e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2022; 12(12); 79-87

Original Research Article

# Comparative Study Computed Tomography Scan And Diagnostic Nasal Endoscopy With Histopathology In Sinonasal Tumours

**Ingita Bhardwaj[1], Vivek Harkare[2], Sonali Khaddakar[3], Priyank Sharma[4]**

[1]Resident, Department of ENT, NKP Salve Medical College, Nagpur
[2]MS (ENT), DNB (ENT), Professor and HOD, Department of ENT, NKP Salve Medical College, Nagpur
[3]Senior Resident, DORL, Department of ENT, NKP Salve Medical College, Nagpur
[4]Medical Officer Balak Ram Hospital Timarpur North MCD

**Received: 19-10-2022 / Revised: 18-11-2022 / Accepted: 09-12-2022**
**Corresponding author: Dr Ingita Bhardwaj**
**Conflict of interest: Nil**

**Abstract**

**Introduction:** Various sinonasal tumours may mimic a simple nasal mass and their extent cannot be determined by mere clinical examination for that investigations like Diagnostic nasal endoscopy (DNE) and computed tomography (CT) scan are required which help to know the extent into the inaccessible areas and to make a provisional diagnosis and histopathological examination (HPE) is required for making a confirmatory diagnosis.

**Aim:** To study and compare the findings of DNE and CT scan with histopathology in sinonasal tumours.

**Materials and Methods**: The study took place from November 2016 to October 2018, every consecutive patient having sinonasal mass was included in the study and those having congenital sinonasal masses or previous history of surgeries were excluded then patients were subjected to investigations like DNE and CT Scan and a provisional diagnosis was made after which HPE was done to reach to the final conclusion.

**Results:** On DNE, CT scan and HPE highest number of cases belonged to non-neoplastic inflammatory category which was 63.89%, 68.66 % and 58.33% respectively. Performance statistics of differentiating DNE with histopathology showed that there was a good agreement between DNE and histopathology in differentiating neoplastic and non-neoplastic lesions and a moderate agreement in differentiating neoplastic malignant from other sinonasal tumours. Performance statistics of differentiating CT with histopathology showed a very good agreement between CT and HPE in differentiating Neoplastic from non-neoplastic lesions and a very good agreement between CT and HPE in differentiating neoplastic malignant lesions from other sinonasal tumours.

**Conclusion:** Diagnostic nasal endoscopy and CT both have high accuracy in differentiating neoplastic tumours from non-neoplastic tumours but are not 100% accurate. Diagnostic nasal endoscopy and CT both have high accuracy in differentiating neoplastic malignant tumours from other sinonasal tumours but are not 100% accurate. In diagnosing sinonasal tumours histopathological examination is essential neither CT nor DNE can give a final diagnosis. Both CT and DNE should be done to know the exact pathology and extent of disease.

**Keywords:** diagnostic nasal endoscopy, computed tomography scan, histopathology, sinonasal tumours



## Introduction

The nasal cavity, paranasal sinuses are collectively called sinonasal tract and it forms a complex system of upper respiratory tract .Various sinonasal tumours ranging from non-neoplastic lesions to malignant lesions may mimic a simple nasal mass. These conditions pose significant problems in management due to their late presentation and juxtaposition to important anatomical structures such as eye and brain. Sinonasal tract is exposed to various infective agents, chemicals, antigens, mechanical and many other influences. These deleterious exposures can lead to formation of tumour like and neoplastic conditions. [1] With increase in industrialisation and increase in burning of additional fossil fuels and raising air pollution rates there is increasing incidence of sinonasal tumours. [2]

Tests like diagnostic nasal endoscopy (DNE) and computed tomography (CT) scan of nose and paranasal sinuses have opened new vistas in peeping into inaccessible areas and niches of frontoethmoid complex, sphenoethmoidal recess and sphenoid sinus and all the anatomical variations that are not detected clinically can be picked up and one can reach to the presumptive diagnosis. Histopathologic examination is necessary to decide the nature of lesion for final diagnosis. With endoscope surgeon gets to see the precise anatomy with angled, illuminated and magnified viewing. As an added benefit an attached camera can provide a photographic demonstration to patient and create documentation for permanent record. [7]

