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Original Article

Performance of CT Scan in diagnosis of Sinonasal mass

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Abstract

Objective:*To establish CT scan as a sensitive modality in the diagnosis of sinonasal mass by correlating with the findings of histopathological examination.*

Methods:*This cross sectional study was conducted in Dhaka Medical College Hospital (DMCH) from 01/07/2013 to 30/06/2014. A total of 32 cases were studied.*

Results: *In this study male and female ratio was 1.4:1. So, the incidence of sinonasal mass slightly higher in male (59.3%) compared to the female (40.6%). Incidence of malignant tumour was found more in age group above 60 years. Out of 32 patients, 6 patients (18.7%) were diagnosed histopathologically as infective, 7 patients (21.8%) were benign and 19 patients (59%) had malignant sinonasal mass.*

Conclusion: *Computed tomography (CT) scan examination of the sinonasal mass correlate well in most of the cases with histopathological results. It is therefore can be concluded that CT examination of nose and paranasal sinuses is a useful modality in the evaluation of sinonasal mass.*

Key words: *CT scan, Sinonasal malignancy, nose and paranasal sinus;*

Introduction

Plain sinus films do no allow adequate evaluation of the sinonasal masses because of overlapping of structures, resolution and other limitations. So they are inaccurate in high percentage of patients and have been supplemented by CT imaging.[1]

The purpose of CT imaging of nose and paranasal sinuses is to confirm the diagnosis, localize the disease, characterize the extent of pathology and describe any anatomical variations.

As a general rule, malignant tumours destroy bone, whereas benign processes cause

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thickening or remodeling of adjacent bone.[2] Bone changes are depicted better with computed tomography. All malignant tumours may not destroy bone, however the true value of CT scanning is its ability to detect bone erosion.[3]

Extensions of the tumour into the intracranial cavity, orbit, pterygomaxillary fossa or into the soft tissues of the face is easily demonstrated on CT. The accuracy of CT in determining tumour spread to these areas is on the order of 85%.[4]

In spite of these properties, it is not always possible to distinguish tumour from mucosal oedema secondary to sinus obstruction by the lesion on CT. In addition, CT can not always clearly determine whether the tumour has invaded the periorbita (important for planning need for orbital exenteration) .[5]

Methods

It was a cross sectional study. This prospective study was carried out in the department of Radiology and Imaging in collaboration with department of ENT of DMCH, Dhaka, during the period of July 2013 to June 2014. A total of 32 patients were included in this study.

Inclusion criteria:

- Clinically suspected patients of sinonasal growth in all age groups and both sexes.
- Patients suspected as sinonasal gowth by plain X-ray.

CT Examination Technique

All CT examination were performed with 64 slice spiral CTscan machine (HITACHI) , both non-contrast and contrast axial scan and coronal reconstruction were performed with following parameters.Patient position: Supine position (axial section), Section thickness: 3mm, Slice interval: 0mm, KVP: 125, mAS: 80-160, Image display: Field of view:14cm, Window width:+2000, Window level:-200

Demographic and clinical variables: Age of the patient , Sex of the patient

Clinical features e.g. Nasal blockage, epistaxis, headache, proptosis, eyeache, watering from eye, gradual swelling of face, discharge from eye, pain in the frontal region, neck pain, fever etc.

Imaging variable

CT Scan findings- CT scan diagnosis of different maxillary growth, density of the lesion, site of origin, unilateral or bilateral sinus involvement, character of enhancement of lesion, bone destruction and spread to other organs.

Histopathological comparison

The postoperative resected tissues were examined histopathologically in the respective pathology department and then collected reports were compared with CT scan findings.

Data Collection Procedure

The aims of study were explained to the patients and informed written consent was taken. Data were collected by face to face interview, from history sheet, CT scan and pathological findings of the patients. All the data were recorded in a pre-designed structured data collection sheet.

Data Analysis

All the data were checked and compiled after collection. The data were analyzed with the help of Statistical Package for Social Sciences (SPSS) software programmed. An analysis plan has developed keeping in view with the objectives of the study. For the validity of the study outcome sensitivity, specificity, accuracy, positive and negative predictive values were calculated after

confirmation of histopathological diagnosis. For significance of differences chi-square test were done where applicable. Statistical significance was set at P< 0.05 and confidence interval was set at 95% level.

Results

This study included 32 patients who were suspected case of sinonasal mass subsequently confined by CT scan and histopathology.

Age and Sex distribution

The age range from 10 years to 75 years and the mean age (±SD) was 35.2±21.3 years in male and 37.0±23.1 years in female. Overall mean age (±SD) was 35.94±21.3 years. Highest incidence of found between 10-19 years of age group.

Age group and histopathological relation

Out of 32 patients 13 were below the age group 20 years (40.6%), 7 cases were within 20-40 years age group (21.83%), 4 cases were within 41-60 years age group (12.53%) and 8 patients were above the age group 60 years (25%). Below 20 years out of 13 patients CT diagnosis were 3 were infective, 3 were benign and 6 were malignant mass. Whereas histolpathology showed 6 cases were infective, 4 cases were benign and 4 cases were malignant tumour. Within 20-40 years age group out of 7 patients CT scan showed 1 case was infective, 4 cases were benign and 2 cases were malignant mass.

