CT evaluation of diseases of Paranasal sinuses & histopathological studies

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Abstract

Introduction: Diseases of the Para nasal sinuses include wide spectrum ranging from inflammatory conditions to neoplasms. CT has replaced conventional radiographs as imaging modality of choice for assessment of Para-nasal sinus diseases. **Material and Method:** This was the prospective study carried out on 50 symptomatic sinus diseased patients who underwent CT imaging of paranasal sinuses in both coronal and axial sections in Department of Radiodiagnosis, NSCB Medical College and hospital, Jabalpur from November 2014 to October 2015. **Results:** Most patients were in the 3rd and 5th decades of their life with male : female ratio of 4:1.The common complaint with which they presented was headache followed by nasal obstruction. Sensitivity and specificity for detection of mucosal abnormality was very good. On evaluating patients with CT PNS, the most common sinus involved was maxillary sinus. Commonest pattern of inflammation was sinonasal polyposis followed by osteomeatal unit pattern. **Conclusion:** To conclude, this study proved good result of CT evaluation of diseases of paranasal sinuses due to high sensitivity and specificity to diagnosis and the planning of management in paranasal sinuses diseases.

Keywords: Para nasal sinuses, maxillary sinus, CT evaluation

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Introduction

Diseases of the Para nasal sinuses include wide spectrum ranging from inflammatory conditions to neoplasms, both benign and malignant. Plain film is inaccurate and inadequate in the diagnosis of non-neoplastic and neoplastic conditions of PNS. Imaging of the PNS has progressed from the realm of conventional radiographs (plain films) almost exclusively into the realms of computed tomography (CT). Technological advances in these two imaging modalities have provided more precise differential diagnosis and details about the anatomic extent of the diseases of PNS. These provide sufficient information for diagnosis and surgical planning in the PNS diseases.

CT has replaced conventional radiographs as imaging modality of choice for assessment of PNS diseases. CT plays an important diagnostic role in patients with sino-nasal disease and determines the treatment. A complete

axial and coronal CT scan series provides an excellent and comprehensive evaluation of PNS. Excellent details are available regarding the anatomy, anatomic variants and pathology of PNS. For confirmation, histopathological diagnosis co-relation is required [1]. CT excels over MRI at evaluating fine bone details, assessment of fibro osseous lesions of PNS and sinus facial trauma.

CT is the imaging modality of choice since the advent of functional endoscopic sinus surgery (FESS). CT plays an important role in the pre-operative evaluation of patients considered for FESS called SSCT (Screening sinus CT). It is now mandatory to evaluate PNS before FESS, as this provides a "Road MAP" to guide the otolaryngologist during surgery and serves to direct the surgical approach [2,3].

CT determines the distribution and extent of disease and detects those anatomic variations[4](like septal deviation, spur formation, concha bullosa, paradoxical; curve of middle turbinate etc.) that may place the

patients at increased risk for intra operative and post operative FESS complications and there by reduces morbidity and mortality of patients.[5].

With the advent of multidetector CT, it is potential to obtained high quality MPR imaging in both coronal and sagittal plane for obtaining the axial CT data. Direct coronal scanning and sagittal reconstruction, imaging the space occupying lesions has been revoluatinalized. Accurate delineation of disease and micro anatomic locales provide a reliable preoperative road map to endoscopic sinus surgery. A combination of CT and diagnostic endoscopy has become the corn-stone in evaluation of the Para-nasal sinus disease. Hence, CT has immense value and offers standard imaging of Para-nasal sinus diseases.

Material & Methods

This prospective study was conducted on 50 patients. Permission from the ethical institute committee was obtained prior to the study and informed consent of study subjects was taken before undergoing CT scan PNS.

Source and Method of Data collection: The main source of data for this study was 50 patients, who were referred from Department of ENT to Radiology Department of NSCB Medical College and Hospital Jabalpur (M.P.) After taking the detailed history and considering the Symptomatology of with clinically suspected paranasal sinus diseases from November 2014 to October 2015.

Inclusion Criteria

1. Patients presenting with history of headache, nasal obstruction, nasal discharge, anosmia, postnasal discharge, epistaxis.
2. Patients undergoing histopathology investigation.

