation, congestion, and rhinorrhea. **Objective And Methodology-**To describe the features (Endoscopic and Radiological) of Chronic Rhinosinusitis among Smokers. Based on Clinical features among the Smokers, patients diagnosed as CRS were evaluated with Endoscopy and CT scan and changes were graded according to Lund Kennedy and Lund Mackay scoring system and correlated. **Results-** Endoscopy showed sinus secretions in 74 patients (92.5%) and 75 patients (93.75%) and mucosal edema was seen in 71 patients (88.75%) and 67 patients (83.75%) on the right and left sides. On CT scan, mucosal thickening was seen in 43 patients (53.75%) and 38 patients (47.5%), polypoidal change was seen in 26 patients (32.5%) and 13 patients (16.25%) on right and left side, respectively. Majority of patients in our study showed secretions and mucosal edema in endoscopy suggestive of goblet cell and epithelial hyperplasia due to smoking and showed moderate positive correlation between endoscopy and CT score.

KEYWORDS : *Chronic Rhinosinusitis, Smokers, Nasal Polyposis.*

INTRODUCTION

Chronic Rhinosinusitis (CRS) is a prevalent condition that has a significant health and economic impact. Chronic Rhinosinusitis (CRS) is a chronic inflammatory disease of the sinonasal mucosa, defined clinically by characteristic symptomatology lasting 12 weeks. Chronic Rhinosinusitis is defined by the presence of at least two out of four cardinal symptoms (i.e., facial pain/pressure, hyposmia/anosmia, nasal drainage, and nasal obstruction) for at least 12 consecutive weeks, in addition to endoscopic findings like nasal polyps, mucopurulent discharge and edema in the middle meatus and/or CT scan showing mucosal changes within the osteomeatal complex and sinuses.[1]

CRS affects patients through not only Chronic Sinonasal symptomatology but also acute exacerbations and worsening of comorbid pulmonary disease. There are likely multiple pathophysiologic mechanisms of CRS which likely contribute to the various CRS subtypes and endotypes.[1]Chronic Rhinosinusitis (CRS) has been classified phenotypically according to the presence of Nasal polyp (NP): Chronic Rhinosinusitis with Nasal Polyposis (CRSwNP) and Chronic Rhinosinusitis without Nasal Polyposis (CRSsNP) . It is known that CRSwNP patients have a greater disease burden compared with those suffering from CRSsNP with respect to disease severity and poor treatment outcomes. Also biologically, CRSwNP and CRSsNP are known to have distinct characteristics. In CRSwNP, inflammation due to the T-helper type 2 (Th2) cell subset used to be the dominant one resulting in tissue eosinophilia with a high prevalence of coexisting asthma . CRSsNP is thought to result from recurrent episodes of Acute Rhinosinusitis or occlusion of the sinus ostium secondary to anatomic variation.[2]

Among all forms of CRS, smoking is known to contribute to disease burden. Cigarette smoking has several pathologic effects on the Sinonasal mucosa, including increased airway resistance, decreased mucociliary clearance, and enhanced symptoms of nasal irritation, congestion, and rhinorrhea.[3] The etiological role of the Sinonasal microbiome is another topical area in which there has been increasing research with respect to smoking and its potential roles in altering this microbiome and/ or encouraging biofilm formation. The nasal mucosa of smokers is also characterized by a significantly increased number of goblet cells, compared with non-smokers and by greater stromal edema, congestion, and diffuse lymphocytic infiltration, accompanied by some plasma cells and/or neutrophils. Respiratory epithelial thickness was also significantly greater in the smokers.[4]

The specific aim of this study is to describe the features (Endoscopic and Radiological) of Chronic Rhinosinusitis among Current Smokers (refers to Individual who smoked greater than 100 cigarettes in their life time and currently has smoked atleast once in last 28 days.[5]) and thereby emphasizing on management of CRS and to clarify the potential role of smoking cessation in CRS symptoms control.

MATERIALS AND METHODS

This Cross-sectional Observational study was conducted from August 2022 to October 2022 at Department of Otorhinolaryngology, Mandya Institute of Medical Sciences, Mandya. Informed written consent was taken from all the patients who participated in the study. Approval from the Institute Ethics Committee was obtained. Patients who are Current smokers above 18 years of age with signs and symptoms of CRS for more than three months duration and fulfilling the diagnostic criteria of CRS given by the European position paper on Rhinosinusitis and nasal polyps (EPOS) were included in our study. Patients who were non-smokers/ex-smokers/never smokers, with anatomical variations like Deviated Nasal Septum, Absolute Eosinophil Count more than 450 cells/microlitre, recent hospital admission for any other illness and other airway disorders like Chronic Bronchitis, Asthma, Emphysema, Bronchiectasis etc. were excluded from the study.

