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TO STUDY DIAGNOSTIC EFFICACY OF MULTIDETECTOR COMPUTED TOMOGRAPHY IN EVALUATION OF PARANASAL SINUS LESIONS

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ABSTRACT

Introduction: MDCT (Multidetector computed tomography) offers unique advantages over the single detector row CT, with its speed and isotropic resolutions of thin slices, improved temporal and spatial resolution. It clearly depicts the fine bony anatomy of osteomeatal unit which clinically one can easily missed, underestimated or sometimes overestimated the anatomical extent.

Aims And Objectives: To detect diagnostic efficacy of multidetector computed tomography in evaluation of paranasal sinus lesions.

Materials And Methods: This cross-sectional observational study was carried out on all out patients, inpatients and referral patients with clinically suspected paranasal sinus lesions in Geetanjali Medical College and Hospital during the period of 2 years.

Results: In our study, nasal discharge was seen in 56 patients, nasal obstruction in 67 patients, headache in 59 patients. In our study, epistaxis was seen in 49 patients. In our study, swelling of face was seen in 5 patients. The most common sinus affected was maxillary sinus. Nasal septum was deviated to right side in 19 patients, to left side in 33 patients and 'S' shaped deviation of nasal septum was seen in 2 patients. Detection of polyp CT had a sensitivity of 90%, specificity of 100%, PPV of 100%, NPV of 98.36%, Diagnostic accuracy of 98.57%. Detection of sinusitis CT had a sensitivity of 95.83%, specificity of 95.45%, PPV of 97.87%, NPV of 91.30%, Diagnostic accuracy of 95.71%.

Conclusion: This study proves the better sensitivity and specificity of CT in evaluation of various sinonasal pathologies in symptomatic patients for the diagnosis, staging and thereby better planning of management. CT is the best modality of choice for evaluating osteomeatal complex anatomy, variations and for assessing bony changes in various sinonasal diseases.

KEYWORDS

INTRODUCTION

CT imaging provides minute information of the paranasal sinuses and anatomical extent of paranasal sinus lesions. CT has ability to optimally display bone involvement and soft tissue involvement in sinuses. MDCT (Multidetector computed tomography) offers unique advantages over the single detector row CT, with its speed and isotropic resolutions of thin slices, improved temporal and spatial resolution. CT is the imaging modality of preference since the introduction of Functional endoscopic sinus surgery (FESS). CT Plays an essential position in the pre-operative comparison of sufferers regarded for FESS referred to as SSCT (Screening sinus CT). It is now obligatory to evaluate PNS and nostril earlier than FESS, as this gives a "ROAD MAP" to information the otolaryngologist for the duration of surgical treatment and serves to direct the surgical approach.[1]

Diseases of the Paranasal sinuses encompass extensive spectrum ranging from inflammatory conditions to neoplasms, both benign and malignant. Plain film is inaccurate and insufficient in the diagnosis of non-neoplastic and neoplastic prerequisites of paranasal sinus lesions. Imaging of the PNS has stepped forward from the realm of traditional radiographs (plain films) almost solely into the geographical regions of computed tomography (CT) and magnetic resonance imaging (MRI).

A complete axial and coronal CT scan offers complete study of PNS. Complete detail is available concerning the anatomy, anatomic editions and pathology of PNS. CT excels over MRI in evaluating bony details, evaluation of fibro-osseous lesions of PNS and sino facial trauma. Multidetector computed tomography (MDCT) of the paranasal sinuses reveals excellent sensitivity and specificity for the analysis of sinus pathologies.[2]

AIMS AND OBJECTIVES

To detect diagnostic efficacy of multidetector computed tomography in evaluation of paranasal sinus lesions. To correlate MDCT diagnosis with clinical features and diagnosis. To study relationship between MDCT findings and plain radiograph in patients with paranasal sinus pathologies.

MATERIALS AND METHODS

This cross-sectional observational study was carried out on all out patients, inpatients and referral patients with clinically suspected paranasal sinus lesions in Geetanjali Medical College and Hospital during the period of 2 years (November 2017 to November2019) fitting in the inclusion and exclusion criteria for this study.