Among 4 cases age within 40-60 years CT diagnosis showed 1 case was infective, 1 case was benign and 2 cases were malignant masses.

Out of 8 patients above 60 years of age, all the 8 cases were diagnosed as malignant masses by both CT and histopathology. Infective and benign lesion in this age group was found zero.

Sex group and histopathological relation

Out of 32 patients 19 were male (59.3%) and 13 were female (40.6%). In this study male and female ratio was 1.4:1. Out of 19 male patients histopathology showed 5 patients positive for infective, 4 patients positive for benign and 10 patients were found malignant lesion.

Out of 13 female patients histopathologically positive- 1 cases were infective, 3 cases were benign and 9 cases were malignant sinonasal growth.

Again out of 19 male patients CT examination revealed that 5 patients were infective, 5 patients were positive for benign and 9 patients were malignant lesion.

Out of 13 female patients CT examination found 2 were infective, 3 cases were benign and 8 cases were malignant sinonasal mass.

Distribution of clinical presentation and histopathological diagnosis:

The most common symptoms associated with sinonasal growth was nasal blockage which was observed in 24 (80%) patients, out of 24 cases 9 were infective, 9 were benign and 6 were malignant lesion. 12 patients (40%) had epistaxis, among them 6 cases were infective, 4 cases were benign and 2 were malignant lesions. Propotosis noted in 9 patients (30%) out of which 2 patients histopathologically proved infective, 3 were benign and 4 were malignant maxillary sinus lesion. Eyeache was in 12 patients (40%) out of which 6 were found infective, 3 were benign and 3 patients were malignant sinonasal mass. Gradual swelling of face in 6 patients (20%), out of which histopathology shows 1 was inflammatory, 1 was benign and 4 were malignant cases. The results of CT scan and histopathological correlation in the following table shows there was significant correlation.

Comparison of CT diagnosis and Histopathological diagnosis:

Out of 32 patients of sinonasal mass 5 patients were diagnosed as infective mass by CT scan whereas histopathology showed 6 cases were infective and 9 patients were diagnosed as benign mass by CT scan whereas histopathological report confirmed that 7 cases were benign and 1 case was infective lesion and 1 malignant lesion. Total 18 patients were diagnosed as malignant tumour by CT scan whereas histopathology showed 19 cases were malignant. Correlation between CT diagnosis and histopathological diagnosis are represented by the following table.

Table-I

Comparison between CT diagnosis and histopathological diagnosis.

	Histopathological diagnosis			Total
	Infective mass	Benign tumour	Malignant tumour	
CT diagnosis				
Infective mass	05	00	00	05
Benign tumour	00	07	02	09
Malignant tumour	01	00	17	18
Total	06	07	19	32

Distribution of sensitivity and specificity of CT scan for sinonasal mass

A. Infective mass:

Out of 32 patients 5 cases were diagnosed as infective mass by CT scan and confirmed by histopathological examination; they are true positive and 9 cases were dignosed as benign but among them 1 case was infective; it was false negative. All 5 patients diagnosed by CT scan as infective mass were also diagnosed hispathologically as infective mass, so there was no false positive. 26 patients were found negative by both of CT and histopathology; these 26 were true negative.

B) Benign mass

Out of 32 patients 9 patients were diagnosed as benign mass both by CT. But 7 cases were diagnosed as benign by histopathologically; they are true positive and 2 cases were diagnosed by CT as benign mass but histopathologically it was negative; it was false negative. Among CT positive for benign lesion no case was diagnosed by histopathology as negative so there was no false nagative and 23 cases were found negative by both of CT and histopathology. These were true negative and shown in the Table-III.

Table-II

Infective mass.

Diagnostic tool		Histopathology report			Sensitivity	Specificity
		Positive	Negative	Total		
CT Scan	Positive	05	00	05	83.0%	100%
	Negative	01	26	27		
Total		06	26	32		

TP (True positive) = 5, FP (False positive) =0

TN (True negative) =26, FN (False negative) =1

Positive predictive value = 100%, Negative predictive value = 96% Accuracy rate = 96%

Table- III
Benign mass

Diagnostic tool		Histopathology report			Sensitivity	Specificity
		Positive	Negative	Total		
CT Scan	Positive	07	02	09	100%	92%
	Negative	00	23	23		
Total		07	25	32		

Positive predictive value = 78%, Negative predictive value = 100%, Accuracy rate = 93.33%

Table-IV
Malignant mass

Diagnostic tool		Histopathology report			Sensitivity	Specificity
		Positive	Negative	Total		
CT Scan	Positive	18	00	18	94%	100 %
	Negative	01	13	14		
Total		19	13	32		

Positive predictive value = 94%, Negative predictive value = 100%, Accuracy rate = 96%

C) Malignant mass

Out of 32 patients 18 cases were positive by both of CT and histopathology; these 18 cases were true positive. No patient was positive by CT but was negative in histopathology; it was false positive. One (1) case was negative by CT but was positive histopathologically i.e.that was false negative. Remaining 13 patients were negative by both of CT and histopathology; they were true negative. The results of CT were correlated with histopathology are given in the following Table-IV.

