

Original Article

Evaluation of Extensions of Sinonasal Malignancy by Clinical, Surgical & CT Scan Findings

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Abstract:

Background: *Sinonasal malignancies are challenging not only from diagnostic view point but also from therapeutic aspects. Owing to the rarity of the lesions, delayed clinical presentations and poor prognosis there is lack of large experience.*

Objectives: *Aim of this study is to assess Evaluation of extensions of sinonasal malignancy by correlating clinical and surgical findings with CT scan.*

Methods: *A Cross Sectional study was carried out in the Department of Otolaryngology-Head and Neck Surgery, Sylhet M.A.G Osmani Medical College Hospital, Sylhet, from August 2019 to July 2021. A total 30 subjects were included in this study based on inclusion and exclusion criteria. A data collection form was designed and prepared including general characteristics of subjects and reviewed clinically, radiologically and surgically. All the data were compiled and sorted properly and the numerical data were analyzed statistically by using Statistical Package for Social Sciences (SPSS-26). The result was expressed as frequency and percentage and displayed with figure and table. Z proportion test, Spearman's rho correlation coefficient test and Diagnostic accuracy test of clinical, CT and surgical finding were performed as applicable. For all comparisons p value of <0.05 was considered as significant.*

Results: *In this study, CT findings was positively related with clinical and surgical findings. But this relation was strongly significant with surgical findings. In this study, clinical evaluation was 28.8% Sensitive and 100% Specific. Positive predictive value (PPV) was 100% and*

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negative predictive value (NPV) was 9.1%. CT evaluation was 78.6% Sensitive and 100% Specific. Positive predictive value (PPV) was 100% and negative predictive value (NPV) was 25%. Surgical evaluation was 92.9% sensitive and 100% Specific. Positive predictive value (PPV) was 100% and negative predictive value (NPV) was 50%.

Conclusion: It can be concluded that CT findings was directly correlated with clinical and surgical findings. But this relation was strongly significant with surgical findings.

Kew words: Sinonasal malignancy, Clinical evaluation, CT scan findings.

Introduction:

Sinonasal malignancies are rare neoplasms with many histological subtype¹. These have incidence of 0.5-1 per 100,000 population per year. They are 1% of all malignancies and 3-5% of all head neck cancer². These malignancies have poor prognosis as complex anatomy of nose and paranasal sinuses compromise oncological resection. These have nonspecific nature of the symptoms initially, most patients are diagnosed late when the disease is already at an advanced stage³. The maxillary sinus is the most common site of sinonasal malignancy (55%), followed by the nasal cavity (35%), ethmoid sinus (9%), frontal and sphenoid sinuses (1%)⁴.

Sinonasal malignancies are frequently asymptomatic in the initial stage or initially develop relatively innocuous symptoms like nasal blockage, rhinorrhea, lacrimation, epistaxis etc. which are indistinguishable from the more common disease process such as rhinosinusitis⁵. Sinonasal malignancies are usually associated with local extension to surrounding adjacent structures frequently and recurrence rate is also high. Demonstration of locations and true local extension of the sinonasal malignancies is essential in choosing the appropriate treatment modality and ensuring an oncologically satisfactory resection with negative cut margins⁵. More than 50% of malignancy would have reached an advanced stage with a poor prognostic outcome at the time of diagnosis⁶.

Plain radiograph does not allow adequate evaluation of sinonasal mass because of overlapping of the structures, poor resolutions and other limitations⁷. Modern imaging like CT & MRI played a revolutionary role to diagnose the disease early and picking up the metastasis. CT scan is more commonly used modality for sinonasal pathology. Contrast enhanced computed tomography with multiplanar reconstruction an excellent modality for imaging the sinonasal mass. It is easily available, cheaper, take less imaging time and the best modality to assess the bony changes. It can define the character of sinonasal mass, thus helps to differentiate benign from malignant. It helps better imaging of cortical areas and helpful in planning treatment such as surgery or radiotherapy⁸.

Extension of tumor into intracranial fossa, orbit, pterygomaxillary fossa or into soft tissue of face is easily demonstrated by CT scan. CT permits superior assessment of osseous margins of skull base and sinus walls which are less effectively demonstrated on MRI. Various researchers of different countries reported that sinonasal malignancy is usually diagnosed late. Therefore, it is important to determine the most common signs & symptoms that should alert the physician to suspect the possibility of this disease and should be evaluate their extension by CT scan before surgery^{9,1}.

Dhillon et al.¹⁰ reported that tumors of the paranasal sinuses are extremely notorious. If they are diagnosed at an early stage and

treated radically, the patient has a chance of good prognosis.. They Compared clinical and radiological findings in their study and found that the radiological findings were consistent with that of clinical suspicion. Bist et al.¹¹ reported similar findings. Dipankar et al.⁷ reported that CT showed sensitivity 94%, specificity 100%, positive predictive value 94%, negative predictive value 100% and accuracy 96% in case of sinonasal malignant mass.