Coronal CT 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 are better seen on axial images. The CT scan proved to be an excellent imaging tool as it can accurately diagnose and differentiate benign and malignant lesions it can describe the masses in terms of their origin, nature, extension, and involvement. It can provide a road map to direct the surgical approach to surgeon. DNE is more sensitive than CT for evaluation of accessible disease and provides valuable information regarding persistent asymptomatic disease post operatively. [3] Their was 90% correlation between DNE and CT examination when combined together than either of them used alone. [4]

The presenting features, symptomatology, DNE and CT scan helps to reach provisional diagnosis but histopathological examination remains the mainstay of final diagnosis. Due to variety of histopathological types and grades of malignancies it is important to study their pathological aspects coupled with radiological and clinical techniques. Histopathology has become indispensable in timely diagnosis and treatment of these lesions. Hence, present study was performed to study and compare DNE and CT of paranasal sinuses findings with histopathology in sinonasal tumours.

## Material and methods

It was a descriptive study held in Department of ENT at a tertiary Health Care Hospital of Central India for 2 years from November 2016 to October 2018. As

this was a time bound study every consecutive patient of Sinonasal tumours attending ENT OPD during the study period were included in the study (n=72). Patients with sinonasal tumour having history of previous surgery, those refusing to undergo either incisional or excisional biopsy or having congenital sinonasal tumours were excluded from the study. Cases selected for study were subjected to a detailed history and clinical examination of ear, nose, and throat. Cases were subjected to routine biochemical and haematological evaluation then DNE was done by three pass technique and CT scan (axial or coronal section) was done to evaluate the extent of tumour bony and tissue invasion. Incisional/ Excisional biopsy was taken under required anaesthesia and sent for HPE. After acquiring the PAC fitness, these patients were subjected to definitive surgery.

### Statistical analysis

The statistical analysis was done by using percentages, Mean, S.D, Median, sensitivity, specificity, PPV, NPV, Diagnostic accuracy and Kappa statistics. It was done by using EPI info software version T. Level of significance was assessed at 5%. Kappa Statistics-Values of Kappa can range from -1.0 to 1.0, with -1.0 indicating perfect disagreement below chance 0.0 indicating agreement equal to chance, and 1.0 indicating perfect agreement above chance. A rule of thumb is that a kappa of 0.7 or above indicates adequate interrater agreement.

| Value of K | Strength of agreement |
|---|---|
| 0-0.2 | Poor |
| 0.21-0.4 | Fair |
| 0.41-0.6 | Moderate |
| 0.61-0.8 | Good |
| 0.81-<1 | Very good |
| 1 | Perfect |

## Results

Figure 1 shows that on DNE a provisional diagnosis was made among the inflammatory lesions 22 cases were sinusitis with polyp, 20 cases were AC polyp and 4 cases were fungal sinusitis with polyposis. Among the granulomatous lesions 2 cases were of rhinoscleroma and 4 were of rhinosporidiosis. Among the neoplastic-benign lesions 8 cases were of inverted papiloma, 4 were benign nasal mass and 5 of them were haemangioma. Among the neoplastic malignant lesions 2 were carcinoma of maxilla, 1 was malignant sinonasal mass.