Inclusion Criteria: Patients of both genders and of any age group. providing written informed consent. Patients with clinical features suggestive of paranasal sinus lesions such as nasal discharge, nasal obstruction, epistaxis, facial pain, swelling over face, suspected orbital or intracranial complications of PNS lesions.

Exclusion Criteria: Pregnant Woman. Patients with history suggestive of psychiatric disorder. Patients with history suggestive of serious terminal illness.

Parameters used for sinus CT

Patient position: Scan mostly scan done in supine position for both axial and coronal planes. Sometimes scanning done in prone position for better visualization in coronal scans.

Angulation: Perpendicular to infra-orbito meatal line in coronal sections, Parallel to infra-orbito-meatal line in axial sections.

Thickness: 5mm with 5mm incrementation in coronal, 5 to 10mm in axial sections, 2mm sections were taken particularly at the osteomeatal complex and frontal recess.

Exposure: 120 kV, 1.5 second scans time, 300 mA Window width (Approx) 2500 – 3000 Window level 250 - 300 Soft tissue window width is 80 Soft tissue window level is 40.

Extent of the study: From the posterior margin of the sphenoid sinus to the anterior most aspect of nasal cavity in coronal from hard palate through frontal sinus in axial sections.

Preparation of the patient: All patients were advised 4 Hrs fasting prior to CT examination. Contrast agent: Omnipaque was used if indicated, at a calculated dose of 300 mg/kg weight as a single intravenous bolus injection after serum creatinine level was estimated. Informed consent obtained from the patient if I.V. contrast was administered.

RESULTS

Table 1: Associated Symptoms

Complains	Frequency	Percentage
Nasal discharge	54	77.1

Nasal obstruction	64	91.4
Headache	56	80
Face swelling	6	8.6
Allergy	18	25.7
Epistaxis	21	30
Decreased vision	11	15.7

Table 2: Site of Affected Sinus and Nasal Cavity

Involvement	Frequency	Percentage
Right maxillary	55	78.57
Left maxillary	54	77.14
Left ethmoidal	45	64.29
Right ethmoidal	43	61.43
Right sphenoidal	27	38.57
Right frontal	25	35.71
Left frontal	25	35.71
Left sphenoidal	23	32.86
Left nasal cavity	22	31.43
Right nasal cavity	22	31.43

Table 3: Deviated Nasal Septum

DNS	Number	Percentage	Z-Value
No DNS	16	22.86	-0.1362, NS
Towards left side	33	47.14	1.4078, NS
Towards right side	19	27.14	0.1362, NS
S shaped deviation	2	2.85	-1.4078, NS

Fig. 1: Histopathological Report

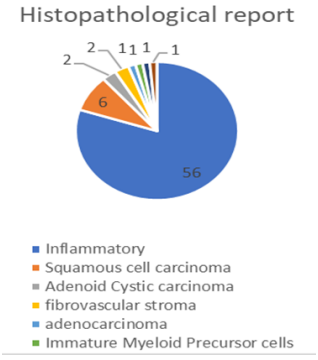

Table 4: Different Diagnosis and Frequency

	MDCT diagnosis	X-ray diagnosis	Clinical diagnosis
Polyp (10)	9	6	5
Sinusitis (48) (other then fungal sinusitis)	46	40	34
Fungal sinusitis (5)	3	2	2
tumor/mass(15)	14	2	2
Mucocele(3)	3	1	0

Some of the patient had a multiple diagnosis.

Table 5: Efficacy of Different Methods For Diagnosis

	Diagnosis	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value	Accuracy	P Value
Polyp	MDCT	90	100	100	98.36	98.57	0.001
	X-ray	37.57	98.15	85.71	84.13	84.29	
	Clinical	50	100	100	92.31	92.86	
Sinusitis (other then fungal)	MDCT	95.83	95.45	97.87	91.30	95.71	0.001
	X-ray	83.33	100	100	73.33	88.57	
	Clinical	70.83	100	100	61.11	80	
Fungal sinusitis	MDCT	60	100	100	97.33	97.44	0.001
	X-ray	40	100	100	96.05	96.05	
	Clinical	40	100	100	96.05	96.05	
Tumor/mass	MDCT	93.33	100	100	98.51	98.51	0.001
	X-ray	13.33	100	100	83.54	83.95	
	Clinical	13.33	100	100	83.54	83.95	
Mucocele	MDCT	100	100	100	100	100	0.001
	X-ray	50	98.28	50	98.28	96.67	
	Clinical	0	0	0	0	0	