But less published data are available in our country. Therefore, present study was designed to evaluate the extensions of sinonasal malignancy by clinical and surgical findings and then correlating them with CT scan findings.

Methods:

Study design: Cross Sectional Study.

Study period: August 2019 to July 2021

Place of study: This study was carried out in the department of Otolaryngology & Head-Neck Surgery, Sylhet M.A.G Osmani Medical College Hospital with the kind collaboration of Department of Radiology & Imaging, Sylhet M.A.G Osmani Medical College Hospital, Sylhet, Bangladesh.

Study population: All patients with Histologically confirmed sinonasal malignancy in Dept. of Otolaryngology & Head-Neck Surgery, Sylhet M.A.G Osmani Medical College Hospital during the study period.

Sample size: 30 sample was taken for this study.

Sampling technique: Consecutive sampling

Inclusion criteria: a) All patients with histologically confirmed sinonasal malignancy. b) Patients of both sex at any age. c) Patient who will undergo surgery as the first modality of treatment.

Exclusion criteria: a) Patient with previous history of radiotherapy or chemotherapy for sinonasal malignancy. b) Patient with previous history of surgery for sinonasal malignancy.

Study Procedure

After admission in otolaryngology and head neck surgery department, patients who will fulfill the inclusion criteria was enrolled in the study during the study period. The patient was informed in details about the study procedure and an informed written consent was obtained. A comprehensive history was taken from every patient including their demography.

Then, a thorough clinical examination with particular emphasis to ear, nose, throat and neck region was done. Nose & PNS was examined with nasoendoscopy. Every patient went through some general investigations and some specific investigations. Specific investigations include multislice CT scan of nose & paranasal Sinuses with neck was done in every patient. A biopsy material was taken with the help of a nasoendoscope and sent for histopathological examination in all patients. CT scan was done before taking biopsy and maximum 7 days before surgery in all patients. CT evaluation was done with "Toshiba Aquilion Prime" 160 slice, multi-slice CT scanner. Scanning was done both in coronal and axial sections with 2mm slice thickness. Pre contrast and post contrast scanning was performed. Intravenous contrast medium named Iopamidol was administered as a single bolus dose. All the procedures were done by a recognized radiology technician of the department and supervised by a radiology and imaging specialist. CT Scan report was prepared by a Radiologist of Assistant professor level or above.

No gross palpable and imageable enlarged neck lymph node was found clinically and on

CT respectively in any of the 30 cases. General investigations for the general fitness for surgery of the patient were done. Informed written consent was obtained from the patient after full explanation of the details of the disease process.

Then patient was prepared for surgery. During surgery extension of the tumor was recorded. Surgery was performed by an Otolaryngologist of Assistant professor level or above. The surgical options are lateral rhinotomy, maxillectomy, extended maxillectomy and anterior craniofacial resection. Maxillectomy defects were closed by temporary dental prosthesis initially and orbital floor was also repair by prosthesis. Surgical findings were reviewed with CT scan after surgery.

Tissues from sinonasal mass were sent for histopathological examination after surgery. Post-operative follow-up was given accordingly. Histopathological reports were received when it was available and compared with preoperative histopathology report. Patients were discharged with advice to follow up regularly according to predefined schedule and to visit oncology department later on for post-operative radiotherapy if indicated, and some for permanent reconstructive prosthesis

to dental and ophthalmological department accordingly.

Data processing and analysis

All the data were compiled and sorted properly and the quantitative data were analyzed statistically by using Statistical Package for Social Science (SPSS-26). Data was expressed as frequency and percentage and displayed with appropriate figure and table. Z proportion test was performed to compare proportion between the groups, Spearman's rho correlation coefficient test was performed to observe correlation of CT findings with clinical and surgical findings. Diagnostic accuracy test of clinical, CT and surgical findings were performed. *p* value of <0.05 was considered as level of significance.

Results:

A total number of 30 subjects were included in this study based on inclusion and exclusion criteria with age ranging from 18 to 70 years to evaluate the extension of sinonasal malignancy by clinical and surgical findings and CT scans. Details clinical examination, CT scan, surgical evaluation and histopathological evaluation was done and recorded in structural data collection sheet.

