DIAGNOSTIC ACCURACY OF ULTRASOUND IN DETERMINING ESOPHAGEAL VARICES IN HEPATIC CIRRHOSIS BASED ON SPLENIC SIZE ASSESSMENT

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ABSTRACT

Objective: To determine the diagnostic value of spleen size assessment on ultrasound as predictor of esophageal varices in patients of liver cirrhosis, using upper GI endoscopy as the gold standard.

Study Design: Cross sectional validation study.

Place and Duration of Study: Military Hospital Rawalpindi, from 28 Aug 2012 to 28 Feb 2013.

Material and Methods: Biopsy proven cases of liver cirrhosis with no previous history of upper gastrointestinal tract endoscopy (UGIE) were included in the study. The selected 115 patients underwent USG (ultrasonography) of abdomen and splenic size was measured and documented, followed by screening endoscopy for esophageal varices. Findings of the endoscopic examination were recorded.

Results: As a predictor of esophageal varices, splenic size was 92.1% sensitive and 57.7% specific, with a positive predictive value of 88.1%, negative predictive value of 68.2% and diagnostic accuracy of 84.3%.

Conclusion: The presence of an enlarged spleen is a valid predictor of the presence of oesophageal varices in patients suffering with liver cirrhosis. Therefore, the use of ultrasound abdomen for the assessment of splenic size may help correctly diagnose such patients and help in their timely management.

Keywords: Cirrhosis, Diagnostic accuracy, Oesophageal varices.

INTRODUCTION

Cirrhosis of liver is an irreversible condition unless diagnosed very early. It carries a wide number of complications. Esophageal varices are one of the major complications of liver cirrhosis caused by portal hypertension. Bleeding is the main complication of esophageal varices and carries a high rate of morbidity and mortality[1]. It also places a great amount of load on the health system. The gold standard for the diagnosis of varices is Upper Gastrointestinal Endoscopy (UGIE)[2]. The prevalence of esophageal varices has been reported to be about 80-90% when evaluated by endoscopy. First event of bleeding carries a mortality rate of about 30-50%. About 60% of esophageal varices patients have recurrent or subsequent episodes of bleeding[3]. Due to the high risks associated with bleeding varices it is imperative that a scheme is devised which detects the presence and grades of varices so that proper and timely management of varices is done and the complications of hemorrhage are prevented. Upper GI endoscopy is an invasive procedure which is neither cost effective nor without risks[4]. There are a number of complications that are related with UGIE. i.e. infection, hemorrhage, rupture, so it is the need of the hour to find and practice parameters that are non-invasive in nature so that varices can be detected without the complications of endoscopy[5]. Various non-invasive hematological, biochemical and ultra-sonographic predictors have been suggested which include splenic size, portal vein diameter, serum albumin levels and platelet count, all of these parameters are non-invasive and easy to perform[6,7]. Among all the noninvasive parameters, the splenic diameter has the accuracy for the diagnosis of esophageal varices at a cut off value of 13.1cm (131mm) with sensitivity of 90.2%, specificity of 83.33%, positive predictive value of 96.10% and negative predictive value of 65.22%[8].

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Received: 16 Mar 2017; revised received: 20 Mar 2017; accepted: 21 Mar 2017

In patients of cirrhosis suffering from esophageal varices, splenomegaly is a useful diagnostic tool. The basis of conducting this study can be explained by the pathophysiology that leads to varices. In cirrhotic patients due to fibrosis and nodule formation there is obstruction to the portal venous flow. This obstruction causes an increase in the resistance to the splenic flow. This increase in resistance leads to splenomegaly. Also an increase in the blood flow leads to further increase in the portal hypertension. Due to the portal pressure the portosystemic circulation opens up leading to the formation of esophageal varices and splenomegaly[9].

