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Correlation of Liver Elastography with Portal Hypertension Markers (Platelet Count, Spleen Size, and Esophageal Varices): An Observational Study

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ABSTRACT

Background: Portal hypertension is one of the most important complications of chronic liver disease and is associated with splenomegaly, thrombocytopenia, and esophageal varices. Liver elastography has emerged as a useful non-invasive method for assessing hepatic fibrosis and the severity of chronic liver disease. The present study aimed to determine the correlation between liver elastography and portal hypertension markers, including platelet count, spleen size, and esophageal varices.

Methods: This observational study was conducted over 1 year in 50 patients with chronic liver disease attending a tertiary care teaching hospital. Liver stiffness measurement was performed using transient elastography. Platelet count, ultrasonographic spleen size, and upper gastrointestinal endoscopic findings were recorded. Statistical analysis was performed using SPSS version 25. Pearson correlation coefficient and independent t-test were applied for analysis.

Results: Liver stiffness demonstrated a significant negative correlation with platelet count ($r = -0.68$, $p<0.001$) and a strong positive correlation with spleen size ($r = 0.72$, $p<0.001$). Patients with oesophagal varices had significantly higher liver stiffness values than those without varices (28.4±6.5 kPa vs 16.2±4.8 kPa, $p<0.001$).

Conclusion: Liver elastography correlates significantly with portal hypertension markers and may serve as a reliable non-invasive tool for assessing disease severity and identifying patients at risk of portal hypertension complications.

Key-words: Chronic liver disease; Esophageal varices; Liver elastography; Platelet count; Portal hypertension; Splenomegaly

INTRODUCTION

Chronic liver disease (CLD) is an important global health problem and is commonly associated with portal hypertension and its complications, including splenomegaly, thrombocytopenia, and esophageal varices.

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Among these complications, variceal bleeding contributes significantly to morbidity and mortality in cirrhotic patients [1].

Hepatic venous pressure gradient (HVPG) remains the standard method for assessing portal hypertension; however, its invasive nature and limited availability restrict routine use [2,3]. In recent years, transient elastography has gained attention as a simple, rapid, and non-invasive method for evaluating liver stiffness and hepatic fibrosis [2,4]. Increased liver stiffness has been shown to correlate with clinically significant portal hypertension and the presence of esophageal varices [4,5]. Platelet count and spleen size are widely used indirect indicators of portal hypertension in patients with chronic

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liver disease [6,7]. Recent consensus guidelines have also supported the use of elastography-based non-invasive approaches for identifying patients at increased risk of portal hypertension-related complications [8].

Despite the growing availability of non-invasive diagnostic modalities, the assessment of portal hypertension and its related complications remains a clinical challenge in patients with chronic liver disease. Identifying reliable, accessible, and patient-friendly methods for early risk stratification may facilitate timely intervention and improve clinical outcomes. In this context, liver elastography has emerged as a promising tool for evaluating disease severity and monitoring patients with chronic liver disease.

The present study was undertaken to assess the correlation between liver elastography and portal hypertension markers, including platelet count, spleen size, and esophageal varices, in patients with chronic liver disease.

MATERIALS AND METHODS

Study Design, Setting and Population- A prospective observational study was conducted in the Department of Radiodiagnosis, Baba Kinaram Autonomous State Medical College, Chandauli, Uttar Pradesh, India, from January 2025 to December 2025. A total of 50 patients diagnosed with chronic liver disease were included in the study.

Inclusion criteria

- Age >18 years
- Diagnosed cases of chronic liver disease

Exclusion criteria

- Acute liver failure
- Hepatocellular carcinoma
- Portal vein thrombosis
- Previous endoscopic variceal ligation
- Patients receiving beta-blockers

Methodology- Detailed history, clinical examination, and laboratory investigations were performed in all patients.

Liver elastography: Transient elastography (FibroScan) was used to assess liver stiffness. Median liver stiffness values were recorded in kilopascals (kPa).

Platelet count: Platelet count was measured using an automated haematology analyzer and expressed as $\times 10^3/\mu L$.

Spleen size: Ultrasonography of the abdomen was performed, and spleen size was measured along the longitudinal axis in centimeters.

Endoscopy: Upper gastrointestinal endoscopy was performed in all patients to assess for esophageal varices.

Statistical Analysis- The data were input into Microsoft Excel, and SPSS version 25 was used to analyze them. The continuous variables were reported as means and standard deviations (SD). The relationship between liver stiffness and the markers of portal hypertension was assessed using the Pearson correlation coefficient. Comparison of patients with and without varices was done using an independent t-test. Data were believed to be approximately normally distributed as the sample size exceeded 30. All statistical tests were two-tailed, with p-values of 0.05 or lower considered significant.