Table I :
Distribution of study population according to clinical presentation (n=30)

Variable	Present	%	Absent	%	p value
Nasal obstruction	24	80.00	6	20.00	0.001 ^s
Headache	10	33.33	20	66.67	0.067 ^{ns}
Swelling face	12	40.00	18	60.00	0.271 ^{ns}
Epistaxis	6	20.00	24	80.00	0.001 ^s
Proptosis	10	33.33	20	66.67	0.067 ^{ns}
Nasal discharge	14	46.67	16	53.33	0.711 ^{ns}
Facial pain	6	20.00	24	80.00	0.001 ^s
Reduced smell	4	13.33	26	86.67	<0.001 ^s
Loosening of tooth	2	6.67	28	93.33	<0.001 ^s
Palatal budging	4	13.33	26	86.67	<0.001 ^s
Visual impairment	2	6.67	28	93.33	<0.001 ^s

In this study, study subjects were presented with nasal obstruction (24; 80%), headache (10; 33.33%), swelling face (12; 40%), epistaxis (6; 20%), proptosis (10; 33.33%), nasal discharge (14; 46.67%), facial pain (6; 20%), reduced smell (4; 13.33%), loosening of tooth (2; 6.67%), palatal budging (4; 13.33%) and visual impairment (2; 6.67%).

Table II :
Distribution of study subjects according to CT findings (n=30)

Variable	Involved	%	Not involved	%	p value
Anatomical site					
Maxillary sinus	18	60.00	12	40.00	0.121 ^{ns}
Nasal cavity	5	16.67	25	50.00	<0.001 ^s
Nasal cavity and maxillary antrum	6	20.00	24	46.67	<0.001 ^s
Ethmoid sinus	1	3.33	29	96.67	<0.001 ^s
Extension					
Hard palate	10	33.33	20	66.67	0.001 ^s
Alveolar process of maxilla	8	26.67	22	73.33	<0.001 ^s
Cheek (Subcutaneous tissue)	6	20.00	24	80.00	<0.001 ^s
Skin	5	16.67	25	83.33	<0.001 ^s
Nasal cavity	5	16.67	25	83.33	<0.001 ^s
Orbital cavity	4	13.33	26	86.67	<0.001 ^s
Pterygoid space	4	13.33	26	86.67	<0.001 ^s
Maxillary antrum	4	13.33	26	86.67	<0.001 ^s
Ethmoid sinus	2	6.67	28	93.33	<0.001 ^s
Frontal sinus	2	6.67	28	93.33	<0.001 ^s
Maxillary sinus	2	6.67	28	93.33	<0.001 ^s
Nasopharynx	1	3.33	29	96.67	<0.001 ^s
Intracranial	2	6.67	28	93.33	<0.001 ^s
Bone erosion	10	33.33	20	66.67	0.001 ^s
Bone destruction	14	46.67	16	53.33	0.603 ^{ns}
Enhancement					
Mild	2	6.67	28	93.33	<0.001 ^s
Faint	2	6.67	28	93.33	<0.001 ^s
Heterogeneous	10	33.33	20	66.67	0.001 ^s

Table III :
Distribution of study subjects according to surgical findings (n=30)

Variable	Found involved	%	Found not involved	%	p value
Anatomical site					
Maxillary sinus	18	60.00	12	40.00	0.121 ^{ns}
Nasal cavity	5	16.67	25	50.00	<0.001 ^s
Nasal cavity and maxillary antrum	6	20.00	24	46.67	<0.001 ^s
Ethmoid sinus	1	3.33	29	96.67	<0.001 ^s
Extension					
Hard palate	10	33.33	20	66.67	0.001 ^s
Alveolar process of maxilla	10	33.33	20	66.67	0.001 ^s
Cheek (Subcutaneous tissue)	8	26.67	22	73.33	<0.001 ^s
Skin	5	16.67	25	83.33	<0.001 ^s
Nasal cavity	5	16.67	25	83.33	<0.001 ^s
Orbital cavity	4	13.33	26	86.67	<0.001 ^s
Pterygoid space	4	13.33	26	86.67	<0.001 ^s
Maxillary antrum	4	13.33	26	86.67	<0.001 ^s
Ethmoid sinus	2	6.67	28	93.33	<0.001 ^s
Frontal sinus	2	6.67	28	93.33	<0.001 ^s
Maxillary sinus	2	6.67	28	93.33	<0.001 ^s
Nasopharynx	1	3.33	29	96.67	<0.001 ^s
Intracranial	4	13.33	28	93.33	<0.001 ^s
Bone erosion	14	46.67	16	53.33	0.603 ^{ns}
Bone destruction	10	33.33	20	66.67	0.001 ^s

Table IV :
Correlation of clinical and surgical findings with CT findings (n=30)

Variable	r value	p value
CT findings		
Clinical findings	+0.302	0.105 ^{ns}
Surgical findings	0.784	<0.001 ^s

Spearman's rho correlation coefficient test was performed and $p < 0.05$ was accepted as level of significant.

In this study, CT findings was positively related with clinical and surgical findings. But this relation was strongly significant with surgical findings.