DISCUSSION

MDCT plays an important diagnostic role in patients with sinonasal diseases and determines the treatment. The CT images clearly show fine structural architecture of bony anatomy thereby determining various anatomical variation, extent of disease and characterization of various inflammatory, benign and malignant sinonasal diseases.[6] Multidetector CT (MDCT) allows assessment of the patency of sinonasal passages and shows the effect of anatomic variants, inflammatory disease or both on patency. MDCT can show anatomic structures that are not visualised by physical examination or diagnostic nasal endoscopy and is, hence, the study of choice for the surgeon who is considering functional endoscopic sinus surgery.[7]

In our study, nasal discharge was seen in 56 patients, nasal obstruction in 67 patients, headache in 59 patients. In our study, epistaxis was seen in 49 patients. In our study, swelling of face was seen in 5 patients. In our study nasal obstruction was most common symptom. As compare to study done by Suthar BP et.al who reported nasal discharge as the most common symptom seen in 44 cases (i.e. 70%) and obstruction in 19 cases (i.e. 30%). Pain was present in 10 cases (i.e. 17%). epistaxis was present in 4 cases (i.e. 7%) and in majority of the paranasal sinus lesions.

In our study the most common sinus affected was maxillary sinus. Right frontal sinus was involved in 45 patients, Left frontal sinus in 44 patients, Right maxillary sinus in 55 patients, Left maxillary sinus in 54 patients, Right ethmoid sinus in 43 patients, Left ethmoid sinus in 45 patients, Right sphenoid sinus in 43 patients and Left sphenoid sinus in 47 patients. This finding was in accordance to the studies done by Suthar et al[5], Kushwah APS et al[8], where maxillary sinus was most commonly involved. In all the studies sphenoid was least involved, which is also observed in the present study.

In our study nasal septum was deviated to right side in 19 patients, to left side in 33 patients and 'S' shaped deviation of nasal septum was seen in 2 patients. So left side is most common site for nasal septum deviation. Concha bullosa was present in 11 patients i.e. 15.7% of the patients. As compare to study done by SS Kanwar et al[9] reported that nasal septum deviated to right side in most of the patients, Concha bullosa was seen in 30% of the patient, this finding was opposite to our study finding.

MDCT was able to diagnose polyp in 90% of the cases that is in 9 cases out of 10 cases and in one case false diagnosis made by MDCT and in that case lesion turn out to be Carcinoma right maxillary sinus as histopathological report reveals squamous cell carcinoma in report. Clinically physician diagnosed polyp in 50%, with x-ray the diagnosis of polyp was 60%.

MDCT finding were same as diagnostic nasal endoscopy / FESS findings in 46 patients with 95.83% sensitivity, different in 2 patients in cases of sinusitis (other then fungal). Clinically physician diagnosed sinusitis in 70.83% and with x-ray the diagnosis of polyp was only 83.33%.

The most common pathology is inflammation followed by squamous

cell carcinoma, adenoid carcinoma, fibro vascular stroma, adenocarcinoma, immature myeloid precursor cells, olfactory placode and PNET, respectively. The most common malignant pathology was squamous cell carcinoma of maxillary sinus which was also seen in studies done by in Azzam MA. Salami et al[10], study, Mohammed A. Gomaa and Hammad MS and Chow et al[11].

The maximum sensitivity and specificity were found in MDCT followed by X-ray and followed by clinical diagnosis for Paranasal sinuses. There was significant difference between MDCT, X-ray and clinical diagnosis.

In our study for detection of polyp CT had a sensitivity of 90%, specificity of 100%, PPV of 100%, NPV of 98.36%, Diagnostic accuracy of 98.57%. In other study done by Rashmi et al[4] CT had a sensitivity of 94.4% and specificity of 98.1%. which is comparable to our study.