Characteristics	Nasal cavity	
	right	left
Polyp (0,1,2)		
Edema (0,1,2)		
Secretion (0,1,2)		
total		

Note: Polyp: 0 - absent; 1 - limited to the middle meatus; 2 - extending to the nasal cavity
Mucosa edema: 0- absent; 1- mild/moderate edema; 2- polypoid degeneration
Secretion: 0 absent; 1- hyaline; 2- thick and/or mucopurulent

Fig 1. Lund Kennedy Score Of Endoscopic Assessment

Patients with CRS fulfilling the inclusion and exclusion criteria were enrolled in this study. The sample size was 80 taking prevalence as 68% based on previous study (Hutson K et al, 2021).[6] Patients who were Current smokers presenting with symptoms of nasal blockage/obstruction/congestion and/or nasal discharge

(anterior/posterior nasal drip), either facial pain/pressure and/or reduction or loss of sense of smell for more than 12 weeks were subjected for Diagnostic Nasal Endoscopy (DNE). DNE was performed after packing the nasal cavity with cotton pledges soaked in 4% Lignocaine with 1:200,000 adrenaline for 7 to 10 minutes. The endoscopy was performed using a 4 mm 0-degree rigid endoscope and findings were noted and scored according to Lund Kennedy Radiological scoring system (Fig 1).

Also these patients were subjected for Non Contrast Computed Tomography of Nose and Paranasal Sinuses (CT Nose and PNS) and the changes like mucosal changes within the osteomeatal complex and/or sinuses were noted and scored according to Lund Mackay radiological scoring system (Fig 2).

Paranasal sinuses	Right	Left
Maxillary 0,1,2		
Anterior ethmoid 0,1,2		
Posterior ethmoid 0,1,2		
Sphenoid 0,1,2		
Osteomeatal complex 0*, 2*		
Total points to each side		

0 = no abnormalities, 1 = partial opacification, 2 = complete opacification
0* = not occluded, 2* = occluded

Fig 2 . Lund Mackay Radiological Score

The demographic details, patient profile, relevant history, and examination findings were documented using a proforma. DNE findings were documented using the Lund-Kennedy endoscopic scoring system, and CT scan of nose and PNS were documented using the Lund-Mackay CT scoring system. The correlation between the DNE score, and CT score were done using Pearson's correlation co efficient (p-value) using the Statistical SPSS Software.

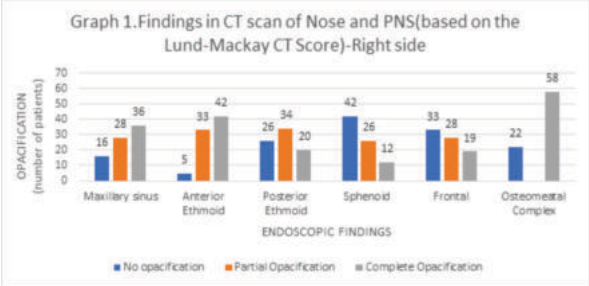
RESULTS

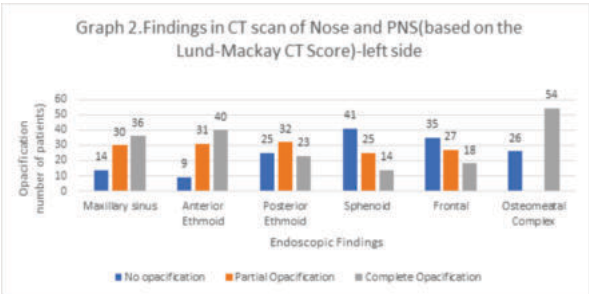
Among the 80 patients who satisfied the inclusion criteria were included in the study, most of the patients were between the age group of 21 to 50 years with the mean age group being 35.55±14.45 years. In the study population, majority of the patients were male which includes 78(98.75%) male patients and only 1 (1.25%) female patient. Data were collected from all the 80 patients included in the study. On performing DNE, 31 (38.75%) of them had polyps in the right nasal cavity and 34(42.5%) of them had polyps in the left nasal cavity. Nasal cavity oedema was observed in 71(88.75%) patients and 67(83.75%) patients on right and left side respectively. Nasal cavity secretions were observed in 74(92.5%) patients on the right nasal cavity and 75(93.75%) patients on the left nasal cavity (Table 1).

