Observational Study

Computed tomographic evaluation of sinonasal masses

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To determine the Computed Tomographic (CT) characteristics of various sinonasal mass lesions. To study about the nature, location and extent of various sinonasal masses. Forty cases of different age groups of either sex, who had sinonasal lesions on the CT scan, were studied in detail. Out of the studied 40 cases under 80 years of age, 28 were male and 12 female. Maximum cases were in the age range of 21-50 years ie, 26 cases (65%). Most of the patients presented with multiple symptoms (82.5%). The most common symptoms were nasal obstruction (80%) followed by nasal discharge (62.5%). The most common lesions were that of inflammatory origin constituting 22 (55%) cases followed by neoplastic masses in 17(42.5%) cases. Polyps were the most common inflammatory sinonasal masses seen in 9 (40.9%) cases. Malignant sinonasal masses were found to be more common than benign ones. Squamous cell carcinoma was the commonest primary malignancy with 8 (72.7%) cases. Maxillary sinus was the most commonly involved sinus being equally affected by both, inflammatory and neoplastic lesions. Involvement of contiguous structures was commonly seen with malignant neoplasms and fungal sinusitis. The overall accuracy of CT in diagnosing sinonasal masses was 73.5%.

[*J Indian Med Assoc* 2018; **116:** 25-7 & 32]

***Key words* : Computed tomography, sinonasal masses.**

The sinonasal cavity extends from the nostrils to the posterior nasal septum ending posteriorly in the nasopharynx. Four aerated paranasal sinuses: maxillary, ethmoid, frontal and sphenoid surround the nasal cavity. The presence of a mass in the nose and paranasal sinuses may seem to be a simple problem; however it raises many questions about the differential diagnosis. They can be either congenital, inflammatory or neoplastic and can be evaluated with X-rays, CT and MRI (Fig 1).

Plain radiographics are of little value for sinonasal evaluation as sinuses are obscured by overlying structures. CT enables clear understanding of sinonasal anatomy and anatomic variants thus it is an important preoperative test and also complementary in the diagnosis and treatment of nasal cavity and paranasal sinus diseases. CT scan with its unique ability to image both bones and soft tissues with multiplanar reconstructions has reliably increased the accuracy of defining the cause and extent of both inflammatory and neoplastic diseases of the sinonasal cavities. The introduction of Spiral CT and Multidetector CT has revolutionized the diagnostic aspects of sinonasal masses. Hence, for evaluating sinonasal masses by CT scan, the present study was undertaken.

MATERIALS AND METHODS

This prospective cross-sectional study of 40 patients

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was carried out in the Department of Radio-diagnosis, VSS Medical College, Burla. Patients referred to the department of Radiodiagnosis presenting with history and clinical features suggestive of sinonasal mass were evaluated with CT. In 40 cases of different age groups of either sex, who had sinonasal lesions on the CT scan, were studied in detail. Patients with no sol in CT were ruled out from the study. The cases selected for the study were subjected to detailed history, relevant clinical examination and required laboratory investigations. The patients were examined with Siemens Somatom Emotion single slice spiral CT machine. Sections were taken extending from frontal sinuses to include the posterior nasal soft tissues anterior to the cervical spine in the coronal plane and in axial sections extending from the alveolar ridge up to and including the frontal sinus (2mm thick slice at 3mm interval with 1.5 mm reconstructions in both axial and coronal planes). Non-ionic contrast (Ultravist/ 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 IV contrast was administered. The cases were followed up with their histopathological results.

OBSERVATIONS

The study was carried out on 40 patients under 80 years of age comprised 28 male and 12 female. The main bulk of cases was in the age range of 21-50 years with 26 cases (65%). The overall male to female sex ratio was 2.3 : 1.

Most of the patients presented with multiple symptoms

Rhinosporidiosis **Sinonasal Fibrous Dysplasia** **Sinonasal Chondrosarcoma** **Sinonasal Inverted Papilloma** **Sinonasal Adenocarcinoma**
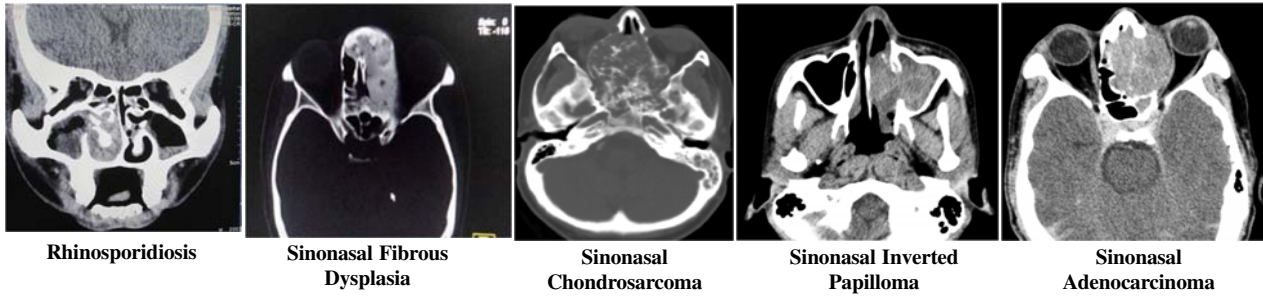
Fig 1 — Showing X-rays, CT and MRI

(82.5%). The most common symptoms were nasal obstruction (80%) followed by nasal discharge (62.5%) as shown in Table 1.

