“SPLEEN STIFFNESS MEASUREMENT IN LIVER CIRRHOSIS PATIENTS FOR NONINVASIVE ASSESSMENT OF ESOPHAGEAL VARICES USING FIBROSCAN”

Gastroenterology

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ABSTRACT

BACKGROUND: Many noninvasive surrogate marker for Portal hypertension or for the presence or grade of esophageal varices were studied. Splenomegaly along with splenic congestion secondary to splenic hyperdynamic circulation is seen secondary to Portal hypertension in cirrhotic patients that can be quantified by elastography.

AIM: The aim of this study was to investigate whether spleen stiffness, assessed by TE, useful tool for grading chronic liver diseases and to compare its performance in predicting the presence and size of esophageal varices in liver cirrhosis patients.

METHODOLOGY: 86 patients with cirrhosis and 80 controls underwent transient elastography of liver and spleen for the assessment of liver stiffness (LSM) and spleen stiffness (SSM). Upper GI endoscopy done in all Cirrhotic patients.

RESULTS: Spleen stiffness showed higher values in liver cirrhosis patients as compared with controls: 58.2 kpa vs 14.8 kpa ($P < 0.0001$) and also found to be significantly higher in cirrhotic patients compared with varices and those without varices (69.01 vs 42.05 kpa, $P < 0.0001$). Liver stiffness was also found to be higher in cirrhotic patients with varices when compared to patients without varices (38.5 vs 21.2 kpa). Using both liver and spleen stiffness measurement we can predicted the presence of esophageal varices correctly.

CONCLUSION: Spleen stiffness can be assessed using transient elastography, higher value correlated well with liver cirrhosis and presence of esophageal varices although it couldn't correlate with grade of Esophageal Varix. Combined assessment of spleen and liver stiffness had better prediction of presence of Esophageal Varix.

KEYWORDS

Cirrhosis, Elastography, Esophageal varices, Spleen stiffness

INTRODUCTION:

Liver cirrhosis is the final stage of any chronic liver disease and its outcomes are modulated by the degree and the consequences of portal hypertension (PH). Clinical investigation of PH include hepatic vein pressure gradient (HVPG), or endoscopy for esophageal varices (EV) screening and grading apart from Doppler Ultrasonogram HVPG value higher than 10 mmHg predicts the presence of EV, while a value higher than 12 mmHg is predictive for variceal bleeding.

Many noninvasive surrogate marker for PH or for the presence or grade of EV were studied, but only a few biochemical markers such as aspartate aminotransferase [AST] to platelets ratio index and platelets count to spleen diameter ratio have been demonstrated to be partially correlated with the presence of EV.

Splenomegaly is a common finding in liver cirrhosis and one should also expect changes in the spleen's density, because of portal and splenic congestion due to the splanchnic hyperdynamic state as well as tissue hyperplasia and fibrosis. These changes may be quantified by elastography.

The aim of this study was to investigate whether spleen stiffness, assessed by TE, is a useful tool for grading chronic liver diseases and to compare its performance in predicting the presence and size of esophageal varices in liver cirrhosis patients with other validated noninvasive approaches (liver stiffness measurement and platelet count to spleen size ratio).

AIMS AND OBJECTIVES:

1. To investigate whether spleen stiffness, assessed by TE, is a useful tool for diagnosing liver cirrhosis.
2. To assess its performance in predicting the presence and size of esophageal varices in cirrhosis patients.

METHODS & METHODOLOGY:

It's a Prospective Study done between the period from June 2018 to

December 2019. 86 cirrhotic patients diagnosed by clinical, biochemical and imaging methods were taken as cases fulfilling inclusion and exclusion criterion and 80 controls attending Medical Gastroenterology department Govt. Stanley Medical College, Chennai were recruited into the study.

