

Original Article

Correlation of Ultrasonographically Measured Splenic Size with Endoscopic Grading of Esophageal Varices in Cirrhosis of Liver

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Abstract:

Background: Cirrhosis is the end stage of chronic liver disease, resulting in formation of fibrous tissue, derangement of liver architecture and ultimately results in portal hypertension and its complication.

Objective: To find out the correlation between splenic size and endoscopic grading of esophageal varices in diagnosed cases of cirrhosis of liver.

Methods: This prospective observational cross-sectional study was carried out in the Department of Radiology and Imaging in collaboration with GHPD, BIRDEM, Dhaka. 110 liver cirrhosis patients with or without esophageal varices diagnosed by endoscopy of UGIT referred to the department of Radiology and Imaging were included in this study on the basis of selection criteria.

Result: The following observations and results were obtained in this study the mean age was 44.81 (± 14.42) years, minimum age was 18 years and maximum age was 65 years. Majority 69% were male and 31% were female. Esophageal variceal grading of the study population majority 47(42.73%) were grade I, 24(21.82%) were grade II, 16(14.55%) were grade III, 12(10.91%) were grade IV and 11(10%) were no varices. Splenic size by ultrasonography, majority 66(60%) were 12-14.9 cm, 37(33.64%) were ≥ 15 cm and 07(6.36%) were < 12 cm. In splenic size ≤ 15 cm, grading of esophageal varices, 15.07% had no varices, 60.27% had grade I, 20.55% had grade II, 2.74% had grade III and 1.37% had grade IV. In splenic size ≥ 15 cm grading of esophageal varices, 8.11% had grade I, 24.32% had grade II, 37.84% had grade III and 29.73% had grade IV. That means there is a positive correlation between ultrasonographically measured splenic size and endoscopic grading of esophageal varices in liver cirrhosis patients.

Conclusion: Positive correlation was found between ultrasonographically measured splenic size with endoscopic grading of esophageal varices.

Key words: Chronic liver disease, Esophageal varices (EV), Cirrhosis.

Introduction

Cirrhosis is the end stage of chronic liver disease, resulting in formation of fibrous tissue, derangement of liver architecture, and nodule formation. Cirrhosis hampers liver function and results in portal hypertension. Portal hypertension is associated with development of a hyperdynamic circulation

and complications such as ascites, dilatation of portal vein, splenomegaly, formation of esophageal and gastric varices, variceal hemorrhage, ascites, hypersplenism, encephalopathy etc. During hemodynamic catheterization, patients with cirrhosis and EV have a hepatic venous pressure gradient of at least 10–12 mmHg¹. EV are present at diagnosis in approximately 50% of cirrhotic patients, being more common in Child-Pugh class C patients compared to Child-Pugh class A patients (85% versus 40%)^{1,2}. De novo formation of varices occurs at a rate of 5% per year, with a higher incidence in patients continuing to consume alcohol or with worsening liver function. Once varices form, they enlarge from small to large at a rate of 5–12% per year and bleed at a rate of 5–15% per year². The greatest bleeding risk is seen in large varices classified as being >5 mm diameter and is also influenced by liver disease severity as assessed by Child-Pugh score, and by the presence of red wale markings on varices at endoscopy.

Reports from the 1940's to the 1980's demonstrate poor outcomes from variceal bleeding with mortality rates between 30–60%³⁻⁵, but studies suggest that the outcomes have improved over the last few decades^{6,7,8}. Although mortality

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from a bleeding episode has decreased with improved endoscopic and radiological techniques together with new pharmacologic therapies, a 20-30% mortality means that bleeding from EV remains of significant clinical importance⁹. Early diagnosis of varices before the first bleed is essential as studies of primary prophylaxis clearly show that the risk of variceal haemorrhage can be reduced by 50% to about 15% for large esophageal varices¹⁰. Current guidelines recommend that all cirrhotic patients should be screened for varices at diagnosis, with follow up every 2-3 years for patients without varices (depending upon liver disease severity) and 1-2 years for patients with small varices, to assess for enlargement of varices and need for prophylactic treatment¹¹. Upper Gastrointestinal endoscopy (UGIE) remains the gold standard for screening, but this test is not without its own limitations. There is conflicting evidence with regard to the interobserver agreement for endoscopic diagnosis of variceal presence, grade, or presence of red signs¹²⁻¹⁴. The current guidelines cause a significant burden and cost to endoscopy units and necessitate patients having repeated unpleasant procedures even when up to 50% may still not have developed EV 10 years after the initial diagnosis².

