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Original Article

Comparing Predictive power of CT-scan Findings among the Malignant Hepatic Mass patients

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Abstract

Background: CT-scan is useful for the detection of hepatic mass. **Objective:** The purpose of the present study was to see the predictive values of CT scan in the diagnosis of malignant hepatic mass. **Methodology:** This cross sectional study was carried out in the Department of Radiology and Imaging at Mymensingh Medical College Hospital (MMCH), Mymensingh, Banghabandhu Sheikh Mujib Medical University (BSMMU), Dhaka and Dhaka Medical College Hospital (DMCH), Dhaka during the period of 1st January 2006 to 31st December 2007. Patients admitted in the Department of Medicine and Department of Hepatobiliary of MMCH, BSMMU, and DMCH with the clinical diagnosis of fever, abdominal pain, anorexia, nausea/vomiting, loss of appetite, jaundice, weight loss and ascites were selected as study population. CT scan and histopathology were performed to all the patients. **Result:** A total number of 50 patients were recruited for this study.. The sensitivity for multiplicity was 71.4%, specificity was 63.6%, accuracy was 68%, PPV was 71.4% and NPV was 63.6%. The sensitivity for hypodensity as a sign of malignancy was 60.7%, specificity was 18.2%, accuracy was 42.0%, PPV was 48.6% and NPV was 26.7%. The sensitivity, specificity, PPV, NPV and accuracy of contrast enhancement were 100.0%, 22.7%, 62.2%, 100.0% and 66.0% respectively. Again the sensitivity, specificity, PPV, NPV and accuracy of detection of pressure effect on biliary apparatus by CT-scan were 100.0%, 22.7%, 62.2%, 100.0% and 66.0% respectively. Again the sensitivity, specificity, PPV, NPV and accuracy of detection of Lymphadenopathy by CT-scan were 35.7%, 95.5%, 90.9%, 53.8% and 62.0% respectively. The sensitivity, specificity, PPV, NPV and accuracy of detection of Portal vein invasion by CT-scan were 14.3%, 100.0%, 100.0%, 47.8% and 52.0% respectively. The sensitivity, specificity, PPV, NPV and accuracy of detection of hepatic vein invasion by CT-scan were 10.7%, 100.0%, 100.0%, 46.8% and 50.0% respectively. The sensitivity, specificity, PPV, NPV and accuracy of detection of inferior vena cava (IVC) invasion by CT-scan were 7.1%, 100.0%, 100.0%, 45.8% and 48.0% respectively. **Conclusion:** CT is a useful diagnostic tool for the detection of malignant hepatic masses. *[Journal of Science Foundation, 2014;12(1):2-6]*

Keywords: CT-scan, malignant, hepatic mass, predictive values

Introduction

Hepatic mass can be malignant and its extension into the surrounding structure can occur. Imaging procedures used to detect hepatic mass includes ultrasound (US), computed tomography (CT), magnetic resonance imaging (MRI), Hepatic artery angiography and radionuclide scan. Since the liver is a large solid

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organ of soft tissue composition it is uniquely suited to examine by computed tomography (Stephens et al, 1977). In comparison of Scintigraphy, Sonography and Computed Tomography, CT is the best single examination to determine both the presence and extent of space occupying lesions within the liver (Snow et al, 1979). Space occupying lesions within the liver were detectable by CT when their attenuation of the x-ray beam differs appreciably from the attenuation by surrounding tissue. The great majority of all intrahepatic masses discovered, whether they are solid or cystic, neoplastic or inflammatory are of diminished radiographic density (Stephan et al, 1977). CT scan has some additional advantage over ultrasonography. Firstly it is more reproducible because it is operator dependent. Secondly all the upper abdominal anatomy is displayed on the CT image, providing information about extra hepatic process that may be important to scan interpretation. Thirdly, the administration of water soluble intravenous contrast medium provides information regarding the regional blood flow characteristics of focal lesion and increases the detection rate of small masses (<20 mm) (Balfe and Hee 1988). Non-contrast enhanced CT scans are helpful in detecting metastases from hypervascular tumours (carcinod, pancreatic islet cell tumours, renal cell carcinoma, breast carcinoma, sarcomas). In case of incremental bolus dynamic CT, it is essential to image the liver during the bolus phase of vascular and parenchymal enhancement and prior to the equilibrium phase when the intravascular and interstitial concentrations of contrast equilibrate (Gordon et ala 1992; Baron, Freeny, and Moss 1992). The present study is designed to the predictive values of CT scan in the diagnosis of malignant hepatic mass.