Discussion

Plain radiograph has limited role in detecting extension and bony involvement of sinonasal lesion.[6] Besides being expensive, MRI cannot provide detailed information regarding bony destruction or remodeling.[7] The study was carried out to determined the usefulness of CT scan in the diagnosis of sinonasal mass compared with histopathological study. Most tumours originated in the maxillary and in the ethmoidal sinus[8]. Sphenoid sinus is divided into right and left parts by a bony septum[9]. Few tumors araises from here.

This cross-sectional study was carried out with the aim to establish the usefulness of the CT scan in preoperative evaluation of sinonasal mass and their histopathological correlation of postoperative resected tissues along with its test of validity by calculating sensitivity, specificity, accuracy and positive predictive value respectively.

In this study concern about the age the highest incidence of disease was found below 20 years of age group (40%) and infective lesion of the maxillary antrum is more common in below 20 years of age. This study also showed malignant tumour most common in the people over 60 years of age. Regarding maxillary antral mass the age range 10-80 years in male and female age range 34 - 75 years.[10] The age range of my study which is almost similar to the study of Hone et al.[xxx]

In this study 32 patients were divided into 4 group on the basis of age. The age of the subjects in this study was range from 10-74 years. The mean age (±SD) was 35.2±21.3 years in male and 37.0±23.1 years in female. Overall mean age (±SD) was 35.94±21.3 years.

The highest incidence of disease was found in between 10-19 years of age group (40%) and lowest in between 41-60 years (13.33%). The invective lesions of the nose and paranasal sinuses are more common in the age group below 20 years. Malignant lesions were found more common over 60 years of age.

Out of 32 patients, symptoms included nasal blockage (80%), epistaxis (40%), proptosis (30%), eyeache (40%) and gradual facial swelling (20%). According to the Hone et al. (1995) commonest presentation of sinonasal mass where nasal obstruction, epistaxis facial swelling which is similar to this study.

Concern about the sex, out of 19 male patients 5 had infective mass, 4 were benign tumour and rest 10 patients had malignant mass in the paranasal sinuses. On the contrary out of 13 female patient's histopathological reports evident that 2 were infective, 3 cases were benign and 8 patients were malignant sinonasal mass. In this study male patient preponderance with maxillary growth 60% than those of female patients 40%. Whereas other study identified 40 patients with malignant tumour and there were 30 male and 13 female and my study showed 19 were male and 13 were female which has similarity to my study.[10]

In this study it was found that 32 patients with malignant tumours[3]. There were 19 males, mean age 50 years range (10-80 years) and 13 females, mean age 59 years, range (34-75 years). Commonest presentations were nasal obstruction, epistaxis, eyeache, proptosis and facial swelling. The maxilla was the site of origin in 18 patients.

In case of infective mass, our study showed sensitivity 83%, specificity 100%, positive predictive value 100%, negative predictive value 96% and accuracy 96% study showed sensitivity 100%, specificity 95.83%, positive predictive value 85.71% and negative predictive value 100%, accuracy 96.6% in case of infective lesion in the nose and paranasal sinuses, which is similar to my study.[10]

In case of benign mass, my study showed sensitivity 100%, specificity 92%, positive predictive value 78%, negative predictive value 100% and accuracy is 93%. This study showed sensitivity 85.5%, specificity 95.45%, positive predictive value 87.5%, negative predictive value 95.45% and accuracy 93.3%, which is similar to my study.[10]

In the malignant mass, my study showed sensitivity 94%, specificity 100%, positive predictive value 94%, negative predictive value 100% and accuracy 96%. Hone et al (1995) showed, Sensitivity 87.5%, specificity 92.86%, positive predictive value 93.33% and negative predictive value 86.67% and accuracy 90% which is similar to my study.

The correlation between CT scan and histopathology in patients with sinonasal mass was observed in this study, p value is based on Chi-square test which reveals significant correlation between the two modalities.

Summary

Computed tomography (CT) scan is very effective and sensitive diagnostic imaging modality in the diagnosis and evaluation of sinonasal mass.

- Out of 32 patients, 6 patients (18.7%) were diagnosed histopathologically as

infective, 7 patients (21.8%) were benign and 19 patients (59%) had malignant sinonasal mass.

- The validity of CT scan in case of infective mass of the sinonasal area by calculating sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 83%, 100%, 100%, 96%, 96% respectively.
- The validity of CT scan in case of benign tumour by calculating sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 100%, 92%, 78%, 100% and 93% respectively.
- Similarly the validity of CT scan were studied in case of malignant lesion by calculating sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 94%, 100%, 94%, 100%, 96% respectively.

Conclusion

Computed tomography (CT) scan of the sinonasal mass correlate well in most of the cases with histopathological results.It is therefore can be concluded that CT examination of nose and paranasal sinus is a useful modality in the evaluation of sinonasal mass.

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