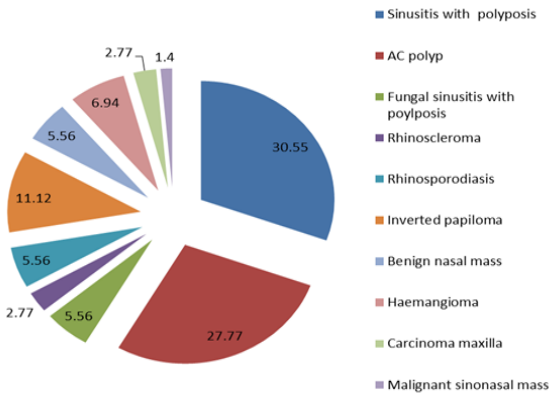


**Figure 1: Provisional diagnosis on DNE**

Table 1 shows distribution of cases according to the diagnosis made on CT Scan . Five cases of haemangioma had limited disease and their extent could be clearly seen clinically and endoscopically in them CT scan was not done to avoid radiation exposure and cost burden. Hence total cases were 67. Among the inflammatory lesions 18 cases were sinusitis with polyp, 20 cases were AC polyp and 8 cases were fungal sinusitis with poylposis. Non neoplastic benign lesions were 6 in number. Among the neoplastic benign lesions 4 cases were inverted papilloma and 6 cases were of benign nasal mass. Among the neoplastic malignant lesions 1 case was diagnosed as chondrosarcoma, 2 cases as carcinoma maxilla, 1 case as malignant tumour of ethmoid, 1 case is malignant sinonasal mass (Table 1).

**Table 1: Distribution of sinonasal tumours on CT scan**

| Diagnosis | Frequency | Percentage |
|---|---|---|
| Inflammatory | 46 | 68.65 |
| Sinusitis with polyp | 18 | 26.86 |
| AC polyp | 20 | 29.80 |
| Fungal sinusitis with poylposis | 8 | 11.94 |
| Non neoplastic benign | 6 | 8.95 |
| Neoplastic- Benign | 10 | 13.88 |
| Inverted papilloma | 4 | 6.00 |
| Benign nasal mass | 6 | 8.95 |
| Neoplastic-Malignant | 5 | 7.46 |
| Chondro sarcoma | 1 | 1.50 |
| Carcinoma maxilla | 2 | 3.00 |
| Malignant tumour ethmoid | 1 | 1.50 |
| Malignant sinonasal mass | 1 | 1.50 |
| Total | 67 | 100 |

Table 2 signifies that Out of total 48 non-neoplastic lesions on HPE majority of cases were inflammatory polyp 34(70.8%). Number of cases of Fungal sinusitis with polyp, rhinosporidiosis, rhinoscleroma were 8(16.7%), 4(8.33%) and 2(4.16%) respectively (Table 2).

**Table 2: Non-neoplastic tumours on HPE**

| Diagnosis | Frequency | Percentage |
|---|---|---|
| Inflammatory Polyps | 34 | 70.8% |
| Fungal Sinusitis with polyp | 8 | 16.7% |
| Rhinosporidiosis | 4 | 8.33% |
| Rhinoscleroma | 2 | 4.16% |
| Total | 48 | 100% |

3rd table shows that majority of cases were of Inverted papilloma 10 (58.82%). Capillary haemangioma was seen in 3 (17.64%), Cavernous haemangioma was in 2(11.6%) and chondroblastoma and Osteoblastoma in 1 (5.88%) each (table 3).

**Table 3: Neoplastic benign tumours on HPE**

| Diagnosis | Frequency | Percentage |
|---|---|---|
| Inverted Papilloma | 10 | 58.82% |
| Capillary Haemangioma | 3 | 17.64% |
| Cavernous Haemangioma | 2 | 11.76% |
| Chondroblastoma | 1 | 5.88% |
| Osteoblastoma | 1 | 5.88% |
| Total | 17 | 100% |

Out of total 7 neoplastic malignant lesions 1 (14.28%) case of each was of chondroblastic osteosarcoma, mucoepidermoid carcinoma and Adenocarcinoma. 2 (28.57%) cases each were of Squamous cell carcinoma of maxilla and Sinonasal Squamous cell carcinoma (Table 4).