RESULTS

The present study involved 50 patients who had chronic liver disease. The analysis of demographic, clinical, laboratory, radiological, and endoscopic findings was performed to establish the relationship between liver stiffness, as assessed by transient elastography, and portal hypertension markers.

The average age of the participants in the study was 48.6 years, and most patients were in the fifth and sixth decades. There were 31 (62% of study subjects) male and 19 (38% of study subjects) female patients, respectively, and chronic liver disease cases showed a male prevalence.

The average liver stiffness measured using transient elastography was 24.5 and 7.2 kPa. The average platelet count was 120.6 ± 36.8 × 10^3/uL, and the average spleen size was 14.8 ± 2.1 cm on ultrasonography. 28 (56 %) of the patients undergoing upper gastrointestinal endoscopy had oesophagal varices, as shown in Table 1.

Table 1: Baseline characteristics of study participants

Variable	Value
Total patients	50
Mean age (years)	48.6 ± 12.3
Male	31 (62%)
Female	19 (38%)
Mean liver stiffness (kPa)	24.5 ± 7.2

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Mean platelet count (×10³/μL)	120.6 ± 36.8
Mean spleen size (cm)	14.8 ± 2.1
Patients with varices	28 (56%)

The Pearson correlation analysis revealed that liver stiffness had a negative, statistically significant correlation with platelet count ($r = -0.68$, $p < 0.001$), as shown in Table 2. Patients whose liver stiffness value was greater had lower platelet counts, suggesting that the severity of portal hypertension worsened as liver fibrosis worsened.

The decreased platelet count was more pronounced among patients with liver stiffness exceeding 25 kPa. This finding substantiates the relationship between thrombocytopenia and aggravating portal hypertension caused by hypersplenism and decreasing thrombopoietin production in advanced chronic liver disease.

Table 2: Correlation between liver stiffness and platelet count

Parameter	Correlation coefficient (r)	p-value
Liver stiffness vs Platelet count	-0.68	<0.001

There was also a positive correlation of liver stiffness and spleen size ($r = 0.72$, $p<0.001$). Patients with increased liver stiffness off scale showed a much greater spleen size on ultrasonography.

Liver stiffness values of 27 kPa or more in patients with a spleen size of more than 15 cm indicate that portal venous pressure increases with hepatic fibrosis (Table 3). The correlation between elastography as an indirect measure of portal hypertension and splenomegaly and liver stiffness only confirms this point.

Table 3: Correlation between liver stiffness and spleen size

Parameter	Correlation coefficient (r)	p-value
Liver stiffness vs Spleen size	0.72	<0.001

Of the 50 participants in the study, 28 (56%) had oesophagal varices, and 22 (44%) had no signs of varices during upper gastrointestinal endoscopy. The average liver stiffness in patients with varices was very high compared with control patients (28.4 ± 6.5 kPa vs 16.2 ± 4.8 kPa, $p<0.001$). Esophageal varices were present in most patients with liver stiffness greater than 25 kPa (Table 4). These results suggest that the presence of clinically significant portal hypertension and variceal formation is strongly related to the increase in liver stiffness.

Table 4: Comparison of liver stiffness in patients with and without varices

Group	Mean liver stiffness (kPa)	p-value
With varices (n=28)	28.4 ± 6.5	<0.001
Without varices (n=22)	16.2 ± 4.8	

The current study has revealed a strong correlation between liver elastography and previously established portal hypertension markers. Liver stiffness was significantly negatively correlated with platelet count and positively correlated with spleen size. Moreover, liver stiffness values were significantly higher in patients with oesophagal varices than in varice-free patients.

The results may indicate that liver elastography is a reliable, non-invasive modality that helps predict the severity of portal hypertension and identify patients at risk of complications related to chronic liver disease.

DISCUSSION

Portal hypertension is a common and serious consequence of advanced chronic liver disease and is responsible for several complications that increase patient morbidity and mortality [1]. The present study demonstrated a significant relationship between liver stiffness measured by transient elastography and established markers of portal hypertension, including platelet count, spleen size, and esophageal varices.

In this study, liver stiffness showed a significant negative correlation with platelet count. Patients with higher liver stiffness values had lower platelet counts, which may be explained by hypersplenism and reduced thrombopoietin synthesis in advanced liver disease. Similar associations between thrombocytopenia and worsening portal hypertension have been described in earlier studies [5,6].

A significant positive correlation was also observed between liver stiffness and spleen size. Progressive

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portal hypertension leads to splenic congestion and enlargement, which may explain this finding. Previous studies have similarly reported that spleen-related parameters can reflect the severity of portal hypertension in cirrhotic patients [7].

Another important observation in the present study was the significantly higher liver stiffness values in patients with oesophagal varices compared with those without varices. Earlier studies and meta-analyses have also shown that transient elastography can help predict clinically significant portal hypertension and the presence of esophageal varices [4,8,10]. The recent Baveno VII consensus has further supported the use of non-invasive elastography-based approaches to identify high-risk patients and reduce unnecessary endoscopic screening procedures [9].

