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Radiological Evaluation of Malignant Paranasal Sinus Masses

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ABSTRACT

Histologically, a squamous cell carcinoma can be recognized as infiltrating broad bands, nested islands or small clusters of malignant cells which have a variable amount of eosinophilic cytoplasm. Keratin formation within cells and between groups of cells (keratin pearls) belies the tumor's mucosal origins. History was taken from each patient followed by clinical examination. Basic investigations like routine blood examination and routine urine examination were done whenever required. Diagnosis was confirmed by characteristic imaging features of masses or post-operative histopathological reports. Follow up of the patients was done by taking details of treatment and procedures done on the patients. Most significant plain radiography finding of squamous cell carcinoma in present study was sinus pacification and bone destruction (100%) followed by nasal pacification (75%). In this study, CT showed extension of mass lesion and bone erosions in 100%, increase in sinus size in 50%, thinning and sclerosis only in 25% of cases. In this study, MRI showed extension of mass lesion into nasal cavity (100%), mass effect on adjacent structures (75%), widening of maxillary ostium (50%) and sinus expansion (50%).

INTRODUCTION

Around 25-58% of the sinonasal carcinomas arise in the maxillary antrum, 25-35% arise in the nasal cavity, 10% arise in the ethmoid complex and only 1% arise in the sphenoid and frontal sinuses. Secondary extension to the maxillary sinus is common occurring in 80% of patients with sinonasal carcinoma. A number of occupations have been epidemiologically linked to sinonasal malignancies. Workers exposed to nickel have a 40 to 250 times greater chance of developing squamous cell cancer. Coexistent Inverted papillomas, previous irradiation and immunosuppression (i.e., lack of immune surveillance) may increase the risk of developing sinonasal carcinoma. Imaging studies are not expected to establish the pathologic diagnosis[1]. Histologically, a squamous cell carcinoma can be recognized as infiltrating broad bands, nested islands or small clusters of malignant cells which have a variable amount of eosinophilic cytoplasm. Keratin formation within cells and between groups of cells (keratin pearls) belies the tumor's mucosal origins[2]. On imaging, all patients with paranasal sinus carcinoma have a primary soft-tissue sinus mass and 70-90% have evidence of bone destruction. On contrast-enhanced CT, carcinomas have a variable, but slight enhancement. On MR imaging, these tumors have an intermediate T1-weighted and a slightly higher T2-weighted signal intensity and they have variable enhancement with contrast. The characteristic imaging feature of these carcinomas is their strong tendency to destroy bone aggressively, regardless of tumor differentiation. Bone remodeling is uncommon. Perineural spread into the skull base may also occur. Such intra cranial disease is best identified with T1-weighted, fat-suppressed, contrast-enhanced images[3]. Sinonasal adenocarcinomas can be subclassified as either salivary type, intestinal-type, neuroendocrine or "other". These tumors occur primarily in males (75-90% of cases) who are between 55 and 60 years of age. Intestinal type adenocarcinoma can be classified as low, intermediate or high grade based on its architecture and cytologic grade. The imaging characteristics of these tumors are nonspecific and are indistinguishable from those of squamous cell carcinoma[4].

MATERIALS AND METHODS

It was a prospective study to assess paranasal sinus masses by X-Ray, Computed Tomography and Magnetic Resonance Imaging.

Sample Size: One hundred and two (102) subjects.

Source of Data: The main source of data for this study were the patients referred from the Departments of ENT, General Medicine, Dental and Ophthalmology with upper respiratory tract symptomatology where imaging revealed paranasal sinus masses. Informed consent was obtained from the subjects before the commencement of the investigations.

Inclusion Criteria: Patients of all age groups presenting with suspected paranasal sinus masses where imaging reveals paranasal sinus masses will be included in this study.

Exclusion Criteria:

- Previous evidence of sinonasal surgery
- All cases of trauma

Clinical Assessment: In all cases thorough history taking and physical examination were done based on the proforma attached.