**Table 4: Neoplastic malignant tumours on HPE**

| Diagnosis | Frequency | Percentage |
|---|---|---|
| Chondroblastic osteosarcoma | 1 | 14.28% |
| Mucoepidermoid carcinoma | 1 | 14.28% |
| SCC maxilla | 2 | 28.57% |
| Sinonasal SCC | 2 | 28.57% |
| Adenocarcinoma | 1 | 14.28% |
| Total | 7 | 100% |

Table 5 shows that on DNE 63.89% cases were having inflammatory lesions, 8.33% were having Granulomatous lesions a total of 72.22% of cases had non-neoplastic lesions 23.61% were having benign lesions and 4.17% were having malignant lesions. Based on CT scans 68.66% cases were having inflammatory lesions, 8.96% were having non-neoplastic benign lesions, a total of 77.61% of cases had non neoplastic lesions. 14.93% were having benign lesions and 7.46% were having malignant lesions. Based on Histopathology, 58.33% were having inflammatory lesions, 8.33% were having granulomatous lesions a total of 66.66% of cases had non-neoplastic lesions.23.61% were having benign lesions and 9.72% were malignant on histopathology.

**Table 5: Distribution of cases according to DNE, CT Scan and HPE**

| Diagnostic modality | Non neoplastic | | | | | | Neoplastic | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Inflammatory | | Granulomatous[#] | | Total | | Benign | | Malignant | |
| | (N) | (%) | (N) | (%) | (N) | (%) | (N) | (%) | (N) | (%0 |
| DNE(n=72) | 46 | 63.89 | 6 | 8.33 | 52 | 72.22 | 17 | 23.61 | 3 | 4.17 |
| CT Scan (n=67)[#] | 46 | 68.66 | 6 | 8.96 | 52 | 77.61 | 10 | 14.93 | 5 | 7.46 |
| Histopathology (n=72) | 42 | 58.33 | 6 | 8.33 | 48 | 66.66 | 17 | 23.61 | 7 | 9.72 |

For CT scan non-neoplastic benign CT was not done in haemangioma cases (N=67)

As shown in table 6a the sensitivity, specificity, positive predictive value and negative predictive value of DNE in differentiating neoplastic lesions from non-neoplastic lesions in comparison to histopathology were 83.33%, 100%, 100 %and 92.31%. Diagnostic accuracy of DNE in differentiating neoplastic lesions from non-neoplastic lesions in comparison to histopathology was 94.44% respectively. Kappa coefficient is 0.896 which shows a very good agreement between DNE and HPE to differentiate neoplastic from non-neoplastic lesions.

**Table 6a: Performance statistics of DNE with histopathology in differentiating neoplastic and non-neoplastic lesions**

| Type of lesion | | HPE | | Total |
|---|---|---|---|---|
| | | **Neoplastic** | **Non neoplastic** | |
| **DNE** | **Non neoplastic** | 20 | 0 | 20 |
| | **Neoplastic** | 4 | 48 | 52 |
| Total | | 24 | 48 | 72 |

| **Parameter** | **Estimate** | **Lower - Upper 95% CIs** |
|---|---|---|
| **Sensitivity** | 83.33% | (64.15, 93.32[1] ) |
| **Specificity** | 100% | (92.59, 100[1] ) |
| **Positive Predictive Value** | 100% | (83.89, 100[1] ) |
| **Negative Predictive Value** | 92.31% | (81.83, 96.97[1] ) |
| **Diagnostic Accuracy** | 94.44% | (86.57, 97.82[1] ) |
| **Cohen's kappa (Unweighted)** | 0.8696 | (0.6406 - 1.099) |

As shown in Table 6b the sensitivity, specificity, positive predictive value and negative predictive value of DNE in differentiating malignant lesions from other sinonasal tumours in comparison to Histopathology were 42.5%, 100%, 100% and 94%. Diagnostic accuracy of DNE in differentiating malignant lesions from other sinonasal tumours in comparison to Histopathology was 94.44%respectively. Kappa coefficient is 0.5752 which shows moderate agreement between DNE and HPE.