Methodology

This cross sectional study was carried out in the Department of Radiology and Imaging of three tertiary care hospitals in Bangladesh named as Mymensingh Medical College Hospital, Mymensingh; Dhaka Medical College Hospital, Dhaka and Banghabandhu Sheikh Mujib Medical University (BSMMU), Dhaka in collaboration with the Department of Pathology of the same institute for histopathological diagnosis from 1st January 2006 to 31st December 2007 for a period of 2 years. All the clinically suspected patients having hepatic mass at any age with both sexes who were attended in three hospitals were taken as study population as per inclusion and exclusion criteria. Patients having hepatomegaly due to extra hepatic causes, patients who refused to undergo CT-scan, patients who refuse to do biopsy or whose biopsy result was not available and patients having known hypersensitivity reaction to contrast agent were excluded from this study. Purposive sampling technique was used to collect the patients. Prior to the commencement of this study, the research protocol was approved by the ethics review committee of the respective hospital. Each patient was undergone CT examination of hepatobiliary system (HBS) at the Department of Radiology and Imaging. All CT-scan were performed with a third generation CT-scan (Siemans). Somatom (2-5) mm thick contiguous slice were taken. These scan were obtained using 120 kv, 75 mm and 0.8 see scanning time for 2 slice. Both pre and post contrast were performed. Oral contrast medium was routinely administrated before the examination. Immediately after completion of bolus injection 8mm contiguous slice were obtained through the upper abdomen by CT-scan. All collected biopsy tissues were sent for histopathological examination in the histopathology department of respective hospital and collected reports were compared with CT-scan diagnosis. Percentages were calculated to find out the proportion of the findings. Further statistical analysis of the results was done by computer software devised as the statistical package for the social sciences (SPSS, win version 13). For the validity of the study outcome sensitivity, specificity, accuracy, positive and negative predictive values were calculated after confirmation of the diagnosis histopathologically. For significance of differences was done using Student's t test and Chi-square test where applicable. Statistical significance was set at p value less than 0.05 and confidence interval was set at 95% level. All probability values quoted were 2-tailed.

Result

The main objective of the study was to evaluate the CT findings of hepatic mass and their correlation with histopathology in respect of age, sex and clinical presentation. Fifty clinically diagnosed hepatomegaly patients those who attended Radiology and Imaging Department of Mymensingh Medical College Hospital (MMCH), Mymenshigh, Dhaka Medical College Hospital, BSMMU, Dhaka, during the period of 1st January 2006 to 31st December 2007 were enrolled in the study. The mean age of the respondents was 51.28 years. Males were more than females. The following observations were made. Statistical analysis of patients of both sex has revealed that they were within similar age distribution (p value= 0.617). Mean age of male was

50.78 years with a std. deviation of ± 13.68 whereas female was 53.3 years with std. deviation of ± 16.11 years. Age range of the total patients was 17 year to 78 years. Maximum patients were within 56 to 65 years age range. 15 (30%) patients were within 56 to 65 years age range followed by 13 (26%) were 46 to 55 years and 8 (16%) patients were 36 to 45 years age range (Table 1).

Table 1: Age of the patients (n-50)

Age (year)	Mean ± SD	Range
Male (n=40)	50.78±13.68	22-78
Female (n=10)	53.30±16.11	17-75
Total	51.28 ±14	17-78
t value=-0.504, df=48, p value=0.617		

Out of 50 patients 40 were male and 10 were female. Here male and female ratio was found 4:1 (Table 2).

Table 2: Sex distributions of the patients (n=50)

Sex	Frequency	Percent
Male	40	80.0
Female	10	20.0
Total	50	100.0

Malignant lesions are usually multiple. The sensitivity for multiplicity was 71.4%, specificity was 63.6%, accuracy was 68%, PPV was 71.4% and NPV was 63.6%. The sensitivity for hypodensity as a sign of malignancy was 60.7%, specificity was 18.2%, accuracy was 42.0%, PPV was 48.6% and NPV was 26.7%. The sensitivity, specificity, PPV, NPV and accuracy of contrast enhancement were 100.0%, 22.7%, 62.2%, 100.0% and 66.0% respectively. Again the sensitivity, specificity, PPV, NPV and accuracy of detection of pressure effect on biliary apparatus by CT-scan were 100.0%, 22.7%, 62.2%, 100.0% and 66.0% respectively. Again the sensitivity, specificity, PPV, NPV and accuracy of detection of Lymphadenopathy by CT-scan were 35.7%, 95.5%, 90.9%, 53.8% and 62.0% respectively. The sensitivity, specificity, PPV, NPV and accuracy of detection of Portal vein invasion by CT-scan were 14.3%, 100.0%, 100.0%, 47.8% and 52.0% respectively. The sensitivity, specificity, PPV, NPV and accuracy of detection of hepatic vein invasion by CT-scan were 10.7%, 100.0%, 100.0%, 46.8% and 50.0% respectively. The sensitivity, specificity, PPV, NPV and accuracy of detection of inferior vena cava (IVC) invasion by CT-scan were 7.1%, 100.0%, 100.0%, 45.8% and 48.0% respectively (Table 3).

