

# Diagnostic Accuracy of Multidetector Computed Tomography (MDCT) in Evaluation of Varices in Cirrhotic Patients

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## ABSTRACT

**Objective:** To evaluate the diagnostic accuracy of Multidetector Computed Tomography in detection of esophageal varices in cirrhotic patients comparing with Upper GI endoscopy results.

**Study Design:** Observational study.

**Place and Duration of Study:** This study was conducted at the Department of Nishtar Medical Teaching Hospital from Oct, 2016 to Oct, 2017.

**Materials and Methods:** Total 172 patients with liver cirrhosis and portal hypertension (Portal vein diameter > 13mm) on ultrasound were included in the study. After unenhanced scanning, helical images were obtained during the hepatic arterial and portovenous phase. Negative oral contrast was given to all patients 30 to 45 minutes before examination. Endoscopic diagnosis of esophageal varices was obtained from medical record of the patients. Using SPSS-18, data was analyzed and diagnostic accuracy, positive predictive value, negative predictive value, sensitivity and specificity were calculated.

**Results:** 172 patients were included in study according to inclusion criteria. Patients mean age was 45.01±6.48 years with range of 25(35-60) years. Male patients were 55.81 % (n=96), and 44.18% (n=76) were female. The overall mean duration of disease was 43.82±12.55 months, with range of 45(19-64) months. MDCT scan was true positive for 126 and true negative for 23 patients. False negative were 23 and false positive only 3 patients. Diagnostic accuracy, positive predictive value (PPV), negative predictive value (NPV), sensitivity and specificity of MDCT were 84.88%, 97.61%, 50.00 %, 84.24%, and 84.46% respectively.

**Conclusion:** MDCT is a new non-invasive diagnostic modality with significantly high accuracy in diagnosis of varices in cirrhotic patients with portal hypertension that are comparable with upper GI endoscopy.

**Key Words:** MDCT, Upper GI Endoscopy, Varices, Portal Hypertension

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## INTRODUCTION

Cirrhosis is the end stage of every chronic liver disease, resulting in fibrosis, disorganization of architecture and nodule formation that results in portal hypertension that is associated with ascites, hepatic encephalopathy and esophago-gastric varices.<sup>1</sup> Reported incidence of esophageal varices in cirrhotic patients has been 90 %.<sup>2</sup> In patients who survive after the initial variceal hemorrhage, a cascade of complications may be initiated that can include hepatic encephalopathy, spontaneous bacterial peritonitis and hepatorenal

syndrome. Therefore, identification of at risk individuals and subsequent prophylactic therapy is most important. Hemorrhage occurs in 25 to 40% of patient with cirrhosis and is associated with a 30% mortality rate. The larger the size of varices, higher the risk of hemorrhage.<sup>3</sup>

Patients with liver cirrhosis, undergo for esophageal screening by endoscopy due to significant mortality associated with varices bleeding.<sup>4</sup> Moderate to large varices (≥5mm diameter), that are found in 30 % of cirrhotic patients on endoscopy had high risk of hemorrhage.

Endoscopic variceal ligation is indicated in large varices.<sup>5</sup>

Risk of variceal hemorrhage can be reduced by 50% with early diagnosis by screening that is why screening is recommended after first diagnosis by follow up. MDCT is less expensive, well tolerated and less invasive method of screening with high sensitivity and specificity in comparison with endoscopy that has limited compliance. Because of high prevalence of liver cirrhosis in our country with life threatening varices, we planned to conduct this study to evaluate the diagnostic accuracy of CT scan in detection of esophageal varices in cirrhotic patients.<sup>7</sup>

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## MATERIALS AND METHODS

We conducted this study at Radiology Department of Nishtar Medical Teaching Hospital, Punjab including 172 patients from Oct, 2016 to Oct, 2017. Patients mean age, percentage of male and female were collected. Patients having liver cirrhosis with portal hypertension for one year were included in the study to determine the diagnostic accuracy of MDCT in detection of esophageal varices. After unenhanced scanning, helical CT images were obtained during the hepatic arterial phase. MDCT images were taken with a 7.5 mm slice thickness on 16 slice Toshiba scanner. All patients received negative oral contrast media over 45-60 minutes before examination. Endoscopic diagnosis of esophageal varices was obtained from the medical record of the patient.

Data was analyzed using computer program SPSS-18. Descriptive statistics were applied to calculate mean and standard deviation for quantitative variables. Frequencies and percentages were calculated for the qualitative variables. Sensitivity, specificity, PPV, NPV and diagnostic accuracy of CT scan was calculated. Effect modifier were controlled by stratification. Chi-square test was applied post stratification and p-value  $\leq 0.05$  was considered as significant.

## RESULTS

Total 172 patients fulfilling inclusion criteria were included. Patients mean age was  $45.01 \pm 6.48$  years with range of 25(35-60) years. Females were (n=76) 44.18% and 55.81% (n=96), were male. Mean duration of disease was  $43.82 \pm 12.55$  months, with range of 45(19-64) months. MDCT scan was true positive for 126 and true negative for 23 patients. False negative were 23 and false positive only 3 patients. Among positive varices found on endoscopy, 57.7% were male and 42.3% were female. Diagnostic accuracy, positive predictive value (PPV), negative predictive value (NPV), sensitivity and specificity of MDCT were 84.88%, 97.61%, 50.00%, 84.24%, and 84.46% respectively.