The aim of this study is to validate the role of splenic size on ultrasound in liver cirrhosis patients as a predictor of esophageal varices. If proven this technique will lead to early diagnosis of the presence and size of oesophageal varices until availability of UGIE and can be applied to patients reporting to OPDs and in those health care facilities where UGIE is not available.

MATERIAL AND METHODS

This Cross sectional validation study was performed in Military Hospital Rawalpindi with the collaborations of department of Radiology and Gastroenterology from 28 August 2012 to 28 February 2013. Biopsy proven cases of liver cirrhosis (histopathology activity index, stage 5 and 6) with no previous history of UGIE were included in the study, patients were from either sex and above 30 years of age. Diagnosed patients of esophageal varices, diagnosed patients of gastric ulcer and patients with history of hematemesis were excluded from study. Sample size was 115 patients. Sampling was non-probability consecutive sampling. The sample size was calculated using incidence and prevalence of the disease. After approval from hospital ethical committee, informed consent was taken from patients. Selected patients go through complete history and examination their profile was entered in the proforma. Each patient underwent USG of abdomen. The patients were postured in the right lateral decubitus position, pillow removed, hands resting by the side of the head, in quiet respiration. A curved array transducer (3.5 MHZ) was placed in the lower left intercostal spaces, the spleen identified and its length measured at its largest dimension. Splenic size was measured and documented. After measurement of spleen size on ultrasound, the patients having spleen larger than 13.1cm were noted. All patients underwent endoscopy within three days at gastroenterology department and the finding were recorded. The specificity and sensitivity was measured in regards to spleen size in the diagnosis of esophageal varices in cirrhotic patients. Upper gastrointestinal endoscopy was used as the gold standard. Findings of the endoscopic examination was recorded. The data was analyzed in SPSS version 10. Mean and standard deviation were calculated for quantitative variables like age and spleen size. Frequencies and percentages were calculated for categorical variables like gender and true positive. A 2 x 2 table was used to determine sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy.

RESULTS

A total of 115 patients were included in the study. There were 82 (71%) male patients and 33 (29%) female patients. The mean age of the patients was 57.10 ± 10.786 years. The minimum age was 30 years while the maximum age was 78 years.

The patients were diagnosed patients of cirrhosis liver on the basis of histopathology. Most of the patients were found to be suffering from viral hepatitis. About 44 (38.26%) were suffering from hepatitis B while 49 (42.61%) were suffering hepatitis C. Other causes included alcoholics 2 (1.74%), mixed viral and alcohol 1 (0.87%), autoimmune 3 (2.61%) and all other causes 16 (13.91%).

After measurement of spleen size on ultrasound, the patients having spleen larger than 13.1cm underwent endoscopy within three days at gastroenterology department Military Hospital

Rawalpindi and the finding were recorded. The specificity and sensitivity was measured in regards to spleen size in the diagnosis of esophageal varices in cirrhotic patients. Upper gastrointestinal endoscopy was used as the gold standard. Diagnostic parameters of the study are given in table-I.

Measurement of Sensitivity, Specificity, Predictive values and Diagnostic Accuracy of Spleen size as a predictor of esophageal varices are presented in table-II.

Table-I: Showing diagnostic parameters of the study.

Splenic size	Upper GI endoscopy	
	Esophageal varices present	Esophageal varices absent
Above normal range	True positive (82)	False positive (11)
Within normal range	False negative (7)	True negative (15)

Table-II: Measurement of sensitivity, specificity, predictive values and diagnostic accuracy of spleen size as a predictor of esophageal varices.

Parameters	Value (%)
Sensitivity	92.1
Specificity	57.7
Positive predictive value	88.1
Negative predictive value	68.2
Diagnostic accuracy	84.3

DISCUSSION

Assessment for enlarged spleen is a safe and reliable tool in the diagnosis of esophageal varices in liver cirrhotic patients[10]. This fact has also been reiterated in our study. In this study, the splenic size more than 13.1 centimeter had high sensitivity and good specificity. The diagnostic accuracy was 84.3%.