Table 3: Comparing predictive power of CT findings in study population

CT findings	Sensitivity	Specificity	PPV	NPV	Accuracy
Multiplicity	71.4%	63.6%	71.4%	63.6%	68.0%
Hypodensity	60.7%	18.2%	48.6%	26.7%	42.0%
CE	100.0%	22.7%	62.2%	100%	66.0%
PEBA	39.3%	95.5%	91.7%	55.3%	64.0%
Lymphadenopathy	35.7%	95.5%	90.9%	53.8%	62.0%
Portal vein invasion	14.3%	100.0%	100.0%	47.8%	52.0%
Hepatic vein invasion	10.7%	100.0%	100.0%	46.8%	50.0%
IVC invasion	7.1%	100.0%	100.0%	45.8%	48.0%

*IVC=inferior vena cava; PEBA= Pressure effect on biliary apparatus; CE= Contrast enhancement

Discussion

Hepatic masses come to clinical attention when they are felt by the patient, discover on physical examination by the physician or most commonly detected on diagnostic radiological studies. Technologic advances and

the expanded use of imaging modalities have led to the increased documentation of hepatic masses. This study was carried out to determine the accuracy of CT scan examination for the evaluation of hepatic masses and it's correlation with histopathological examinations. Subjects of this study were taken from Mymensingh Medical College Hospital, Mymensingh Dhaka Medical College Hospital, BSMMU, and BIRDEM Dhaka. During the study period from 1st January 2006 to 31st December 2007, total 50 cases were studied who had undergone CT examinations of hepatobiliary system.

The final diagnosis of hepatic masses was made by histopathological examinations. Mean age of male of present study was 50.78 years with a std. deviation of ± 13.68 whereas female was 53.3 years with std. deviation of ± 16.11 years. Age range of the total patients was 17 year to 78 years. Maximum patients were within 56 to 65 years age range. 15(30%) patients were within 56 to 65 years age range followed by 13(26%) were 46 to 55 years and 8 (16%) patients were 36 to 45 years age range. Statistical analysis of patients of both sex has revealed that they were within similar age distribution (p value= 0.617). Liver mass can occur in a person of any age but the incidence is more common in middle aged and elderly persons which have been observed by Saad et al (1996). In their study age of the patients varied from 20-75 years. Most of the patients were found between 41-50 years. These results were nearly comparable with present study. In the USA and Western Europe, HCCs are seldom encountered before the age 60 with male and female ratio of about 6:1 to 8:1. In Africa and Asia this form of cancer occurs in younger individuals often between 20 and 40 years age with a male: female ratio about 3:1 to 4:1 (Crawford 1999). Out of 50 patients of present study 40 were male and 10 were female with a male and female ratio 4:1. This result was consistent with Saad et al (1996). They found males were affected more than females (3:1). In another study Haque et al (1998) reported male and female ratio of hepatic masses was 6:1 in Bangladeshi people.

Malignant lesions are usually multiple. The sensitivity for multiplicity was 71.4%, specificity was 63.6%, accuracy was 68%, PPV was 71.4% and NPV was 63.6%. The sensitivity for hypodensity as a sign of malignancy was 60.7%, specificity was 18.2%, accuracy was 42.0%, PPV was 48.6% and NPV was 26.7%. The sensitivity, specificity, PPV, NPV and accuracy of contrast enhancement were 100.0%, 22.7%, 62.2%, 100.0% and 66.0% respectively. Again the sensitivity, specificity, PPV, NPV and accuracy of detection of pressure effect on biliary apparatus by CT-scan were 100.0%, 22.7%, 62.2%, 100.0% and 66.0% respectively. Again the sensitivity, specificity, PPV, NPV and accuracy of detection of Lymphadenopathy by CT-scan were 35.7%, 95.5%, 90.9%, 53.8% and 62.0% respectively. The sensitivity, specificity, PPV, NPV and accuracy of detection of Portal vein invasion by CT-scan were 14.3%, 100.0%, 100.0%, 47.8% and 52.0% respectively. The sensitivity, specificity, PPV, NPV and accuracy of detection of hepatic vein invasion by CT-scan were 10.7%, 100.0%, 100.0%, 46.8% and 50.0% respectively. The sensitivity, specificity, PPV, NPV and accuracy of detection of inferior vena cava (IVC) invasion by CT-scan were 7.1%, 100.0%, 100.0%, 45.8% and 48.0% respectively. The appearance of the lesion on CT varies primarily with size; small lesions are more homogenous, while large lesions may exhibit mosaic pattern due to necrosis and fatty change (MacKenzie 2002). Present study revealed that all malignant lesions (100%) and 77.3% benign lesions were enhanced after giving contrast. 16 (57.1%) malignant lesions were mildly enhanced, 10 (35.7%) were moderate and 2 (7.1%) were intensely enhanced. On the other side 8(47.1%) benign lesions were mild, 6 (35.5%) moderate and 3 (17.6%) were intensely enhanced. Tumour invasion of the portal vein, and less often the hepatic vein or Inferior vena cava, occur, and show as distension of the vein with a filling defect on contrast-enhanced CT (Dick and Watkinson, 2003). 14.3%, 10.7%, and 7.1% patients of current series had portal vein, hepatic vein and IVC invasion respectively. No patients had benign lesions had similar vein invasions.

Conclusion

The results of the present study therefore conclude that CT-scan is helpful for the prediction of malignant hepatic masses. Because of its accuracy CT has been regarded as the imaging modality of the choice for pre-operative evaluation of hepatic mass.

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