



Study of Paranasal Sinus Diseases with Computed Tomography

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Abstract

Aims and Objectives

1. To study the diseases of PNS.
2. To correlate the Clinical diagnosis with CT diagnosis.
3. To assess the reliability of CT for early diagnosis of PNS pathology.

Materials and Methods: A total of 50 patients (both Male and Female) with clinically suspected paranasal sinus diseases were selected from Department of Radiology. CT scan is an excellent tool as it can accurately diagnose and differentiate benign and malignant lesions and can describe the masses in terms of their origin, extension and nature. The objective of the present study is to accurately diagnose the diseases of PNS and to correlate with histopathological study.

Result: CT diagnosis had higher sensitivity, specificity, positive predictive value and negative predictive value in diagnosing anatomic variants of PNS, chronic sinusitis, sinonasal polyps, and other lesions in comparison to clinical diagnosis. However, sensitivity of CT was not so high in diagnosing fungal sinusitis as seen with other

lesions. But involvement of the bone by PNS lesions was always demonstrated by the CT, which is the standard imaging modality to demonstrate it accurately.

Conclusion: Pathological conditions of PNS are common and have a varied presentation in all the age groups. These are difficult to diagnose accurately on conventional plain films. CT imaging provides detailed information regarding involvement, location, extent of paranasal sinus diseases accurately and is an excellent alternative to standard radiographs.

Keywords: Paranasal Sinus, CT Diagnosis, Negative Predictive Value, CT Imaging

Introduction

Diseases of the Paranasal 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) and magnetic resonance imaging (MRI).

CT has replaced conventional radiographs as imaging modality of choice for assessment of PNS diseases. CT plays an important diagnostic role in patients with sinonasal 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.

CT excels over MRI at evaluating fine bone details, assessment of fibro- osseous lesions of PNS and sino-facial trauma.

CT determines the distribution and extent of disease and detect those anatomic variations (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 the morbidity and mortality of patients. Now with the unique ability of CT to image both the bones and soft tissues, direct coronal scanning and sagittal reconstruction, imaging the space occupying lesions has been revolutionalised. It is now mandatory and a medico legal requirement to evaluate PNS and nose before FESS, as this provides a “ROAD MAP” to guide the otolaryngologist during surgery and serves to direct the surgical approach.

Hence CT has immense value and offers standard imaging of paranasal sinus diseases.

Inclusion criteria

The study includes:

1. Clinically confirmed patients of PNS diseases like sinusitis, infection, neoplasm.
2. Patients of all ages and both sexes.

Exclusion criteria

The study excludes:

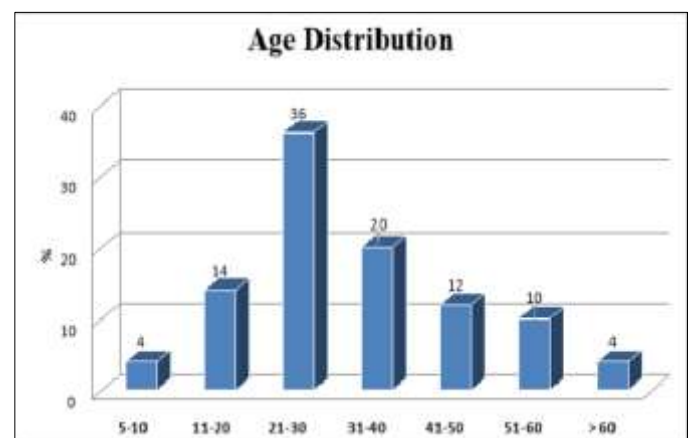
1. Pregnant women.

Age wise distribution of patients

Table 1:

| Age in years | Number (n=50) | | | Percentage |
|--------------|---------------|-------|-------|------------|
| | Females | Males | Total | |
| 5 - <10 | 1 | 1 | 2 | 4% |
| 11 - <20 | 5 | 2 | 7 | 14% |
| 21 - <30 | 10 | 8 | 18 | 36% |
| 31 - <40 | 6 | 4 | 10 | 20% |
| 41 - <50 | 5 | 1 | 6 | 12% |
| 51 - <60 | 3 | 2 | 5 | 10% |
| > 60 | 1 | 1 | 2 | 4% |

Graph 1:



Maximum numbers of patients from the age-group 21-30 years i.e. 36% followed by 31-40 years i.e. 20%. Whereas minimum age was 8 years and maximum age was 72 years. The average age of patients was observed as 32.84 years with standard deviation of 14.85 years.