Exclusion Criteria

1. Patients with maxillofacial / head trauma.
2. Pregnant women.
3. Children less than 5 years of age.
4. Psychatric patients.
5. Non cooperative patients.

CT Paranasal sinus

Both axial and coronal CT scan study (with GE, spiral CT machine) was done.

CT findings were recorded in a proforma those specially prepared for the purpose of our study. CT PNS findings were compared with Histopathological findings. Statistical analysis was done using statistical software, Microsoft Word and Excel have been used to generate graphs, tables etc.

Sensitivity and specificity of CT findings were calculated using histopathological sinus surgery findings as standard with reference to mucosal thickening, polypoidal/mass lesions, involvement of adjacent bones and soft tissue.

Results

A total of 50 patients satisfying the inclusion criteria were include in the study, A descriptive comparative analysis of imaging findings was compared, and results were derived. Majority of case were found in age group 21-30 and 41-50 years age i.e 22% and youngest patient was of 8 years and eldest patient was of 75 years. Incidence of paranasal sinus disease was more in male (80%) as compared to female (20%).The Female: Male ratio is 1:4. Predominant symptoms in study group were headache in 29 patients (58%) followed in decreasing order by facial pain & swelling in 19 patients(38%) and nasal obstruction in 8 patients(16%).

Table-1: Sinus distribution

Sinus	Number (n=50)	Percentage
Maxillary	44	88
Anterior Ethmoid	2	4
Posterior Ethmoid	2	4
Frontal	3	6
Sphenoid	4	8

In this study most common diseased sinus was maxillary sinus (88%).

Table- 2: CT Findings in Deviated nasal septum (DNS)

DNS	Number (n=50)	Percentage
Towards Left	8	16
Towards Right	10	20
Total	**18**	**36**

DNS was seen in 18 patients (36%) with more common towards right side. DNS towards right side seen in 10 patients (20%), DNS towards left side seen in 8 patients (16%)

Table-3: CT Findings in OMU

OMU Obstruction	Number (n=50)	Percentage
Left	12	24
Right	11	22
Bilateral	4	8
Total	**27**	**54**

OMU obstruction was observed in 27 patients (54%) with Bilateral Involvement seen in 4 patients (8%).

Table-4: Histopathlogical Findings

Histopathology	Number (n=50)	Percentage
Same as CT	47	94%
Different from CT	3	6%

Histopathological findings were similar to CT findings in 47 (94%) patients and different from CT findings in 3 (6%) patients. These different findings were related to either fungal disease or inspissated secretions.

Table-5: Histopathological Reports

HPR	Number (n=50)	Percentage
Inflammatory polyp	4	8
Non-specific inflammation	32	64
Fungal sinusitis	1	2
Mucocele	1	2
Angiofibroma	3	6
Inverted papilloma	2	4
Poorly differentiated carcinoma	7	124

50 patients were sent for histopathological examination. Non specific inflammatory changes were most common (64%) and least common histopathological finding was fungal Sinusitis (2%).

Table-6: Bone Involvement

Bone Involvement	Number of patients (n=50)	Percent	Sensitivity	Specificity
In clinical diagnosis	1	2	28.6	100
CT diagnosis	5	10	100	100
Final Diagnosis	5	10	-	-

Out of the 5 patients found to have bone involvement in the form of erosion or destruction on CT detected in all the 5 patients but on clinical examination found only in 1 patient. CT had higher sensitivity and specificity whereas clinically sensitivity was very low.

Table No. 7: Comparative evaluation between CT Diagnosis, Histopathology diagnosis and final diagnosis.

	Sensitivity	Specificity	PPV	NPV	DA	P VALUE
Ch. Sinusitis (31/15 v/s 31/16)	100.0	93.8	96.9	100.0	97.9	P<0.001
Polyp (3/4 v/s 16/15)	100.0	93.8	75.0	100.0	94.7	P<0.001
Others (15/31 v/s 16/31)	93.8	100.0	100.0	96.9	97.9	P<0.001

Discussion

In the recent past, it is accepted that CT is the best imaging method of demonstrating simple inflammatory disease to neoplasms in the paranasal sinuses. Previous studies have shown poor correlation of plain X-ray with CT. Plain films are unreliable and no longer routinely indicated for the evaluation of paranasal sinus disease. Clinical assessment is used to evaluate acute sinus infection and CT used for the investigation of persistent and chronic sinus disease refractory to medical therapy. CT evaluates the osteomeatal complex anatomy, which is not possible with plain radiographs.