A study by Sharma et al proved that liver cirrhosis patients with splenomegaly more than 14 cm in size were positive for esophageal varices[11]. He found a direct relation between the size of the spleen and varices. In our study we consider splenomegaly more than 13.1cm.

Chang et al in his study derived the same results as in our study[12]. Chang et al on the other hand also took into account alcoholism and ascites. Giannini et al worked on non-invasive parameters for the diagnosis of varices in cirrhotic patients[13]. He combined splenic size with platelet count ratio so he was able to achieve greater sensitivity and specificity. From the above discussion it is clear that the splenic size is proportional to the size of the esophageal varices. The sensitivity is very high in all the studies including our study. Whereas the specificity is relatively less due to the fact that when spleen size is less than 13.1cm small can be missed. Thus it concludes that it is difficult to diagnose varices when spleen size is normal (low specificity). But at the same time one can confidently diagnose varices if there is splenomegaly in cirrhotic patients (high sensitivity). Increased specificity was found by researchers like Giannini E etaland some others when they combined splenic size with platelet count ratio[13]. Thus achieving better results in terms of specificity. One other reason that can explain the lower level of specificity may be that those patients may just be having portal hypertension and may not have developed varices at that point in time.

While considering the other parameters in our study, 7 out of 115 cases were found false negative. On ultrasound the spleen was found to be normal or not enlarged. So meaning thereby that in these patients no varices should be present. But on the contrary it was found that on

UGIE they had varices. Upper gastrointestinal endoscopy is considered the gold standard in this case. So in these seven cases I was proved wrong. The seven false negative cases may be explained by the fact that there is a lot of discrepancy in the size of spleen in different literature[14]. Also some people have small splenic size. So as portal hypertension develops the spleen size increases but due initially smaller size they still remain within the normal limits. Some studies have taken splenomegaly as greater than 12 cm while others have taken it as much as 14 cm. In our study splenomegaly is taken as greater than 13.1 cm. This case was selected based on vigilant and through revision of the available text. There is no set criteria for splenomegaly and difference of opinion exists.

Literature is also available that suggests the use of splenic index. It measures the spleen size not only in cranio-caudal diameter but in three dimensions. The three dimensions are measured and their sum is taken. The normal splenic index is between 120-480 ccm[15]. So it is recommended that splenic index would be a better diagnostic tool to measure splenomegaly in patients of esophageal varices secondary to cirrhosis[16]. The cases in which the spleen size was normal and they do not have varices were called the true negative cases. The cases were than confirmed on UGIE as having no varices. 15 patients were found to be true negative in our study. All these patients were confirmed cases of cirrhosis so why there was no portal hypertension and in turn enlarged spleen. It can be hypothesized that portal hypertension may be in an early stage and hence splenomegaly has yet not destroyed. It also proved that esophageal varices are present when there is splenomegaly.

Many studies have concluded that ultrasound is an accurate modality in diagnosis of cirrhosis and later on esophageal varices based on splenic size.

In this single center study only a single non invasive parameter was used - splenic size. Many other studies have employed more than one parameter simultaneously. Some of the researchers have used a combined modality i.e. splenic size with platelet count ratio[17]. A number of studies have been conducted on portal vein diameter, platelet count, albumin levels, ascites and Doppler indices with promising results[18]. We should also strive to find better non-invasive procedures either alone or in combination so that esophageal varices may be diagnosed accurately when upper gastrointestinal endoscopy is not readily available. It would reduce the burden on the gastroenterology departments in terms of both cost and workload.

No study investigating the association of splenic size for the assessment of esophageal varices has been reported in the literature. Therefore, compresion of the results of the present study with local data could not be done.

CONCLUSION

The presence of an enlarged spleen is a valid predictor of the presence of oesophageal varices in patients suffering with liver cirrhosis. Therefore, the use of ultrasound abdomen for the assessment of splenic size may help correctly diagnose such patients and help in their timely management.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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