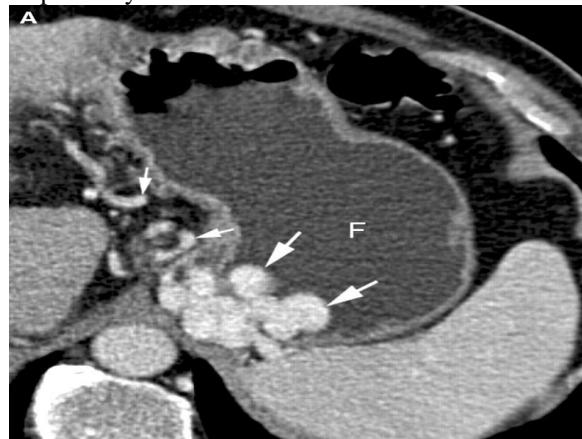


Figure No.1: Varices on Multi-Detector CT scan.

The stratification according to gender, age, and duration of disease was done and sensitivity, specificity and diagnostic accuracy were also calculated post stratification. Sensitivity among male was 83.4%, 85.5% among female patients, and 86.4% in patients of age  $\leq 45$  years. Post stratification association of outcome with age, gender, and duration of disease were calculated using chi square test considered  $p \leq 0.05$  as significant. The results showed significant association with gender, age and duration of disease.

**Table No. I: Diagnostic accuracy of ct scan in evaluation of esophageal varices in cirrhotic patients (n=172)**

CT Findings	Endoscopic Findings		Total
	Positive	Negative	
Positive	True positive(a) 123 (71.51%)	False positive (b) 3 (1.74%)	a + b 126 (73.25%)
Negative	False negative(c) 23 (13.37%)	True negative (d) 23 (13.37%)	c + d 46 (26.75%)
Total	a + c 146 (73.25%)	b + d 26(15.11%)	172 (100%)

**Accuracy** = True +ve + True -ve / (True +ve + True -ve / False +ve + False -ve) x 100 = 84.88%

**PPV** = True +ve / (True +ve + False +ve) x 100 = 97.61%

**NPV** = True -ve / (True -ve + False -ve) x 100 = 50.00%

**Sensitivity** = True +ve / (True +ve + False -ve) x 100 = 84.24%

**Specificity** = True -ve / (True -ve + False +ve) x 100 = 88.46%

## DISCUSSION

Significant morbidity and mortality associated with variceal bleeding justifies screening and surveillance of cirrhotic patients with portal hypertension. Upper GI endoscopy is invasive, expensive and have relatively poor compliance in routine clinical practice. MDCT angiography and capsule endoscopy are emerging noninvasive modalities for evaluation of esophageal varices.<sup>8</sup> Cancer screening of patients with chronic liver parenchymal disease by MDCT has better diagnostic accuracy, compared with ultrasound as reported by several investigators, however it remains controversial.<sup>9</sup> MDCT with 16 or more detectors providing isotropic or near isotropic data sets that enables multiplanar details. With the use of high resolution techniques, comparable results were obtained in detection of esophageal varices against upper GI endoscopy. MDCT imaging show high potential to detect or exclude the presence of esophageal varices in cirrhotic patients. MDCT imaging in cirrhotic patients has significantly high positive predictive value (PPV) in detecting esophageal varices (97.6%), along with an impressive negative predictive value (NPV) in excluding clinically

significant esophageal varices (50%).<sup>11</sup> Detection of esophageal varices was high i.e. 84.3% and 88.5% as sensitivity & specificity respectively in our study in comparison with Kim et al. who reported that the overall sensitivity of MDCT for detecting esophageal varices of any size were less than 70% due to poor detection of small varices; however sensitivity for large varices was very high (92%). High detection rate of varices by MDCT is clinically much important, as the ultimate goal of screening for esophageal varices is to decrease morbidity and mortality due to variceal bleeding.<sup>12</sup> CT size criteria (4mm) for differentiation of high risk varices was used as an effective threshold in our study, comparing with 5mm used by Perri et al. as Cut-Off<sup>13</sup>. In our study male patients were more than female patients. Most of the patients were of age <45 years. Endoscopy found 84.90% varices among them most were male patients. Sensitivity of CT scan among male was 83.4% and 85.5% among female patients. Furthermore, significant association was observed in diagnostic accuracy of CT after the stratification with respect to age, gender and duration of disease at 5% level of significance.<sup>14</sup>

Results of our study support the need to develop a sensitive and non-invasive method of accurately detecting the presence of esophageal varices. Additional benefit of evaluating images obtained for another purpose is to reduce risks of radiation exposure and no additional costs would be incurred. Additional clinical information would be given to the clinicians in a given patient with cirrhosis.<sup>15,16</sup>

## CONCLUSION

Our results have demonstrated that routine liver MDCT allows the evaluation of the presence and grading of esophageal varices. As the accuracy of esophageal varices with clinical relevance on liver MDCT is good, even as detected by endoscopists. MDCT imaging which is highly acceptable to patients prove to be cost-effective and suitable promising tool for screening of esophageal varices in cirrhotic patients.

### Author's Contribution:

Concept & Design of Study:	Abdul Sattar
Drafting:	Sadia Anjum
Data Analysis:	Saeeda Rana
Revisiting Critically:	Abdul Sattar
Final Approval of version:	Abdul Sattar

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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