

**Evaluation of Paranasal sinus diseases by CT and histopathological studies****Ashish. S. Rudrawadi<sup>1</sup>, Siddarth Ragupathi<sup>2\*</sup>**<sup>1</sup>*Assistant Professor, Department of Radiodiagnosis, Christian Medical College, Vellore, India*<sup>2</sup>*Associate Professor, Department of Radiodiagnosis, Vinayaka Mission Medical College, Vinayaka Mission Research Foundation, Karaikal, India***Received: 31-01-21 / Revised: 10-03-2021 / Accepted: 28-03-2021****Abstract**

**Introduction:** Diseases of the Para nasal sinuses include wide spectrum ranging from inflammatory conditions to neoplasms. Computed tomography (CT) has replaced conventional radiographs as imaging modality of choice for assessment of Para-nasal sinus diseases. **Material and Methods:** This prospective study was done in the Department of Radiology at a tertiary care teaching Hospital over a period of six months. A total of 70 patients who were referred to our department with clinical suspicion of PNS disease underwent CT evaluation of PNS using 64 Multi slice CT scanner. The patient was then placed on the gantry table in prone position. The coronal scan is taken from posterior margin of sphenoid sinus to anterior margin of frontal sinus. **Results:** In the present study, a total of 70 subjects were included out of which 41 (58.5%) were males and 29 (41.5%) were females. In our study, most of the subjects were 21-40 years i.e., 34 out of 70 (48.5%) followed by 41-60 years, i.e., 31 out of 70 (31.4%). Deviated nasal septum (DNS) was seen in 24 patients (37.1%) with more common towards right side. DNS towards right side seen in 14 patients (20.0%), DNS towards left side seen in 12 patients (17.31%). In table 7, CT findings of chronic sinusitis in 32 patients (45.7%) followed by inflammatory polyp in 17 patients (24.2%), fungal sinusitis in 13 patients (18.5%), Antrochoanal polyp in 6 patients (8.5%) and Neoplastic in 2 patients (2.8%). Seventy patients were sent for histopathological examination. Non-specific inflammatory changes were most common (45.7%) and least common histopathological finding was Angiofibroma and mucocele (1.4%). **Conclusion:** Paranasal sinus pathology is very varied with therapeutic and prognostic repercussions. Clinical radiological study is sometimes insufficient and histopathological confirmation is essential.

**Keywords:** Paranasal sinuses, Computed tomography, Histopathology.

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**Introduction**

Paranasal sinuses (PNSs) diseases commonly affect the varied range of population, which range from inflammatory conditions to neoplasms, both benign and malignant.[1] Their clinical assessment is hampered by the surrounding bony structures, hence for confirmation of their diagnosis, the role of radiology is of paramount importance.[2] Imaging of the sinuses is usually done to approve the clinical findings when history and physical examinations are suggestive of PNS lesions, but the patient is not responding to conventional treatment. Plain radiography is the commonly used imaging modality for diagnosis of PNS diseases as it is economical, simple, and widely available. However, it only provides a basic overview of the anatomy and underlying pathology. Plain radiography could not display the three-dimensional structures in a two-dimensional plane. It can provide limited views of the anterior ethmoid cells along with the upper two-thirds of the nasal cavity. [3] Computerized tomography (CT) is considered the gold standard for preoperative evaluation of PNS diseases for appropriate patient selection for functional endoscopic sinus surgery (FESS). It is mandatory to evaluate the PNS and nose by CT before planning for FESS. It can provide a "ROAD MAP" to direct the surgical approach to otolaryngologist. CT has some medico-legal importance as well. [4] CT plays an important diagnostic role to determine the

distribution and extent of paranasal disease and detect those anatomic variations (such as septal deviation, spur formation, concha bullosa, and paradoxical curve of middle turbinate) that may place the patients at increased risk for intra- and post-operative FESS complications and thereby reduces the morbidity and mortality of patients. [5] Coronal imaging plane offers the best visualization of the drainage pathways of the sinuses, whereas some drainage pathways (such as sphenoid sinus ostia) and sinus walls, oriented close to the coronal plane, are better seen on axial images. [6] Contrast enhanced CT scans are obtained only in patients who are acutely ill and suspected of having a complication of acute sinusitis. [7] The present study was aimed to evaluate the spectrum of PNS diseases on CT and correlate their clinical and histopathological findings.