History was taken from each patient followed by clinical examination. Basic investigations like routine blood examination and routine urine examination were done whenever required. Diagnosis was confirmed by characteristic imaging features of masses or post-operative histopathological reports. Follow up of the patients was done by taking details of treatment and procedures done on the patients.

RESULTS AND DISCUSSIONS

In this study, 2 cases of squamous cell carcinoma were detected, of which 50% (1/2) of the cases were in 50-60 years age group and males and females were equally affected with a male to female ratio of 1:1. The most common clinical presentation of squamous cell carcinoma was obstruction of nasal cavity (100%), followed by epistaxis (50%), nasal discharge (50%), swelling in nasal cavity (25%) and pain in cheek (25%). In this study, squamous cell carcinoma was involving the maxillary sinus with extension into adjacent structures. Most significant plain radiography finding of squamous cell carcinoma in present study was sinus pacification and bone destruction (100%) followed by nasal pacification (75%). In this study, CT showed extension of mass lesion and bone erosions in 100%, increase in sinus size in 50%, thinning and sclerosis only in 25% of cases. In this study, MRI showed extension of mass lesion into nasal cavity (100%), mass effect on adjacent structures (75%), widening of maxillary ostium (50%) and sinus expansion (50%). In present study, CT was able to accurately diagnose bone erosions (100%), thinning and sclerosis of bone (25%) and MRI was able to accurately diagnose extension of mass lesion (100%). On HPE, moderately differentiated SCC showing high nuclear, cytoplasmic ratio, hyperchromatic nucleoli with few mitotic figures and infiltration into subepithelium were noted in all cases (2 patients). In this study, 2 cases of adenocarcinoma were detected, of which 100% (2/2) of the cases were

Table 1: Etiology of Sinonasal malignancy

Etiology	No. of cases	Age group (years)
Squamous cell carcinoma	2	50-60
Adenocarcinoma	2	50-60
Total	4	-

Table 2: Gender distribution of Sinonasal malignancy

Sex	No of cases	Percentage
Females	1	25
Males	3	75
Grand total	4	100

Table 3: Clinical findings in Sinonasal malignancy

Clinical features	No of cases	Percentage
Nasal obstruction	3	75
Swelling in nasal cavity	1	25
Nasal discharge	2	50
Bleeding per nose	2	50
Pain in cheek	1	25

Table 4: Plain radiography findings in Sinonasal malignancy

Plain radiography findings	No of cases	Percentage
Bone destruction	4	100
Sinus opacification	4	100
Nasal opacification	3	75

Table 5: Computed tomography findings in Sinonasal malignancy

CT findings	No of cases	Percentage
Extension of mass	4	100
Bone Erosions	4	100
Sinus size increased	2	50
Thinning of bone	1	25
Sclerosis of bone	1	25

Table 6: MR imaging findings in Sinonasal malignancy

MRI findings	No of cases	Percentage
Extension	4	100
Mass effect	3	75
Widening of ostium	2	50
Sinus size increased	2	50

in 50-60 years age group with only male involvement. The most common clinical presentation of adenocarcinoma was nasal obstruction (100%) followed by nasal discharge and swelling in both nasal cavity (50%).

In this study, adenocarcinoma was most commonly involving the maxillary sinus (100%). Plain radiography findings of adenocarcinoma in present study were sinus pacification, wall destruction and sinus expansion (100%). In this study, CT showed extension of mass and bone erosions in 100% of cases. Other findings were increase in sinus size (50%), thinning and sclerosis of bone (25%). In this study, MRI showed extension of mass in all 2 cases (100%). Other findings were mass effect (75%), widening of ostium and increase in sinus size (50%). On HPE, adenocarcinoma of enteric type showing glands with dysplastic epithelium were noted in all patients (2 cases) with sinonasal adenocarcinoma. In the present study, the age range of patients was between 50 to 55 years with a mean age of 53 years. In the study by Dutta *et al*.[5], mean age at diagnosis was 62.3 years. In the study by Poursadegh *et al*.[6], mean patient age was 54.07±16.04 years. Study by Sanghvi *et al*.[7], showed majority of Sino-Nasal Squamous Cell Carcinoma (SNSCC) occured in people of 55 years and older. In the study by Rawat *et al*.[8], mean patient age of SNSCC was 53 years and adenocarcinoma was 66 years. In the study by Orvidas *et al*.[9], mean patient age was 64±15 years. All the above mentioned studies are correlating with the present study with respect to age distribution. In the present study, there were 3 males and 1 female out of 4 patients. In the study by Khan *et al*.[10], there were 10 males and 5 females out of 15 patients. In the study by Dutta *et al*.[5], there were 7,795 males and 5,500 females out of 13,295 patients. In the study by Poursadegh *et al*.[6], there were 45 males and 24 females out of 69 cases. In the study by Sanghvi *et al*.[7], there were 3,218 males and 1,776 females out of 4,994 cases. All the above mentioned studies showed male preponderance which correlates well with the present study.