The spleen parenchyma is extremely homogeneous and it has a uniform mid-to-low echogenicity. When the spleen enlarges, it can be more echogenic. Splenomegaly commonly accompanies portal hypertension and is a noteworthy finding^{15,16}. A maximum cephalo-caudal measurement exceeding 12 cm indicates enlargement with a high degree of reliability¹⁷.

If it is possible to correlate the development of EV with splenic size by noninvasive means such as USG this will reduce the number of endoscopies required for diagnosis of portal hypertension.

Grading of EV was done¹⁸:

Grade-I- Small varices without luminal prolapse.

Grade-II- Moderate-sized varices showing luminal prolapse minimally obscuring the gastro-esophageal junction.

Grade-III- Large varices showing luminal prolapse substantially obscuring the gastro-esophageal junction.

Grade-IV- Very large varices completely obscuring the gastro-esophageal junction.

Methodology:

This prospective observational cross-sectional study was carried out in the Department of Radiology and Imaging in collaboration with GHPD, BIRDEM, Dhaka. The study was carried out over a period of one year from 1st March 2015 to 29th February 2016. Liver cirrhosis patients with or without EV diagnosed by endoscopy of UGIT referred to the department of Radiology and Imaging were included in this study on the basis of selection criteria.

Inclusion Criteria are the following

1. Diagnosed cases of cirrhosis of liver.
2. Endoscopy of upper gastro-intestinal tract done.
3. Adult patients of both sexes.

Exclusion Criteria are the following

1. Patients suffering from acute liver failure,
2. Active gastro-intestinal tract bleeding.
3. Patients who have done endoscopic band ligation (EBL).

After taking written consent 110 patients with liver cirrhosis were included in this study. Diagnosis of liver cirrhosis was based on combination of clinical signs & symptoms, laboratory findings (deranged coagulation profile, reversal of albumin/globulin ratio) and Ultrasonographic findings (size and echogenicity of the liver). Endoscopy was done in the department of gastroenterology. Ultrasonogram was done by the researcher first by Hitachi Aloka F-37, Aloka prosound-6, Simens Sonoline Antares & confirmed by a radiologist who did not know the finding of endoscopy. Splenic size was measured ultrasonographically by placing the patient in supine position, using 2 - 5 MHz curvilinear transducer in the coronal plane of section posteriorly in one of the lower left intercostal spaces. The patient was examined in various degrees of inspiration to maximise the window to the spleen. The plane of section was then be swept posteriorly and anteriorly to view the entire volume of spleen. The average adult spleen was measured 12 cm in length.

Statistical analyses were carried out by using the Statistical Package for Social Sciences version 20.0 for Windows (SPSS Inc Chicago Illinois USA) and Microsoft Excel were utilized for data management and analysis. Exploratory data analysis was carried out to describe the study population where categorical variables were summarized using frequency tables and continuous variables were summarized using measures of central tendency and dispersion such as mean, median, percentiles and standard deviation. To determine association chi squared tests was used. Means and proportions were compared with Chi-square (χ^2) and t-Test. A p-value of less than 0.05 was considered statistically significant.

Results:

Total 110 patients with liver cirrhosis were included in this study. Mean age was 44.81 (\pm 14.42) years, minimum age was 18 years and maximum age was 65 years (Table 1). Among them majority 69% were male and 31% were female.

Table 1

| Age in years | Number | Percentage |
|---------------|----------------------|-----------------|
| 18-20 yrs | 09 | 08.2 |
| 21-30 yrs | 08 | 07.3 |
| 31-40 yrs | 25 | 22.7 |
| 41-50 yrs | 38 | 34.5 |
| 51-60 yrs | 09 | 08.2 |
| 61- 65 yrs | 21 | 19.1 |
| Total | 110 | 100.0 |
| Mean \pm SD | 44.81 (\pm 14.42) | Range 18-65 yrs |

Table 2 shows baseline laboratory findings of the study population (n=110).

| | Mean | Std. Deviation | Minimum | Maximum |
|-------------------------|-------------|-----------------------|----------------|----------------|
| Albumin (gm/L) | 28.36 | ±7.43 | 17.00 | 44.00 |
| Bilirubin (mg/dl) | 6.80 | ±7.24 | 01.00 | 26.90 |
| Prothrombin time (sec) | 16.66 | ±2.96 | 12.10 | 22.40 |
| Platelet count (/cu mm) | 136345.45 | ±78530.35 | 38000.00 | 320000.00 |

