

Original Research Article

A comparative study and correlation between preoperative computed tomogram and endoscopic sinus surgery in chronic rhinosinusitis

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ABSTRACT

Background: Chronic rhinosinusitis (CRS) with its classical symptoms of nasal obstruction, nasal discharge, and headache is relatively a common disease in otorhinolaryngology practice. The objectives of the present study was to correlate the operative findings in such patients with the CT findings, using the Perioperative sinus endoscopy (POSE) scoring system and to correlate the maximum scores obtained in the POSE scoring system and Lund-Mackay scoring system.

Methods: A prospective study was conducted from January 2014 to March 2015 in 50 patients suffering from chronic rhinosinusitis who underwent endoscopic sinus surgery in the age group of 36-60 years of age.

Results: Agger nasi cells were the most common wandering ethmoid cell detected (90%) followed by various types of frontal cells (54%), Haller cells (26%) and least commonly Onodi cells (12%). Almost perfect agreement was obtained for rest of the criteria which included middle turbinate status, ethmoid cavity mucosal edema and ethmoid cavity polypoid change. Lund-Mackay scoring system was used to score findings in the CT scan and POSE scoring system used to score peroperative findings in the study and this study reveals excellent correlation (Pearson correlation value of 0.879).

Conclusions: Novel POSE scoring is a new entity which has the potential to be a valid system to score preoperative and perioperative findings. In the current study POSE scoring shows excellent correlation with Lund Mackay scoring which is an established scoring system used in the evaluation CT scan.

Keywords: Rhinosinusitis, Nasal obstruction, CT scan, POSE

INTRODUCTION

Chronic rhinosinusitis (CRS) with its classical symptoms of nasal obstruction, nasal discharge, and headache is relatively a common disease in Otorhinolaryngology practice. The development of Functional endoscopic sinus surgery (FESS) as a means of managing such patients has heralded the extensive use of computerised tomography (CT) scan of nose and paranasal sinuses. The advent of CT scan in the delineation of sinonasal pathology and anatomical variations has proven to be an invaluable diagnostic tool for the otorhinolaryngologist.¹ CT, which has an ability to optimally display bone, soft

tissue and air simultaneously, can not only complement endoscopic examination but also provides an important guide in delineating the anatomy, defining the obstructing lesions and noting anatomic variations which are valuable in conducting precise and meticulous endoscopic sinus surgery.² Anatomical variations such as Agger nasi cells, pneumatization of uncinate process, pneumatization or paradoxical curvature of the middle turbinate, Haller cells, Onodi cells and frontal cells can now be imaged with a high level of clarity using CT scan of the paranasal sinuses. The preoperative detection of the various anatomical variations is essential as it helps in avoiding complications. CT scan has also improved detection of

mucosal abnormalities of the paranasal sinuses. Previously, standard sinus radiographic techniques failed to adequately detect minimal to moderate degrees of mucosal thickening in the ethmoid sinus and middle meatus region. CT techniques, however, clearly image such abnormalities in these regions.³ CT scan with its excellent capability of displaying bone and soft tissue is the gold standard tool for specific diagnosis of sinonasal disease.⁴ In this study the Lund-Mackay scoring and Perioperative sinus endoscopy (POSE) scoring are done for all the cases in the study.^{5,6} Selected criteria in POSE scoring system are used for comparing preoperative CT scan findings and preoperative findings during endoscopic sinus surgery in patients with chronic rhinosinusitis.

METHODS

Study design

A prospective observational study was designed with a sample size of 50 cases.

Study setting

Study is a done on patients attending the outpatient department of otorhinolaryngology at Pushpagiri Institute of Medical Sciences, Tiruvalla, Kerala who have been diagnosed to have chronic rhinosinusitis and planned to undergo endoscopic sinus surgery.

Study duration

The study was conducted from January 2014 to March 2015.

Source of study

Patients with CRS were diagnosed according to criteria formulated by rhinosinusitis task force of the American Academy of Otorhinolaryngology, consisting of two major or one major and two minor criteria for more than 12 weeks based on clinical manifestations.

Major criteria

Facial pain or pressure, facial congestion or fullness, nasal obstruction or blockage, hyposmia or anosmia, purulent nasal or postnasal secretion, fever (ARS only).