Table.1 Diagnostic Nasal Endoscopy Findings In Right And Left Nasal Cavity In Patients With Chronic Rhinosinusitis Using The Lund-kennedy Endoscopic Scoring System

Nasal Endoscopy Findings (n= 80)	Right	Left
	N (%)	N (%)
Nasal cavity Polyp		
No Polyp	49(61.25)	46(57.5)
Restricted to Middle Meatus	18(22.5)	22(27.5)
Extended to Nasal cavity	13(16.25)	12(15)
Nasal cavity Oedema		
None	9(11.25)	3(16.25)
Moderate	43(53.75)	46(57.5)
Severe	28(35)	21(26.25)
Nasal cavity Secretions		
None	6(7.5)	5(6.25)
Clear and thin	19(23.75)	24(30)
Thick and/or Mucopurulent	55(68.75)	51(63.75)

For CT findings, the Lund-Mackay CT scoring system was applied. The scoring system revealed that anterior ethmoids and osteomeatal complex were more involved, followed by maxillary sinus, posterior ethmoids, frontal sinus, and sphenoid sinus, respectively. In cases where anterior ethmoids were involved, 33(41.25%) and 31(38.75%) of patients showed partial opacification in the right and left nasal cavity, whereas 42(52.5%) and 40 (50%) of patients showed complete opacification in the right and left nasal cavity, respectively.58(72.5%) and 54(67.5%) of patients showed complete opacification in Osteomeatal complex in the right and left nasal cavity, respectively. (graph 1 and graph 2).





The mean and standard deviation of the Lund Kennedy endoscopy score was found to be 6.77± 2.14, and the Lund-Mackay CT score was found to be 12.96 ± 2.94.(Table 2)

The correlation between the Lund-Kennedy endoscopic score and the Lund- Mackay CT scores were calculated by using Pearson's correlation coefficient . The Lund-Kennedy endoscopic score had a positive correlation with the Lund-Mackay CT score (r=0.402, p=0.01)(Table 3).

Table 2. Descriptive Statistics of LKS and LMS

	Mean	Std. Deviation	N
Total LKS	6.78	2.140	80
Total LMS	12.96	2.949	80

Table 3. Correlations between Lund kennedy and Lund Mackay score

		Total LKS	Total LMS
Total LKST Total LKS	Pearson Correlation	1	.402**
	Sig. (2-tailed)		.000
	N	80	80
Total LMS	Pearson Correlation	.402**	1
	Sig. (2-tailed)	.000	
	N	80	80

DISCUSSION

Smoking is attributed to be one of the risk factors for chronic rhinosinusitis. It is known that Inhalation of chemicals from smoking causes changes in the respiratory mucosa. The nasal mucosa is histologically similar to that of respiratory mucosa i.e pseudo-stratified ciliated columnar epithelium .So smoking causes similar changes like epithelial hyperplasia, degeneration and necrosis of epithelium, metaplasia, adenoma and malignant changes in nasal mucosa. Goblet cells are unicellular mucous glands in the Respiratory and nasal mucosa. T Hadar et al,2009 [4] showed that the nasal mucosa of the smokers is also characterized by a significantly Increased number of goblet cells, greater stromal edema, congestion and epithelial thickness.

In our study ,80 smokers who were diagnosed with CRS were subjected for Direct nasal Endoscopy and CT Nose and PNS. In the Endoscopic findings of Nose and PNS, sinus secretions(fig.3) were present in 74 patients (92.5%) and 75 patients (93.75%), mucosal edema(fig.4) was seen in 71 patients (88.75%) and 67 patients (83.75%), polypoidal change(fig.5) in sinuses in 31 patients (38.75%) and 34 patients (42.5%), and frank polyposis in 3 patients (3.75%) and 5 patients (6.25%) on the right and left sides, respectively. Our study findings were similar to the study conducted by Kaku DR et al,2017 [7] in Which maximum changes were seen in ethmoid sinus and findings of anterior ethmoid sinus secretions were present in 19 patients (63.33%)

and 21 patients (70%), mucosal edema was seen in 20 patients (66.66%) and 19 patients (63.33%), polypoidal change in sinuses in 19 patients (63.33%) and 20 patients (66.66%), and frank polyposis in ten patients (33.33%) and eight patients (26.66%) on the right and left sides, respectively.