In this study, nasal obstruction was the most common presenting symptom found in 75% of cases (3 out of 4 cases) followed by bleeding per nose and watery discharge per nose in 50% of cases (2 out of 4 cases) and pain in cheek and swelling in nasal cavity in 25% of cases (1 out of 4 cases). In the study by Orvidas *et al*.[9], nasal obstruction was the most common presenting symptom present in 75% of cases (18 out of 24 cases) followed by epistaxis in 38% of cases (9 out of 24 cases). Study by Verma *et al*.[11]. showed nasal obstruction in all cases of sinonasal malignancy (2 cases) followed by nasal discharge and bleeding per nose in 50% of cases (1 out of 2 cases). The above mentioned studies are correlating with the present study with respect to pattern of clinical presentation.

Plain radiographic findings in the present study were bone destruction, sinus pacification and nasal pacification. In the study by Chaudhury *et al*.[12], X-Rays were available in 40 out of 61 cases, out of which sinus pacification was noted in all cases (40 cases) and bone destruction in 88% of cases (37 out of 40 cases). In a case report by Kalyani[13], plain radiographs had less sensitivity and were not able to detect sinonasal carcinoma as the paranasal sinus were normal (2 cases). In the present study, as the X-Rays showed bone destruction and malignancy was suspected in the present study, CT and MRI of PNS was done to know the bone destruction and extension of sinonasal malignancy.

CT findings in present study were sinus and nasal cavity pacification with expansion, destruction of posterolateral wall of right maxillary sinus, sclerosis and thinning of inferior wall of right orbit with extension into ethmoid air cells, frontal sinus and sphenoid sinus by causing bone erosion. MRI findings were heterogenous mass lesion causing sinus

expansion and widening of maxillary ostium with extension into ethmoid air cells, frontal sinus and sphenoid sinus. There was also extension into right orbit. In the study by Philips *et al*.[14], CT showed paranasal sinus extension and bone destruction in 91% of cases (10 out of 11 cases), orbital extension was found in 36.36% of cases (4 out of 11 cases). However, they observed that there was no specific pattern of imaging characteristics to detect sinonasal malignancy. In a case report by Kalyani[13], CT revealed a mass was noted in right maxillary, ethmoid, sphenoid, frontal sinuses and entire nasal cavity with destruction of medial wall of right orbit. In a case report by Jones AV *et al*.[15], CT revealed a large mass occupying the superior nasal cavity, maxillary sinus and ethmoid region with destruction of left lateral wall of the nose, medial aspect of the left orbit and the floor of the frontal sinus. In the study by Som *et al*.[16],contrast-enhanced CT scan showed extensive bone destruction of the right facial bones. Contrast-enhanced MR imaging of the head and facial region revealed extraconal extension into right orbit. CT and MRI features in all the above mentioned studies are correlating with the present study.

CONCLUSION

Thus CT had higher sensitivity to detect bone sclerosis and bone destruction. MRI had higher sensitivity to detect intra cranial and intra orbital extension. X-Rays were less sensitive than CT and MRI to detect sinonasal malignancy. However, pathological investigations are required for confirmation of sinonasal malignancy.

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