The most common lesions were that of inflammatory origin constituting 22(55%) cases followed by neoplastic masses in 17(42.5%) cases. Only one case of congenital sinonasal mass was found which was a case of nasal dermoid.

Polyps were the most common inflammatory sinonasal masses seen in 9(40.9%) cases . It was followed by fungal sinusitis with 6(27.2%) cases, mucous retentetion cyst and mucocele with 3(13.7%) cases each and a single case of rhinosporidiosis (4.5%).

Malignant sinonasal masses (64.7%) were found to be more common than benign ones (35.3%). The different benign and malignant sinonasal masses along with their incidence are as depicted in the Table 2. Squamous cell carcinoma was the commonest primary malignancy with 8 (72.7%) cases.

Most sinonasal masses showed involvement of multiple sinonasal regions. In our study maxillary sinus was the most commonly involved sinus (72.5%) by all types of sinonasal masses (Fig 2) except mucocele which was more frequent in frontal sinus (50%).

Involvement of contiguous structures was common with neoplastic masses and fungal sinusitis. Bony changes were most frequently observed (77.5%), of which bone destruction was the leading bony change (51.6%). Intraorbital and intracranial involvement was more common with squamous cell carcinoma and fungal infection as shown in Table 3.

The overall accuracy of CT in diagnosing sinonasal masses was 73.5%. In most of the cases, CT was able to

Table 2 — *Various neoplastic sinonasal masses*			
	Type of neoplasm	Number	Percentage
Benign	Juvenile angiofibroma	2	11.7%
	Fibrous dysplasia	1	5.9%
	Inverted papilloma	1	5.9%
	Ossifying fibroma	1	5.9%
	Osteoma	1	5.9%
Malignant	Squamous cell carcinoma	8	47%
	Adenocarcinoma	1	5.9%
	Undifferentiated carcinoma	1	5.9%
	Chondrosarcoma	1	5.9%

predict a possible histopathological diagnosis, but the final diagnosis was established after histopathological examination.

DISCUSSION

The present study was undertaken to study the usefulness of CT scan not only in identifying the lesion but also in delineating the extent of the lesion. The computed tomographic scans of 40 patients who were found to have sinonasal masses were analysed with available similar studies.

The commonest age group affected with sinonasal masses was observed to be 21-50 years (65%) which correlates with the study done by Afolabi *et al*[1]   in which they found that the maximum cases occurred in the age group of 21-50 years.

It was observed that sinonasal masses were more common in males than in females with male : female ratio of 2.3:1. This high male preponderance correlates well with the studies done by Purundare and Deorad (2:1) as well as Zafar *et al*[2] (1.7:1).

In the present study, the most common symptom was nasal obstruction (80.0%) and nasal discharge (62.5%) . These findings compare favourably with studies done by Afolabi *et al*[1] (nasal obstruction 97.4% & nasal discharge 94.7%). The multiplicity of symptoms was more commonly observed in carcinoma and fungal infections. This was mainly because of presentation at a fairly advanced stage with the involvement of the adjacent structures.

Non-neoplastic lesions (55%) outnumbered the neoplastic sinonasal lesions (45%) in the present study also

Table 1 — *Clinical Presentation of the study population*		
Clinical Symptoms	No of Patients	Percentage
Headache	17	42.5 %
Nasal obstruction	32	80 %
Nasal discharge	25	62.5%
Swelling over the face or deformity	16	40 %
Pain and tenderness over the sinuses	15	37.5 %
Epistaxis	6	15 %
Proptosis	8	20 %
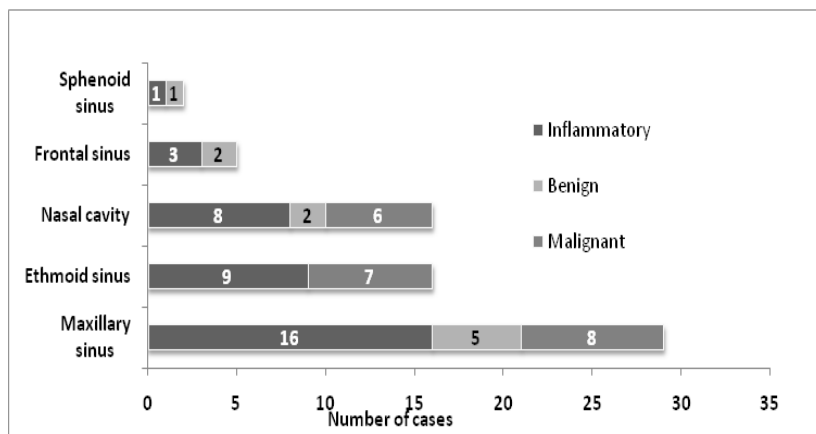
Fig. 2 — Distribution of sinonasal masses as per sinonasal cavity involved