Minor criteria

Headache, halitosis, fatigue, dental arch pain, cough, ear pain or pressure in the ear and fever (non-acute).

Inclusion criteria

Diagnosed cases of chronic rhinosinusitis not responding to medical treatment for more than 12 weeks.

Exclusion criteria

Patients who responded to medical treatment, patients not willing for study, acute exacerbations of chronic rhinosinusitis, osteomyelitis and infiltrating tumours.

Each subject was explained about the nature of the study and informed consent was obtained. Routine investigations like hemogram, bleeding and clotting parameters, renal function and blood glucose was done for the patients as a preoperative evaluation. CT scan (3 mm thickness) axial and coronal views was taken. The following anatomic variations were evaluated in preoperative CT scan: Deviated nasal septum (DNS), spur, concha bullosa, paradoxical middle turbinate, uncinated process variation: variations in superior attachment (type1: lamina papyraceae; type2: roof of ethmoid; type3: middle turbinate) and pneumatization and agger nasi cells, haller cells, frontal cells and onodi cells.

The Lund Mackay scoring system and POSE scoring system for sinusitis based on CT scan findings was done for each subject.

Statistical analysis

Data were collected and the variables were fed into SPSS version 17.0. Continuous variables are summarised as mean and standard deviation. Categorized variables were tabulated and percentage was found out. Correlation coefficient is worked out between overall scores of Lund Mackay scoring system and POSE score. Agreement is estimated as kappa statistics. p value <0.05 will be considered as statistically significant.

RESULTS

As per table 1 age ranged between 21 to 77 years in the study with mean age of 48.24 and standard deviation of 15.40. 46% of patients were aged between 36-60 years. CRS were found to be more common in the 4th to 5th decade. When sex distribution was studied among patients with CRS who underwent surgery, it was found that 58% were females and 42% were males.

Table 1: Age and gender wise distribution of the study participants.

Parameters	Frequency	%	Total
Age in years			
Upto 35	16	32	32
36-60	23	46	78
61 and above	11	22	100
Gender			
Female	29	58	58
Male	21	42	42
Total	50	100.00	100

Study shows that from a study group of 50 patients who underwent endoscopic sinus surgery for CRS, the minimum value for LM scoring was 2 whereas maximum was 24 (maximum obtainable score is 24). Mean being 16

and standard deviation being 7.78. POSE score maximum value was found to 34.00 (maximum obtainable being 40.0) whereas minimum score was 3.75. Mean being 19.3 and standard deviation being 10.22.

Table 2: LM scoring and POSE scoring analysis.

Scoring system	Min score	Max score	Mean	S.D.
L M score	2.00	24.00	16.0000	7.77752
POSE right	.00	17.00	10.1800	5.40102
POSE left	.00	17.00	8.7800	5.73671
POSE total	3.75	34.00	19.3000	10.22394

Table 3: Kappa statistics value for selected POSE criteria.

Criterion	Kappa statistics value	Agreement
MT right	0.935	AP
MT left	0.926	AP
MSO right	0.715	Sub
MSO left	0.737	Sub
MAX con right	0.460	Mod
MAX con left	0.597	Mod
EME right	0.852	AP
EME left	0.932	AP
EPC right	0.894	AP
EPC left	0.907	AP
EP right	0.935	AP
EP left	1.000	AP
FR right	0.750	Sub
FR left	0.845	AP
SS right	0.869	AP
SS left	0.839	AP

Table 3 shows kappa statistics value for selected criterion of POSE scoring system used to compare between pre-operative CT scan findings and preoperative findings. Kappa statistics value shows almost perfect agreement when comparing middle turbinate status (MT), ethmoidal cavity mucosal edema (EME), ethmoidal cavity polypoidal changes (EPC), ethmoidal polyposis (EP) and sphenoid sinus ostia patency (SS). Whereas kappa statistics value show substantial agreement when frontal recess narrowing (FR) and maxillary sinus opening (MSO) status were assessed. Moderate agreement was obtained when maxillary sinus contents (MAX Con) were assessed.

Table 4: Correlation between LM scoring and POSE scoring.