This study was carried out to evaluate the pathological lesions of the paranasal sinuses by CT. 50 patients were evaluated with CT which were referred after clinical examination and then correlated with Histopathological findings.

Age of incidence (years): Age distribution of our study subjects was similar as found by Gliklich RE [6], Venkatachalam VP, [7], Prabhakar S [8].

Symptoms: In our study 58% patients presented with headache and 16% with nasal obstruction similar findings were observed **by. Asruddin etal [9] in** their study.

Deviated nasal septum and OMU: 36% patient had DNS and 54% had involvement of OMU as observed by Dua K [10] and Babble RW in [11] their study.

Sinus involvement: Most common sinus involved was maxillary sinus in 44 patients (88%), followed by anterior ethmoid (4%), Posterior ethmoid (4%), frontal (6%) and sphenoid sinuses (8%). Studies in literature observed involvement of maxillary sinus more common and frontal sinus was least involved. When findings were correlated with other studies similar results were observed by Kelkar AA [12] maxillary sinus in 58%

(88%).

The CT severity assessed for 31 patients with inflammatory diseases showed highest no of patients of grade 4- 13 (41.9%) patients and lowest of grade I- 1 (3.2%) patient.

Bone involvement: CT has the capability to delineate the bone erosion or destruction with the highest accuracy in the imaging modalities. In this study CT detected the bone erosion or destruction in all the 5 patients. The sensitivity and specificity of CT to detect bone erosion or destruction was 100% where as clinical detection had 28.6% sensitivity and 100% specificity.

CT and Histopathological correlation: Histopathological findings in almost all cases correlated with CT findings. The findings of CT were similar to Histopathological findings in 47(94%) of patients and different in 3(6%) patients. All the false positive or false negatives are related to fungal sinusitis. Except the fungal sinusitis, sensitivity and specificity of CT was almost 100%.

CT Histopathological and Final diagnosis: When the comparision table is viewed there is a best correlation between the CT diagnosis and final diagnosis but also between the Histopathological diagnosis and final diagnosis.

Thus, CT plays an important role in diagnosing and also adding important findings for the better management of the patients with paranasal sinus diseases.

The sensitivity of Chronic Sinusitis of CT over HPR was 100.0%, Specificity 93.8%, Positive predictive value was 96.9%, Negative predictive value was 96.9% and the Diagnostics accuracy was 97.9% with a significant P level. (P<0.001).

The sensitivity of Polyp of CT over HPR was 100.0%, Specificity 93.8%, Positive predictive value was 75.0%, Negative predictive value was 100.0% and the Diagnostics accuracy was 94.7% with a significant P level. (P<0.001).

The sensitivity of others finding of CT over HPR was 93.8%, Specificity 100.0%, Positive predictive value was 100.0%, Negative predictive value was 96.9% and diagnostics accuracy was 97.9% with a significant P level. (P<0.001). This high sensitivity and specificity for benign and malignant masses could be due to small number of masses evaluated.

Thus CT plays an important role in diagnosing and also adding important finding for the better management of the patients with paranasal sinus diseases.

Conclusion

1. CT is the modality of choice in imaging the paranasal sinuses for evaluating the chronic diseases and associated complications.
2. Fungal sinusitis and dense secretions are potential pitfall on CT to differentiate them. But CT may suggest fungal sinusitis in whom it is not suspected.
3. CT is the modality of choice in evaluating the bone erosion or destruction.
4. CT evaluation of PNS in symptomatic patients helps in planning the further management of the patient.

However, CT has certain potential drawbacks and disadvantages like complex projections, artifacts induced by very high density structures in and around PNS, by the patient movement, limited soft tissue resolution. Even radiation exposure in CT examination limits frequent usage, test repeatability and its use in children and pregnant women.

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