Lesions	Bony changes				Orbital extension	Intracranial extension
	Remo-delling	Hyper-osteosis	Erosion	Destruc-tion		
Fibrous dysplasia	1	1	0	0	0	0
Mucocele	2	0	0	0	1	0
Polyps	2	0	0	0	0	0
Fungal sinusitis	0	0	1	4	2	1
Juvenile angiofibroma	1	0	1	1	0	0
Inverted papilloma	1	0	0	0	0	0
Ossifying fibroma	1	0	0	0	0	0
Squamous cell carcinoma	1	0	3	8	4	2
Adenocarcinoma	0	0	0	2	2	0
Chondrosarcoma	0	0	0	1	0	0
Total	9	1	5	16	9	3

Table 3 — *Involvement of contiguous structures by sinonasal masses*

Among the benign neoplasms seen in the present study, the most common benign sinonasal mass was juvenile angiofibroma (33.3%) which is similar to the findings by Narayan Swamy *et al*[7](26.6%). In the present study, malignant sinonasal masses exceeded benign neoplasms. Among the squamous cell carcinoma was the predominant primary malignant sinonasal tumor (72.7% cases) as also reported in the studies of SK Venkatesh[4] (71.4%).

Maxillary sinus (76.2%) was the most common type of paranasal sinus affected which is consistent with the studies of Zinreich *et al*[9] (65%) and Bolger *et al*[10] (77.7%). 38% cases also affected the nasal cavity which is consistent with the study by Lathi *et al*[3] (25% cases). The difference in incidence between the present study and other studies may be due to the variation in the number of cases taken up for study. In the present study of the neoplasms of sinonasal regions, maxillary sinus was the most common site of origin (66.7% cases), followed by lateral nasal wall (44.4% cases) which is consistent to the study by Kondo *et al*[11] which stated that 82.4% of primary malignancies of PNS originated from maxillary sinus.

Involvement of contiguous structures by sinonasal masses was commonly seen in the present study. Bony involvement was most common and the most common bony change noted was bone destruction (77.5%) followed by bony remodelling (29%). Squamous cell carcinoma was the lesion most frequently associated with bony, orbital and intracranial involvement. These findings noted in the present study correlate well with studies by Larrson *et al*[12], Holsti *et al*[13] and Bataini *et al*[14]. Although bony, orbital and intracranial extensions were less common with inflammatory sinonasal masses , yet a significant number of patients with fungal sinusitis (83%) showed bony changes and extension to contiguous structures.

The overall accuracy was found to be 68.1% in suggesting the most likely histological diagnosis. This is fairly consistent ,though less than the observation by Schneider G *et al*[15] which stated that the overall accuracy of CT in predicting sinonasal masses was 84%. The variation in accuracy may be ascribed to the variation in the number of cases studied in the present study.

CONCLUSION

CT study was able to give a precise diagnosis in most of the cases. In the rest of the cases CT helped to bring out the differential diagnosis and also the extent of the

seen in the study by Lathi *et al*[3] (71.4% nonneoplastic and 28.6% neoplastic sinonasal masses). In the present study, the commonest age group with inflammatory sinonasal masses was between 21-40 years (61.9%). This is in accordance to the study done by Lathi *et al*[3](47.5%).

Polyps were the most common inflammatory sinonasal mass noted in this study(40.9%) which is consistent with the study done by SK Venkatesh[4] (30% cases of polyp). In our study of 5 patients with PNS mucoceles, they were more common in the frontal sinus (50.0%) than in other sinuses, comparable with the study by Jashwal *et al*[5] (56.2%) and Kuczkowski J *et al*[6] (52.4%). The incidence of fungal sinusitis was found high in the present study with 6(27.2%) cases. Most patients with fungal sinusitis presented at an advanced age.

All the benign neoplasms were more common in age group between 11-20 years (30.7% cases) in the present study which correlates well with the study by Narayan Swamy *et al*[7] (36.7% cases in 11-20 years). The malignant sinonasal masses were more common in age group between 30-50 years (64% cases) in the present study which is consistent to the results of the study by Nepal *et al*[8] (77% cases in between 40-60 years of age).

mass was well depicted on CT which helped the surgeon to plan out a perfect anatomical road map for surgery. Again CT was helpful in detecting the associated complication of all the lesions which otherwise was not detected. Thus CT is now considered mandatory in the diagnostic evaluation of sinonasal masses and planning better management.

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