Histopathological Reports:

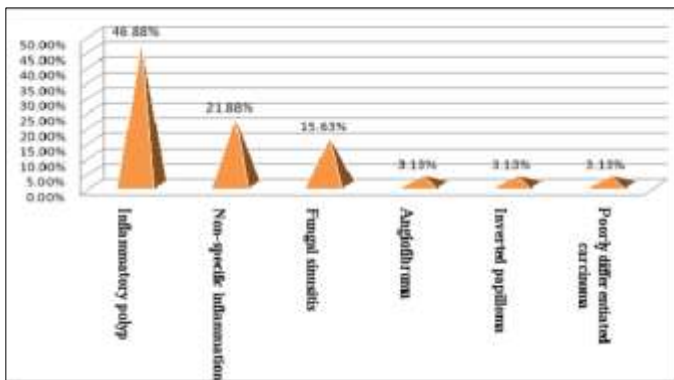
Table 2:

| Histopathological report | Number (n=50) | Percentage |
|---------------------------|---------------|------------|
| Inflammatory polyp | 15 | 46.88% |
| Non-specific inflammation | 7 | 21.88% |
| Fungal sinusitis | 5 | 15.63% |
| Angiofibroma | 1 | 3.13% |
| Inverted papilloma | 1 | 3.13% |

| | | |
|---------------------------------|---|-------|
| Poorly differentiated carcinoma | 1 | 3.13% |
|---------------------------------|---|-------|

Out of 50 patients, biopsy of 30 patients were sent for histopathological examination. Inflammatory polyps were most common (46.88%) followed by nonspecific inflammation (21.88%).

Graph 2:



Comparison of findings of Clinical, CT and final diagnosis:

Table 3:

| Findings | Clinical | | CT | | Final diagnosis | |
|-------------------|----------|--------|----|--------|-----------------|--------|
| | No | % | No | % | No | % |
| Chronic Sinusitis | 43 | 86.00% | 26 | 52.00% | 25 | 50.00% |
| Polyp | 4 | 8.00% | 15 | 30.00% | 15 | 30.00% |
| Fungal sinusitis | 1 | 2.00% | 4 | 8.00% | 5 | 10.00% |
| Others | 2 | 4.00% | 5 | 10.00% | 5 | 10.00% |

Graph 3:

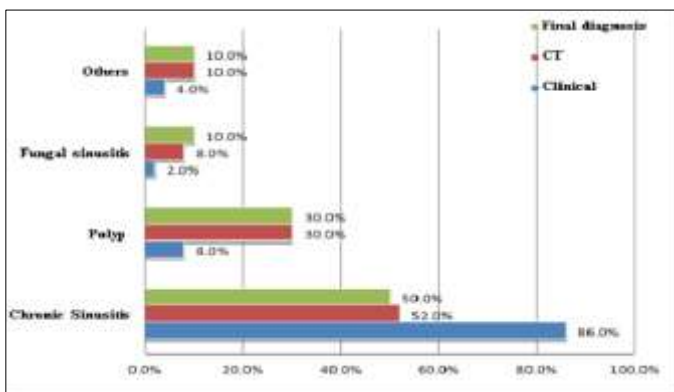
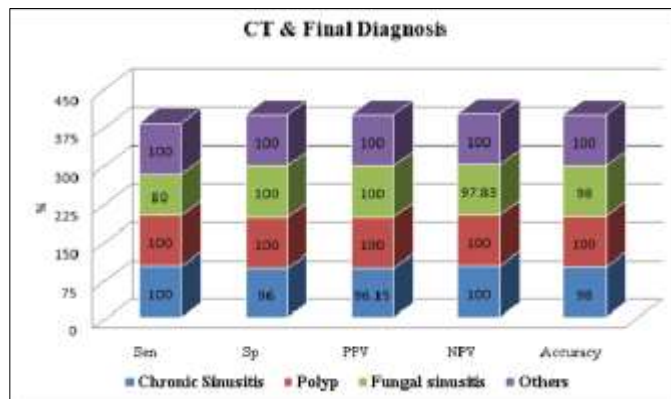