**Table 6b: Performance of DNE in comparison to Histopathological Diagnosis for differentiating Neoplastic Malignant Lesion from other sinonasal tumours**

| Type of lesion | | HPE | | Total |
|---|---|---|---|---|
| | | Neoplastic malignant | Other Sinonasal tumours | |
| DNE | Neo plastic malignant | 3 | 0 | 3 |
| | Other Sinonasal tumours | 4 | 65 | 69 |
| Total | | 7 | 65 | 72 |

| Parameter | Estimate | Lower - Upper 95% CIs |
|---|---|---|
| Sensitivity | 42.5% | (15.82, 74.95[1] ) |
| Specificity | 100% | (94.42, 100[1] ) |
| Positive Predictive Value | 100% | (43.85, 100[1] ) |
| Negative Predictive Value | 94% | (86.02, 97.72[1] ) |
| Diagnostic Accuracy | 94.44% | (86.57, 97.82[1] ) |
| Cohen's kappa (Unweighted) | 0.5752 | (0.3661 - 0.7843) |

As shown in Table 7a, the sensitivity, specificity, Positive predictive value and Negative predictive value of CT in differentiating malignant lesions from other sinonasal tumours in comparison to Histopathology were 78.95%, 100%, 100% and 92.3%. Diagnostic accuracy of CT in differentiating malignant lesions from other sinonasal tumours in comparison to Histopathology was 94.03% respectively. Kappa coefficient is 0.84 which shows a very good agreement between CT and HPE in differentiating Neoplastic from non-neoplastic lesions.

**Table 7a: Performance statistics of CT scan with histopathology in differentiating neoplastic and non-neoplastic lesions (N=67)**

| Type Of Lesion | | HPE | | Total |
|---|---|---|---|---|
| | | Neoplastic | Non neoplastic | |
| CT | Neoplastic | 15 | 0 | 15 |
| | Non neoplastic | 4 | 48 | 52 |
| Total | | 19 | 48 | 67 |

| Parameter | Estimate | Lower - Upper 95% CIs |
|---|---|---|
| Sensitivity | 78.95% | (56.67, 91.49[1] ) |
| Specificity | 100% | (92.59, 100[1] ) |
| Positive Predictive Value | 100% | (79.61, 100[1] ) |
| Negative Predictive Value | 92.31% | (81.83, 96.97[1] ) |
| Diagnostic Accuracy | 94.03% | (85.63, 97.65[1] ) |
| Cohen's kappa (Unweighted) | 0.8431 | (0.6066 - 1.08) |

As shown in Table 7b the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of CT in differentiating neoplastic malignant and other sinonasl tumours in comparison to histopathology were 71.43%, 100%, 100% and 96.77%. Diagnostic accuracy of CT in differentiating neoplastic malignat from other sinonasal tumours in comparison to histopathology was 97.01% respectively. Kappa coefficient is 0.81 that shows a very good agreement between CT and HPE in differentiating neoplastic malignant lesions from other sinonasal tumours.

**Table 7b: Performance statistics of CT scan in comparison to histopathology in diagnosing Neoplastic Malignant lesions from other Sinonasal Tumours**

| Type Of Lesion | | HPE | | Total |
|---|---|---|---|---|
| | | Neoplastic malignant | Other Sinonasal tumours | |
| CT | Neoplastic malignant | 5 | 0 | 5 |
| | Other Sinonasal tumours | 2 | 60 | 62 |
| Total | | 7 | 60 | 67 |

| Parameter | Estimate | Lower - Upper 95% CIs |
|---|---|---|
| Sensitivity | 71.43% | (35.89, 91.78[1] ) |
| Specificity | 100% | (93.98, 100[1] ) |
| Positive Predictive Value | 100% | (56.55, 100[1] ) |
| Negative Predictive Value | 96.77% | (88.98, 99.11[1] ) |
| Diagnostic Accuracy | 97.01% | (89.75, 99.18[1] ) |
| Cohen's kappa (Unweighted) | 0.8174 | (0.582 - 1.053) |