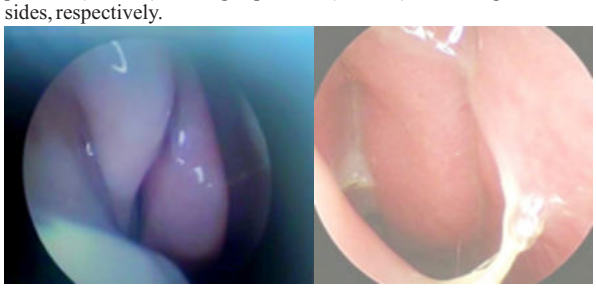


Fig.3. Endoscopic Images Showing Secretions

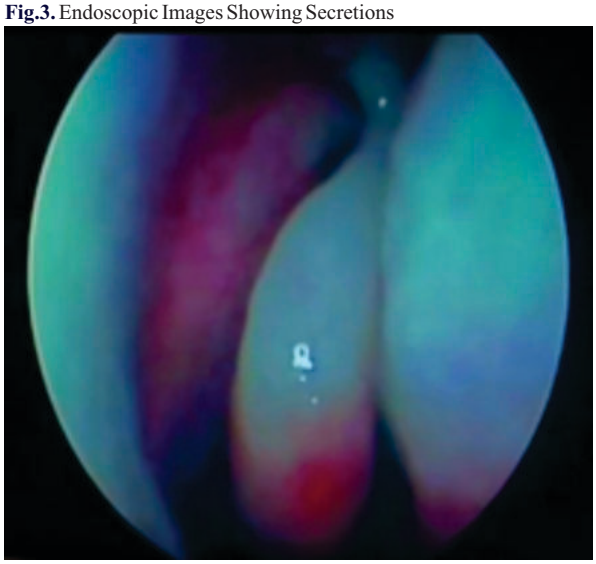


Fig.4. Endoscopic image of mucosal edema.

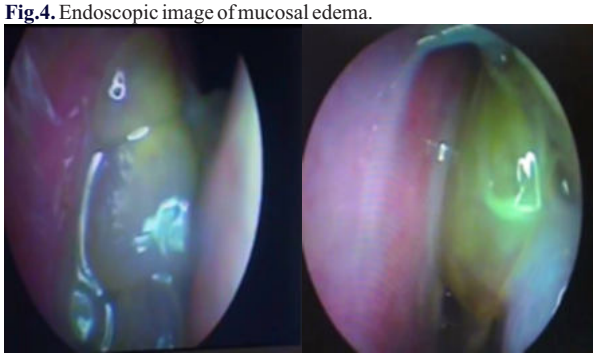


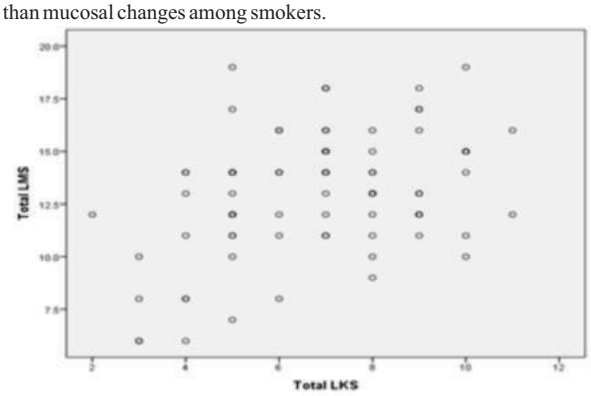
Fig.5. Endoscopic images of Polypoidal changes.

In our study on CT scan, mucosal thickening was seen in 43 patients (53.75%) and 38 patients (47.5%), polypoidal change was seen in 26 patients (32.5%) and 13 patients (16.25%), Osteomeatal complex (OMC) occlusion was seen in 58 patients (72.5%) and 54 patients (67.5%) on right and left side, respectively.

Anterior Ethmoidal sinus (88.75%) showed maximum involvement followed by OMC (72.5%), maxillary sinus (70%), posterior ethmoids (68.75%). The findings were similar to the study conducted by Baba Caliaperoumal et al, 2021[8] in which maximum involvement was seen in Ethmoid sinus with 27% and 30% partial opacification and 61% and 64% complete opacification on right and left side, respectively. EJ Amodu et al,2014[9] study showed the similar results with 81.7% involvement of maxillary sinus followed by ethmoid sinuses (81.7%).

In our study, concha bullosa was found in 9 patients on endoscopy and 11 patients on CT scan and it was the most common anatomical variant of middle turbinate with good correlation between CT scan and endoscopic findings. Majority of patients in our study showed secretions and mucosal edema in endoscopy suggestive of goblet cell and epithelial hyperplasia due to smoking (T Hadar et al).

Our study did not find any significant correlation between Age group and endoscopy or CT score(p=0.539) and duration of smoking and endoscopic and CT score(p=0.654).But, the Lund Mackey endoscopy score had a good correlation with Lund Kennedy CT score (r=0.402, p=0.001)(Graph.3) which is similar to a study conducted by Kaku DR et al (r=0.867,p<0.02) and Deosthale et al which showed a correlation coefficient of 0.881 (p-value <0.0001) between the Lund-Mackay CT Score and the Lund-Kennedy endoscopy score. Rosbe et al.[10] recorded that, patients with positive findings on endoscopy had positive CT scan reports, too. Our study showed moderate positive correlation between endoscopy and CT score probably due to increase in secretions rather than mucosal changes among smokers.



Graph 3. Pearsons Correlation Between LKS And LMS (Showing Positive Correlation)

CONCLUSION

Smoking causes goblet cell hyperplasia and increases epithelial thickness which result in excessive secretions and mucosal edema on Direct nasal endoscopy. Also, Endoscopy is superior to CT scan in localizing pathologies such as discharge and edema whereas CT scan is useful for OMC assessments and involvement of sphenoid and frontal sinuses.

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