Table 3 shows EV grading of the study population, majority 47(42.73%) were grade (I).

| | Number | Percentage |
|-------------|---------------|-------------------|
| No varices | 11 | 10.00 |
| Grade (I) | 47 | 42.73 |
| Grade (II) | 24 | 21.82 |
| Grade (III) | 16 | 14.55 |
| Grade (IV) | 12 | 10.91 |
| Total | 110 | 100 |

Table 4 showed splenic size by Ultrasonography, majority 66(60%) were 12-14.9 cm.

| | Number | Percentage |
|------------|---------------|-------------------|
| < 12 cm | 07 | 6.36 |
| 12-14.9 cm | 66 | 60.00 |
| ≥ 15 cm | 37 | 33.64 |
| Total | 110 | 100.0 |

Table 5 shows relation between grading of EV with splenic size. Here splenic size by cm was increased with high esophageal grade and that was statistically significant.

| EV | Splenic size by cm | | | Total n (%) | X² | p value |
|-------------|---------------------------|-----------------------|-------------------|--------------------|----------------------|----------------|
| | < 12 cm n (%) | 12- 14.9 n (%) | ≥ 15 n (%) | | | |
| no varices | 06(85.7) | 05(7.6) | 00 | 11(10) | 49.13 | <0.001 |
| Grade (I) | 01(14.3) | 46(69.7) | 00 | 47(42.7) | 49.53 | <0.001 |
| Grade (II) | 00 | 14(21.2) | 10(27.1) | 24(21.8) | 2.56 | 0.27 |
| Grade (III) | 00 | 01(1.5) | 15(40.5) | 16(14.5) | 30.32 | 0.001 |
| Grade (IV) | 00 | 00 | 12(32.4) | 12(10.9) | 26.57 | 0.001 |
| Total | 07(100) | 66(100) | 37(100) | 110(100) | | |

Table 6 shows correlation between splenic size with grading of EV and it was statistically significant (p<0.001).

| | Correlation Coefficients | T | P value |
|--------------------|---------------------------------|----------|----------------|
| Splenic size vs EV | 0.737 | 11.340 | <0.001 |

Figure 1 shows positive correlation between splenic size with grading of EV. If splenic size is increased then grading of EV is increased and that was statistically significant.

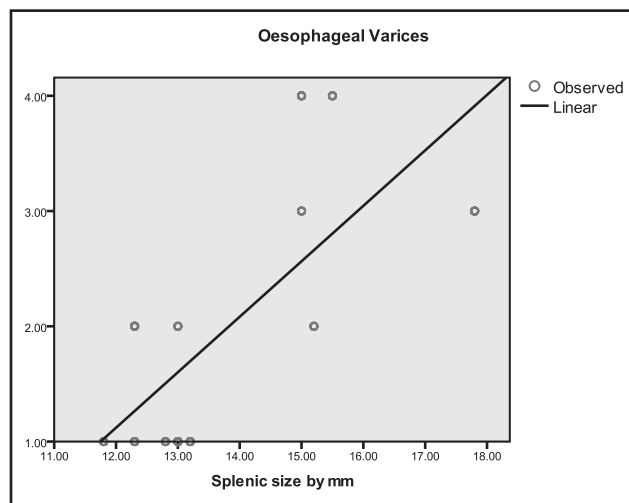


Figure 1

Discussion

Esophageal variceal bleeding is one of the most dreaded complications of cirrhosis because of its high mortality. Prevention of esophageal variceal bleeding remains at the forefront of long-term management of cirrhotic patients. But performing endoscopy in every patient is cumbersome and costly. Splenic size could be good predictor of esophageal varices. This cross-sectional study took place in department of Radiology and Imaging, BIRDEM hospital, Dhaka. Purposive sampling technique (n=110) was used and liver cirrhosis patients with or without EV diagnosed by endoscopy of Upper GIT referred to the department of Radiology and Imaging was included in this study.

In this study mean age was 44.81 (±14.42) years, minimum age was 18 years and maximum age was 65 years. Majority 69% were male and 31% were female. Mean albumin level were 28.36(±7.43) (gm/l), mean bilirubin 6.80(±7.24) (mg/dl), mean prothrombin time 16.66 (±2.96) sec. In a study Sakr et al. showed they were 66 males (55%) and 54 females (45%) with a mean age of 53.6 ± 1.2 years (range 44-63 years)¹⁹. In another study Mandal et al. found average serum albumin level was 2.76 ± 0.585 gm/dl, average platelet counts were 1,11,000 ± 2,840 and 2,15,000 ± 5,500/cu mm of blood in the same groups respectively¹⁸.