**Material and Methods**

This prospective study was done in the Department of Radiology at a tertiary care teaching Hospital over a period of six months. A total of 70 patients who were referred to our department with clinical suspicion of PNS disease underwent CT evaluation of PNS using 64 Multi slice CT scanner. A detailed history of the patient including signs and symptoms, detailed physical examination, biochemical investigations and radiological investigations which included sinus X-ray were recorded and tabulated. The patient was then placed on the gantry table in prone position. The coronal scan is taken from posterior margin of sphenoid sinus to anterior margin of frontal sinus.

**Inclusion criteria:** Patients of any age and either gender who attended a medical consultation due to a sinus pathology and who required at least a confirmatory biopsy or surgical treatment of the lesion.

\*Correspondence

**Dr. Siddarth Ragupathi**

Associate Professor, Department of Radiodiagnosis, Vinayaka Mission Medical College, Vinayaka Mission Research Foundation, Karaikal, India

E-mail: [rsidd1111@gmail.com](mailto:rsidd1111@gmail.com)

**Exclusion criteria:** Patients who had not given informed consent, relapses of previously diagnosed and/or treated lesions, new lesions in the same patient, lesions which affect the maxillary sinus due to loco-regional spreading but which originate in another location, and infectious lesions with odontogenic origin.

#### Results

In the present study, a total of 70 subjects were included out of which 41 (58.5%) were males and 29 (41.5%) were females (table-1).

#### Histopathological study

This was conducted in a routine manner with paraffin inclusion and hematoxylin and eosin stain. Where necessary, multiple sections of each of the blocks were made and PAS and Grocott stains were used in those patients whose clinical suspicion included a micosis.

**Table 1: Distribution of gender**

Gender	No. of patients	Percentage %
Male	41	58.5
Female	29	41.5
Total	70	100

**Table 2: Distribution of different age groups of patients**

Age	No. of patients	Percentage %
<20 years	11	15.7
21-40 years	34	48.5
41-60 years	22	31.4
>61 years	3	4.2
Total	70	100

In table 2, in our study, most of the subjects were 21-40 years i.e., 34 out of 70 (48.5%) followed by 41-60 years, i.e., 31 out of 70 (31.4%).

**Table 3: Distribution of Symptoms among patients**

Symptoms	No. of patients	Percentage %
Headache	21	30.0
Facial pain	13	18.5
Swelling	10	14.2
Nasal obstruction	26	37.1
Total	70	100

In table 3, predominant symptoms in study group were nasal obstruction in 26 patients (37.1%) followed in decreasing order by headache in 21 (30%), facial pain in 13 patients (18.5%) and swelling in 10 patients (14.2%).

**Table 4: Distribution of Sinus among patients**

Sinus	No. of patients	Percentage %
Maxillary	49	70.0
Anterior Ethmoid	5	7.1
Posterior Ethmoid	3	4.2
Frontal	9	12.8
Sphenoid	4	5.7
Total	70	100

**Table 5: CT Findings in Deviated nasal septum (DNS)**

DNS	No. of patients	Percentage %
Towards Right	14	20.0
Towards Left	12	17.1
Total	26	37.1

In table 5, DNS was seen in 26 patients (37.1%) with more common towards right side. DNS towards right side seen in 14 patients (20.0%), DNS towards left side seen in 12 patients (17.31%).

**Table 6: CT Findings in OMU**

OMU Obstruction	No. of patients	Percentage %
Bilateral	9	12.8
Left	19	27.1
Right	17	24.2
Total	45	64.2

In table 6, OMU obstruction was observed in 45 patients (64.2%) with Bilateral Involvement seen in 9 patients (12.8%).

**Table 7: Distribution of patients of sinus lesions according to computed tomography diagnosis**

Diagnosis	No. of patients	Percentage %
Chronic sinusitis	32	45.7
Inflammatory Polyp	17	24.2
Antrochoanal polyp	6	8.5
Fungal sinusitis	13	18.5
Neoplastic	2	2.8

In table 7, CT findings of chronic sinusitis in 32 patients (45.7%) followed by inflammatory polyp in 17 patients (24.2%), fungal sinusitis in 13 patients (18.5%), Antrochoanal polyp in 6 patients (8.5%) and Neoplastic in 2 patients (2.8%).

**Table 8: Distribution of Histopathological outcome**

Histopathological outcome	No. of patients	Percentage %
Non-specific inflammation	32	45.7
Inflammatory polyp	17	24.2
Antrochoanal polyp	6	8.5
Fungal sinusitis	9	12.8
Mucocele	1	1.4
Angiofibroma	1	1.4
Inverted papilloma	2	2.8
Poorly differentiated carcinoma	2	2.8
Total	70	100

In table 8, Seventy patients were sent for histopathological examination. Non-specific inflammatory changes were most common (45.7%) and least common histopathological finding was Angiofibroma and mucocele (1.4%).