**Discussion**

**Table 8: Distribution of sinonasal tumours according to type of lesion in various studies**

| Study | Non neoplastic | Neoplastic Benign | Neoplastic Malignant |
|---|---|---|---|
| Rawat DS et al[5] | 68.56% | 22.72% | 8.71% |
| Maheshwari A et al[6] | 66.25% | 13.75% | 20% |
| Majumdar A et al [7] | 68.34% | 24.46% | 7.19% |
| Present Study | 66.67% | 23.61% | 9.72% |

In all the studies it has been found that non-neoplastic lesion which includes inflammatory polyps, fungal sinusitis and granulomatous disease has the majority of cases which is similar to the findings in our study. Our findings are almost similar to the findings of Maheshwari A et al[6] i.e. 66.25% In present study it was followed by neoplastic benign lesions and least number of cases were in neoplastic malignant category which are in agreement with all the studies, in contrast Maheshwari A et al [6] study found neoplastic malignant sinonasal tumours more common than neoplastic benign lesions. In the study of Rawat DS et al [5] and Majumdar A et al [7] neoplastic benign lesions were 22.72% and 24.46% respectively which were similar to the findings of present study (23.61%).In the study of Rawat DS et al [5] and Majumdar A et al [7] neoplastic malignant lesions were 8.71% and 7.19% respectively which were similar to the findings of present study (9.72%).

**Table 9: Perfomance statistics of CT scan with histopathology for differentiating neoplastic tumours from other non-neoplastic Sinonasal tumours**

| Study | Sensitivity | Specificity | PPV | NPV | Accuracy |
|---|---|---|---|---|---|
| Vaghela K et al[8] N=100 | 100% | 96.3% | 68.7% | 100% | _ |
| Kanwar SS et al[9] N=91 | 100% | 97.7% | 66.6% | 100% | _ |
| Present study N=67* | 78.95% | 100% | 100% | 92.31% | 94.03 |

*CT Scan was not done in 5 cases of haemangioma

In present study the sensitivity of CT scan with Histopathology in order to determine the neoplastic lesions was 78.95 % which is lower than Vaghela K et al [8] and Kanwar SS et al [9] studies which is 100%.

Specificity of present study was 100% is almost equal to Vaghela K et al [8] (96.3%) and Kanwar SS et al [9] (97.7%) In Kanwar Set al [9] and Vaghela K et al [8] study PPV was lower (66.66%) and (68.7%) than 100% in our study.NPV of present study 92.31% is in agreement with value of Kanwar SS [9] et al and Vaghela et al [8] study i.e 100%.

**Table 10: Performance statistics of CT scan with histopathology for differentiating Neoplastic malignant lesions from other Sinonasal Tumours**

| Study | Sensitivity | Specificity | PPV | NPV | Accuracy |
|---|---|---|---|---|---|
| Islam T et al [10] N=76 | 93.3 | 96.7 | 87.5 | 98.3 | 96.1 |
| Present study, N=67* | 71.43 | 100 | 100 | 96.77 | 97.01 |

*CT Scan was not done in 5 cases of haemangioma

In the study conducted by Islam T et al [10] sensitivity and negative predictive value for differentiating neoplastic malignant lesions from other sinonasal tumours was more than present study. Specificity and positive predictive value were less than the present study. Diagnostic accuracy is almost equal for both the studies. To our knowledge and after review of literature no work has been found on comparison DNE with HPE in diagnosis of Sinonasal tumours. In our study sensitivity, specificity, positive predictive value and negative predictive value of DNE to differentiate neoplastic lesions from non-neoplastic sinonasal tumours was 83.33%, 100%, 100%, 92.31% respectively. Diagnostic accuracy was found to be 94.44% in comparison with HPE. In our study sensitivity, specificity, positive predictive value and negative predictive value of DNE to differentiate neoplastic malignant lesions from other sinonasal tumours was 42.5%, 100%, 100% and 94% respectively. Diagnostic accuracy

was found to be 94.44% in comparison with HPE. So DNE can be used as a good diagnostic tool to plan for the management of Sinonasal tumours.

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