Transient elastography has several practical advantages, including rapid assessment, non-invasive nature, reproducibility, and good patient acceptability. Because of these benefits, it may serve as a useful screening tool for evaluating disease severity and portal hypertension in patients with chronic liver disease [10-15].

However, liver stiffness measurements can sometimes be influenced by conditions such as hepatic inflammation, cholestasis, and venous congestion. Therefore, elastography findings should be interpreted in conjunction with clinical examination, laboratory investigations, and imaging findings to provide a more accurate assessment [11,14].

Overall, the findings of the present study support the role of liver elastography as a reliable non-invasive method for assessing portal hypertension and identifying patients at increased risk of related complications in chronic liver disease.

Further large-scale multicenter studies are required to establish standardised liver stiffness cut-off values for predicting clinically significant portal hypertension and oesophagal varices. Future research may also help improve the role of elastography in routine clinical assessment and long-term management of patients with chronic liver disease.

CONCLUSIONS

The present study found that liver stiffness measured by transient elastography was significantly associated with platelet count, spleen size, and the presence of esophageal varices in patients with chronic liver disease. Higher liver stiffness values were associated with lower platelet counts, larger spleen size, and a greater frequency of esophageal varices, indicating increasing severity of portal hypertension. These observations support the usefulness of liver elastography as a simple, non-invasive, and reliable tool for assessing disease severity and identifying patients at higher risk of portal hypertension-related complications. The use of elastography may also help reduce unnecessary invasive procedures, such as repeated endoscopic screening in selected patients.

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REFERENCES

[1] Bosch J, Abraldes JG, Berzigotti A, Garcia-Pagan JC. Portal hypertension and gastrointestinal bleeding. N Engl J Med., 2008; 361(12): 1118-27.
[2] Castera L, Forns X, Alberti A. Non-invasive evaluation of liver fibrosis using transient elastography. J Hepatol., 2008; 48(5): 835-47.
[3] Berzigotti A, Seijo S, Arena U, et al. Elastography in portal hypertension. J Hepatol., 2013; 58(2): 348-57.
[4] Singh S, Venkatesh SK, Wang Z, et al. Diagnostic accuracy of transient elastography in portal hypertension: A systematic review and meta-analysis. Clin Gastroenterol Hepatol., 2017; 15(5): 789-800.

doi: 10.21276/SSR-IIJLS.2026.12.3.44

[5] Giannini E, Botta F, Borro P, et al. Platelet count/spleen diameter ratio for the noninvasive diagnosis of esophageal varices in patients with liver cirrhosis. Gut, 2003; 52(8): 1200-05.

[6] Stefanescu H, Grigorescu M. Noninvasive assessment of portal hypertension in cirrhosis: Liver stiffness and beyond. World J Gastroenterol., 2012; 18(11): 1192-99.

[7] Sharma P, Kirnake V, Tyagi P, et al. Spleen stiffness in patients with cirrhosis in predicting esophageal varices. Hepatol Int., 2013; 7(1): 363-68.

[8] de Franchis R. Expanding consensus in portal hypertension: Report of the Baveno VI Consensus Workshop. J Hepatol., 2015; 63(3): 743-52.

[9] de Franchis R, Bosch J, Garcia-Tsao G, et al. Baveno VII – Renewing consensus in portal hypertension. J Hepatol., 2022; 76(4): 959-74.

[10]Shi KQ, Fan YC, Pan ZZ, et al. Transient elastography: A meta-analysis of diagnostic accuracy in evaluating portal hypertension. Hepatol Int., 2013; 7(1): 62-71.

[11]Deng H, Qi X, Guo X. Diagnostic accuracy of transient elastography for esophageal varices in liver cirrhosis: A meta-analysis. World J Gastroenterol., 2015; 21(10): 3072-81.

[12]Augustin S, Millan L, Gonzalez A, et al. Detection of early portal hypertension with routine data and liver stiffness in patients with compensated cirrhosis. J Hepatol., 2014; 60(3): 561-69.

[13]Colecchia A, Montrone L, Scaioli E, et al. Measurement of spleen stiffness by transient elastography identifies portal hypertension in cirrhosis. Hepatol., 2012; 56(6): 2280-87.

[14]Venkatesh SK, Yin M, Ehman RL. Magnetic resonance elastography of liver: Technique, analysis, and clinical applications. J Magn Reson Imaging, 2013; 37(3): 544-55.

[15]Robic MA, Procopet B, Métivier S, et al. Liver stiffness accurately predicts portal hypertension related complications in patients with chronic liver disease. Aliment Pharmacol Ther., 2011; 34: 953-62.