Table 4: Correlation of CT with Final Diagnosis:

| Parameters | Sensitivity | Specificity | PPV | NPV | Accuracy | P-value |
|-------------------|-------------|-------------|------|------|----------|---------|
| Chronic Sinusitis | 100% | 96% | 96% | 100% | 98% | <0.001 |
| Polyp | 100% | 100% | 100% | 100% | 100% | <0.001 |
| Fungal sinusitis | 80% | 100% | 100% | 98% | 98% | <0.001 |
| Others | 100% | 100% | 100% | 100% | 100% | <0.001 |

Graph 4: Correlation of CT with Final Diagnosis:



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 endoscopic/FESS findings.

CT and Endoscopy/FESS correlation

Endoscopic findings were almost all correlated with CT findings except in fungal sinusitis. The findings of CT were similar to endoscopy/FESS findings in 47(97.92%) of patients and different in 1(2.08%) 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%.

Clinical and Final diagnosis

On correlating clinical diagnosis with final diagnosis, chronic sinusitis has 100% sensitivity but only 28% specificity with accuracy of 64%. Polyps has sensitivity of 27% and specificity of 100% with accuracy of 78%. For fungal sinusitis the sensitivity was only 20%, which was very poor. In diagnosing benign and malignant

lesions of PNS was also difficult which had sensitivity of only 40%.

CT and Final diagnosis

On correlating CT diagnosis with final diagnosis, chronic sinusitis has 100% sensitivity and 96% specificity. Polyps have sensitivity of 100% and specificity of 100%. Again for fungal sinusitis CT has lower sensitivity of 80% and specificity of 100%.

For diagnosing benign and malignant lesions CT has 100% sensitivity, specificity, positive predictive value and negative predictive value with 100% accuracy.

P value in all instances was < 0.05 i.e. < 0.01 , indicating the significance of the findings.

Greatest pitfall in diagnosis of PNS diseases by CT is the fungal sinusitis. In this study 5 patients were studied among which 4 (80%) were diagnosed correctly and others were not diagnosed on CT. The sensitivity was 80% and specificity was 100% for CT to diagnose fungal sinusitis.

Figure 1: Chronic Sinusitis

Chronic Sinusitis Inflammatory mucosal thickening noted in bilateral maxillary sinus right $>$ left mucosal thickening noted in bilateral maxillary sinus right $>$ left with multiple foci of calcification within it.



Figure 2: Fungal Sinusitis

Soft tissue attenuation area in bilateral frontal, ethmoidal, maxillary and sphenoidal sinuses extending into nasal cavity with hyperdense area within it and smooth bony erosion of medial walls of bilateral maxillary sinuses, nasal septum, right perpendicular plate of ethmoid, nasal turbinates, medial wall of bilateral orbit, cribriform plate of ethmoid...features s/o fungal sinusitis. bilateral orbit, cribriform plate of ethmoid features s/o fungal sinusitis. bilateral orbit, cribriform plate of ethmoid...features s/o fungal sinusitis.

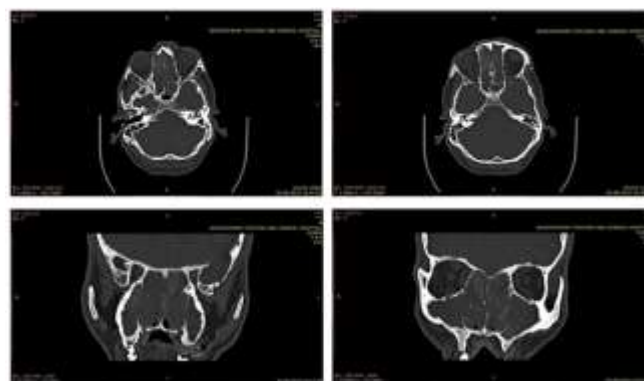


Figure 3: Antchoanal Polyp:

Mucosal thickening seen involving left maxillary, frontal, left ethmoidal and bilateral sphenoidal sinus extending into left nasal cavity and nasopharynx with obliteration and widening of left osteomeatal complex features s/o Antchoanal Polyp.



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