**Table 9: Distribution of Involvement of bone**

Involvement of bone	No. of patients	Percentage %
In clinical diagnosis	1	1.4
CT diagnosis	9	12.8
Final Diagnosis	9	12.8

In table 9, Out of the 9 patients found to have bone involvement in the form of erosion or destruction on CT detected in all the 9 patients but on clinical examination found only in 1 patient.

#### 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. [8] This study was carried out to evaluate the pathological lesions of the paranasal sinuses by CT. 70 patients were evaluated with CT which were referred after clinical examination and then correlated with Histopathological findings. In our study, most of the subjects were 21-40 years i.e., 34 out of 70 (48.5%) followed by 41-60 years, i.e., 31 out of 70 (31.4%). Age distribution of our study subjects was similar as found by Balıkcı HH [9]. In our study, 51% of the cases were male while 49% were female with marginal preponderance for male which is in concordance with study conducted by Yazıcı D et al. [10] In our study, predominant symptoms in study group were nasal obstruction in 21 patients (30.0%) followed in decreasing order by headache in 21 (30%), facial pain in 13 patients (18.5%) and swelling in 10 patients (14.2%) similar findings were observed by Dasar U et al. in their study. [11] Deviated nasal septum and OMU: 37.1% patient had DNS and 64.2% had involvement of OMU as observed by Shpilberg KA their study. [12] The most common sinus involved was maxillary sinus in 49 patients (70%) and least Posterior ethmoid (4.2%). 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 Sommer F et al, maxillary sinus in 58% (88%). [13] In our study frontal sinus was involved (12.8%) this is consistent with study done by Rereddy SK et al. [14] Fungal sinusitis is a chronic form of inflammation which shows complete opacification of sinus, bony erosion, and calcification with involved sinus showing higher attenuation than bacterial sinusitis. In our study 13 patients had fungal sinusitis according to CT and 9 patients according to histopathology. This is in consistency with study done by Gotlib T et al. [15] Antrochoanal polyp is an inflammatory growth with bone remodelling and sinonasal involvement. Antrochoanal polyp according to CT and histopathology were seen in 6 patients. In our

study 17 cases were diagnosed as inflammatory polyp in which sinonasal involvement. On follow up 2 cases were diagnosed as rhinosinusitis. So, the diagnostic accuracy for polyp in our study was 20% which is consistent with the study done by Yüksel A et al. [16] Mucocele is an expansile, cystic, hypo to isodense lesion with bony erosion and intraorbital extension with no contrast enhancement. Diagnostic accuracy of mucocele in our study was 1.4% which is consistent with the study done by Nikolova S et al. [17] Angiofibroma is locally invasive neoplasm arising from pterygopalatine fossa causing progressive destruction of surrounding structures, bony erosion and show homogenous enhancement on CECT. In our study 1 cases were diagnosed angiofibroma all of which showed involvement of the pterygopalatine fossa and is consistent with the study of Kim SH et al. [18] Inverted Papilloma is primary benign lesion of nasal cavity and paranasal sinuses, which showed mass in the nasal cavity with opacification of sinus and bony erosion. Sinus computed tomography (CT) is widely performed in the imaging workup of sinusitis, but it is sometimes criticized by the surgeons for its lack of specificity. There have been studies where mucosal thickening of the paranasal sinus has been seen in up to 30% of the asymptomatic population. In addition to that, the mucosal thickening of sinuses has been reported in patients with nonspecific upper respiratory tract infection, such as the common cold and rhinorrhea. Gwaltney JR et al there have been numerous reports in surgical journals that found sinus CT findings did not correlate well with a patient's clinical symptoms, since results of sinus CT can be normal for severely symptomatic patients and abnormal for patients with minimal symptoms Arslan HH et al. [19] When the comparison 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.

#### Conclusion

CT was able to characterize the PNS diseases along with their extension. It could also delineate the bony involvement of PNS diseases. Preoperative CT enabled the surgeon to visualize the drainage pathways, anatomical and critical variants in PNSs thus allowing effective management of the patient. However, a potential pitfall was its inability to accurately differentiate in cases of fungal sinusitis and high-density secretions. CT may be used as gold standard imaging modality for evaluating the PNS diseases.

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