Discussion:

Sinonasal malignancies are challenging not only from diagnostic point of view but also from therapeutic aspects. Extensions of the lesion can be evaluated effectively by the

commonly available cross sectional imaging modality CT (computerized tomography) scan. CT Scan is also a great tool for studying recurrence of the tumor. The purpose of this study is to emphasize the importance of 'CT

Scan of paranasal sinuses' in the overall management of sinonasal malignancies such as prediction of malignancy, extensions, area to be explore during surgery and correlating CT Scan findings with clinical and surgical findings to plan appropriate treatment planning.

In present study, study subjects were presented with nasal obstruction, headache, swelling face, epistaxis, proptosis, nasal discharge, facial pain, reduced smell, loosening of tooth, palatal budging and visual impairment. Llorente et al.¹² agreed with our findings. They reported that nasal obstruction, facial pain, persistent rhinorrhea, epistaxis, are nonspecific symptoms and are often indistinguishable from symptoms of patients with benign sinonasal disease. Proptosis, diplopia or neurological symptoms are also be present in patients with advanced-stage tumors.

In present study, maxillary mass and nasal cavity mass was found after clinical examination and this mass was extended into nasal cavity, hard palate and cheek. Llorente et al.¹² reported that clinical examination of patients with suspected sinonasal tumor with a thorough medical history and a comprehensive ear, nose and throat (ENT) examination, including assessment of the cranial nerves and neck. Anterior rhinoscopy generally delivers limited information. Therefore, nasoendoscopy deliver useful data with facility to take biopsy. Noninvasive imaging tests are also essential because they can potentially provide information on the benign or malignant nature of the tumor.

After CT evaluation, maxillary mass, nasal cavity mass, mass in the nasal cavity and maxillary antrum and ethmoid sinus was found and in these mass was extended into hard palate, alveolar process of maxilla, cheek, Skin, nasal cavity, Orbital cavity, pterygoid

space, maxillary antrum, ethmoid sinus, frontal sinus, maxillary sinus, Nasopharynx, opposite nasal cavity and intracranium. Bone erosion was observed in 33.33% cases and bone destruction was observed in 46.67% cases. Mild enhancement was found in 6.67% cases, faint in 2; 6.67% cases and heterogenous was found in in 33.33% cases. No neck node was seen on CT scan grossly. These findings were agreed with study performed various researchers of different countries^{8,9}.

On surgical evaluation, maxillary mass, nasal cavity mass, nasal cavity and maxillary antrum and ethmoid sinus were found. This mass was extended into hard palate (33.33%), alveolar process of maxilla (33.33%), cheek (26.67%), Skin (16.67%) nasal cavity (16.67%), Orbital cavity (13.33%), pterygoid space (13.33%), maxillary antrum (13.33%), ethmoid sinus (6.67%), frontal sinus (6.67%), maxillary sinus (6.67%), Nasopharynx (3.33%) and intracranial extradural (13.33%). Bone erosion was observed in 46.67% cases and bone destruction was observed in 33.33% cases. In 2 cases among 4, eyelid spearing orbital exenteration was done as tumor extend to periorbital structures, remaining 2 patients did not give consent. During surgery intracranial extradural extension was noted in 4 cases. After surgery these patients having extensive disease was advised for radiotherapy.

CT findings were positively related with clinical and surgical findings. But this relation was strongly significant with surgical findings. No study was found as similar with our study due to different in their methodology. But Kandukuri and Phatak¹³ reported that clinical diagnosis and CT diagnosis was correlated with final diagnosis which was obtained on basis of nasal endoscopy/FESS and histopathological findings.

In present study, clinical evaluation was 28.8% Sensitive and 100% Specific. Positive predictive value (PPV) was 100% and negative predictive value (NPV) was 9.1%. CT evaluation was 78.6% Sensitive and 100% Specific. Positive predictive value (PPV) was 100% and negative predictive value (NPV) was 25%. Surgical evaluation was 92.9% sensitive and 100% Specific. Positive predictive value (PPV) was 100% and negative predictive value (NPV) was 50%. Islam et al.⁸(2013) found that sensitivity of CT scan to diagnose malignant sinonasal mass was 93.30%, specificity 96.70%, positive predictive value 87.50% and negative predictive value 98.3%. Kandukuri and Phatak¹³ (2016) found that sensitivity of CT scan to diagnose malignant sinonasal mass was 94.1%, specificity 99.3%, positive predictive value 99.27% and negative predictive value 98.7%.

Conclusion:

After analyzing the results of present study , it can be concluded that CT scan findings directly correlate with clinical and surgical findings. But this relation is strongly significant with surgical findings. CT scans and surgical findings proves the better sensitivity and specificity in evaluation of sinonasal malignancy.

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