In our study EV grading of the study population majority 47(42.73%) were grade (i), 24(21.82%) were grade (ii), 16(14.55%) were grade (iii), 12(10.91%) were grade (iv) and 11(10%) were no varices. Sakr et al. study showed grading of EV among studied patients showed that ten cases (14.9%) had grade I, 18 (26.9%) had grade I-II, 8 (11.9%) had grade II, 16 (23.9%) had grade II-III, 11 (16.4%) had grade III, 4 (6%) had grade III-IV EV. None of enrolled patients had grade IV EV¹⁹.

In present study splenic size by ultrasonography majority 66(60%) were 12-15 cm, 37(33.64%) were ≥15 cm and

07(6.36%) were < 12 cm. In study of Sudha Rani et al (2015) study showed when cut off value for spleen size taken as 15 cm, 45 patients out of 65 patients (69%) with varices found to have Spleen size > 15 cm. 25 patients out of 30 patients (83%) with large varices found to have spleen size > 15 cm²⁰.

In current study showed in splenic size ≤ 15 cm grading of EV, 15.07% had no varices, 60.27% had grade (i), 20.55% had grade (ii), 2.74% had grade (iii) and 1.37% had grade (iv). In splenic size ≥ 15 cm grading of EV, 8.11% had grade (i), 24.32% had grade (ii), 37.84% had grade (iii) and 29.73% had grade (iv). That means whereas splenic size increase than EV grade is high (p <0.001) that was statistically significant. Nemichandra et al found that there was a positive correlation between grading of EV and splenic size²¹. Splenic size of >131.5mm and >131.29mm were associated with presence of esophageal varices in cirrhosis as studied by Esmat and Omran and Mandal et al respectively^{18,22}. In Umar et al. (2015) a splenic size of >13 cm was found in 54 (75%) cases having mean splenic diameter of 14.5 cm (±2.39). Level of significance was determined by application of Pearson chi square (p-value <0.001)²³.

In current study positive correlation between splenic size with grading of EV. If splenic size is increased then grading of EV is increased that was highly statistically significant. Platelet count < 88 x 103 / uL was found to be significantly associated with presence of varices by Zaman et al²⁴.

Gil et al identified esophageal varices in 70% cases when surveillance endoscopy was performed only in cirrhotic patients with platelet count < 140, 000 u/L INR > 105 and portal vein diameter > 13 mm²⁵. Schepis et al found in their study in cirrhotic patients that prothrombin activity < 70%, platelet count < 100 x 109/L, portal vein diameter > 13 mm are non-invasive predictors of varices²⁶. Sarwar et al found that Serum Albumin <2.95 gm/dL platelet count <88 x 103/uL portal vein diameter > 11 mm are non-endoscopic predictors of varices²⁷.

In Mandal et al. study, it was also found that in patients with gastro- esophageal varices, grading of varices directly correlated with portal vein diameter and spleen size. (r = 0.707 and 0.467 respectively). That implied, when portal vein diameter and spleen size increased, EV also transformed to higher grades. Average portal vein diameter and spleen size in higher grade varices were 14.43 ± 0.86 mm and 15.36 ± 2.14 cm¹⁸. In a study by Schepis et al. portal vein diameter 13 mm was associated with higher grade varices²⁶. Sharma and Aggarwal had noted that a clinically palpable spleen was associated with high grade varices; however, they did not measure the splenic size radiologically²⁸.

Splenomegaly and portal vein diameter are also reliable predictors of variceal hemorrhage, in a study carried out by Mandal et al. it has been shown that grading of EV also correlate with splenic size and portal vein diameter. In their study average portal vein diameter and splenic size in high grade varices were 14.43 ± 0.86 mm and 15.36 ± 2.14 cm¹⁸.

Limitation:

1. The present study was conducted during short period of time.
2. Small sample size was also a limitation of the present study.

Conclusion:

There is a positive correlation between ultrasonographically measured splenic size with endoscopic grading of esophageal varices. This explains ultrasonographically measured splenic size has good predictive power for non-invasively assessing the presence of EV especially in low resource settings.

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