Correlations		LM score	POSE score
LM score	Pearson correlation	1	0.879**
	Sig. (2-tailed)		0.000
	N	50	50
POSE score	Pearson correlation	0.879**	1
	Sig. (2-tailed)	0.000	
	N	50	50

** : Correlation is significant at the 0.01 level (2-tailed).

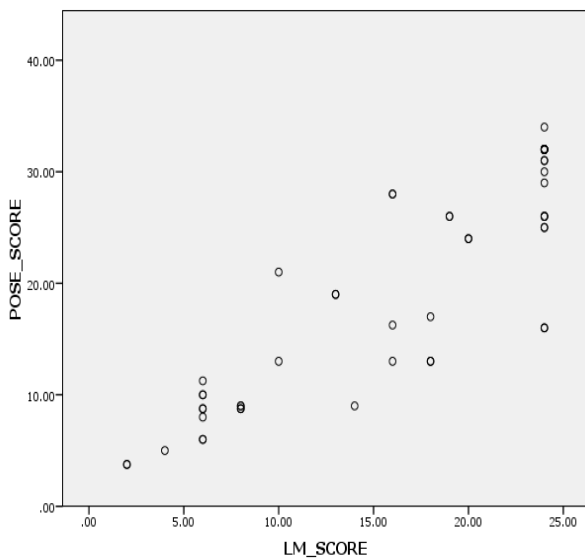


Figure 1: Correlation between L M scoring and POSE scoring in the study group.

Pearson correlation was used to analyse correlation between LM scoring and POSE scoring and it was found to have Pearson correlation value of .879 which indicate excellent correlation as evidenced in Figure 1 where value of +1 indicate perfectly positive correlation and value of -1 indicate perfectly negative correlation.

DISCUSSION

When age distribution was studied among 50 patients it was found that 46% of cases were in the age group of 36-60 years (adult population). Least population was in the elderly age group of 61 years and above. Talaiepour et al in their study of 143 patients found the average age of presentation with sinusitis to be 35 years but ranges from 16 to 75 years.⁷ Asif et al in their study of 150 patients found that average age of sinsitus was 35years.⁸ Sex distribution was studied in the 50 patients with CRS and who underwent surgery. It was found that 58% of the

patients in the study were females and the rest were males Azila et al in their study found that 38% of the affected patients were males.⁹ The study by Benjaporn et al observed a female preponderance which complimented this study.¹⁰ Kappa criterion was analysing the middle turbinate status on each side and the Kappa statistics value was 0.935 and on left it was 0.926 both of which implies almost perfect agreement in assessing middle turbinate status using preoperative CT scan and per operative evaluation. The Kappa statistics value obtained on right side was 0.715 and on left it was 0.737 both of which revealed there is substantial agreement in assessing maxillary sinus ostium using preoperative CT and preoperative evaluation. The next criterion was assessing the maxillary sinus contents. Kappa statistics value obtained on right side was 0.460 and on left side was 0.597 both of which gives moderate agreement in assessing maxillary sinus contents between preoperative CT scan and per operative findings. Then ethmoid cavity mucosal edema was assessed between preoperative CT scan and preoperatively. Kappa statistics value obtained was 0.852 on right side and 0.932 on left both of which reveals almost perfect agreement between preoperative CT scan and preoperative assessment for comparing ethmoid cavity mucosal edema. According to a study conducted by Daniel et al concurrent agreement between radiologist's CT scan findings and surgeon's operative findings for mucosal thickening intranasally was 48.81%. P value was 0.79 whereas for polypoidal change in maxillary sinus was 66.97%. P value was 0.12.¹¹ Contrary to the above, the study conducted by Rashmi and Anil, sensitivity was 60 suggesting a poor correlation between CT scan and ESS findings.¹² Pearson correlation was used to analyse correlation between LM scoring and POSE scoring and it was found to have Pearson correlation value of 0.879 implying excellent correlation.

CONCLUSION

Agger nasi cells were the most common wandering ethmoid cell detected followed by various types of frontal cells. Our studies reveal excellent correlation between Lund-Mackay and POSE scoring. This study proves the validity of POSE scoring system for preoperative evaluation of mucosal abnormalities in a patient with CRS as it gives an excellent correlation with Lund-Mackay scoring which is a well-established staging system for rhinosinusitis.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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