In our study for detection of sinusitis CT had a sensitivity of 95.83%, specificity of 95.45%, PPV of 97.87%, NPV of 91.30%, Diagnostic accuracy of 95.71%. In other study done by SS Kanwar et.al[9] reported sensitivity as 97.7%, Specificity 97.8, PPV value of 97.7%, NPV value of 97.8%. The MDCT had a sensitivity ranging from 90 to 100 percentage in study done by Radha et al. Greatest pitfall in diagnosis of PNS diseases by CT is the fungal sinusitis. In Chaitanya CS, et al[13] study 8 patients were studied among which 5 (62.5%) were diagnosed correctly and others were not diagnosed on CT. The sensitivity was 62.5% and specificity was 97.9% for CT to diagnose fungal sinusitis. The sensitivity described in literature was 76% by Zenreich SJ et al, which was a retrospective study.

CONCLUSION

This study emphasizes the significant role of CT in diagnosis and characterization of various sinonasal diseases. It proves the better sensitivity and specificity of CT in evaluation of various sinonasal pathologies in symptomatic patients for the diagnosis, staging and thereby better planning of management. CT is the best modality of choice for evaluating osteomeatal complex anatomy, variations and for assessing bony changes in various sinonasal diseases.

Its importance lies in its ability to detect bony erosion. It is now being increasingly used as complement to sinus endoscopy to evaluate areas, which are blind to endoscopy. Recently developed multidetector CT (MDCT) enables us to obtain 1mm collimation scans and subsequent high quality multiplanar reformations.

As CT is now considered mandatory in the diagnostic evaluation of diseases of PNS and planning better management, it is referred to as the gold standard imaging of PNS diseases.

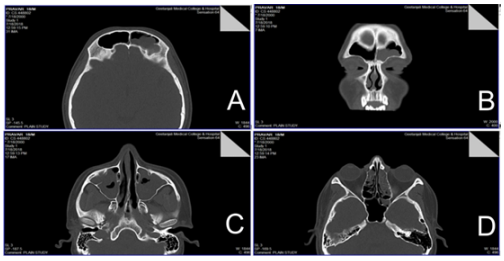

Fig. 2: A, B) Axial image shows polypoidal mucosal thickening in bilateral maxillary, sphenoid and ethmoid sinuses, C) coronal image shows polypoidal mucosal thickening in bilateral maxillary and ethmoid sinuses and deviated nasal septum towards right side, D) axial image shows polypoidal mucosal thickening in bilateral frontal sinuses

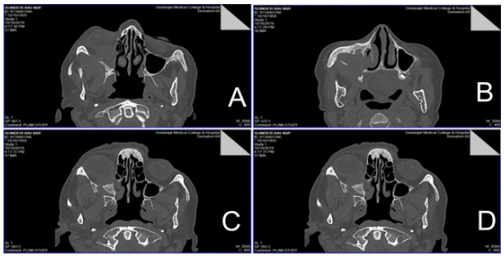

Fig 3: A, B, C, D) axial images show heterogeneously enhancing mass lesion seen in right maxillary sinuses with extension into orbit, nasal cavity, infratemporal fossa, nasolacrimal duct, medial and lateral pterygoid muscles, pterygomaxillary fissure and sphenopalatine fossa

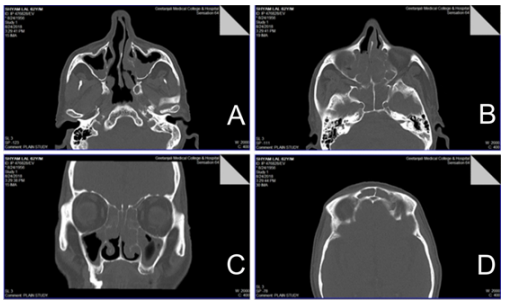

Fig 4: A, B) Axial image shows polypoidal mucosal thickening in bilateral maxillary, sphenoid and ethmoid sinuses, C) coronal image shows polypoidal mucosal thickening in bilateral maxillary and ethmoid sinuses and deviated nasal septum towards right side, D) axial image shows polypoidal mucosal thickening in bilateral frontal sinuses

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