All patients underwent transient elastography of both the liver and spleen for the assessment of liver stiffness (LSM) and spleen stiffness (SSM) done by single trained personnel using fibroscan machines. All Cirrhotic patients underwent upper endoscopy by single gastroenterologist blinded with the results of elastography. Institutional ethical committee approval was obtained.

Liver and spleen stiffness measurement

Liver and spleen stiffness measurements were performed using TE (FibroScan). The medium probe was used for all patients. The results were expressed in kilopascals (kPa). Ten successful measurements were carried out on each patient. The success rate was calculated as the number of validated measurements divided by the number of total measurements.

The median value of 10 successful measurements was kept as a representative of the liver stiffness. For assessing the spleen stiffness (SSM) we changed the standard procedure, by having the patient in supine position with his left arm in maximum abduction and by placing the transducer in the left intercostal spaces, usually on the posterior axillary line.

Upper endoscopy

All patients underwent upper endoscopy after written and oral consent. Esophageal varices were graded according to their size as follows: (i) grade 1: small, straight esophageal varices; (ii) grade 2: enlarged, tortuous varices occupying less than one third of the lumen; and (iii) grade 3: large, coil-shaped esophageal varices occupying more than one third of the lumen according to Japanese classification.

STATISTICAL ANALYSIS:

Using SPSS software the elastographic data were expressed as median values. The data were compared using the Mann–Whitney *U*-test and the χ^2 test for continuous and categorical variables, respectively.

RESULTS

In our study baseline characteristics were comparable between cirrhosis and controls. Mean age among cirrhotics was 46.2 years and among controls was 39.5 years. In both the groups Majority were Males comprising of 56(65.1%) among cirrhotics and 45(56%) among controls. Females were 30(33.9%) and 35(44%) among cirrhotics and controls respectively.

In our study major etiology for cirrhosis was related to alcohol (46) followed hepatitis B(19)& hepatitis C(9) , other etiology(12) were Wilsons disease, autoimmune hepatitis, Buddchairi syndrome . Among cirrhotics 19(22.09%) were in Child A , 29(33.72%) were in Child B and 38(44.1%) were Child C.

Table 1: Spleen Stiffness, Liver Stiffness measurements among cirrhotic and controls

Transient Elastography	Cirrrosis (kpa)	Control(kpa)	P value
Spleen Stiffness	58.2	14.8	<0.001
Liver Stiffness	23.1	4.6	<0.001

Table 2: Spleen Stiffness, Liver Stiffness measurements among patients with presence or absence of varices in cirrhosis

Transient Elastography	Esophageal Varices present(kpa)	Esophageal Varices absent(kpa)	P value
Spleen Stiffness	69.01	42.05	<0.001
Liver Stiffness	30.5	21.2	<0.001

The median value of SSM for patients with no varices (V0) was 42.05 kPa, 60.15 kPa

for patients with grade 1 varices (V1), 63.91 kPa for patients with grade 2 varices (V2) and 64.9 kPa for grade 3 varices.

DISCUSSION:

HVPG measurement and endoscopy are considered the standard of care in noninvasive assessment of portal hypertension in patients liver cirrhosis¹.

Until now, platelet count to spleen size ratio and the liver stiffness were validated to predict EV. Although splenomegaly is common in liver cirrhosis, this finding was considered only in terms of size, and not as a complex change⁵.

We used transient elastography to measure the spleen stiffness and we were trying to demonstrate that SSM is a useful tool for grading chronic liver disease. Recently spleen stiffness was identified as a potential surrogate marker for portal hypertension⁴.

As far as the SSM using transient elastography is concerned, only two reports have been presented so far. In first one there was an increase of SSM values in LC patients compared with controls and the strong correlation of SSM for PH⁶. The other one, adding SSM to the usual LSM evaluation of chronic liver disease patients, it concluded that SSM is independent from LSM and its assessment increases the accuracy of TE as a noninvasive diagnostic tool for cirrhosis and PH⁷.

Analysis of spleen stiffness in the study population:

Spleen Stiffness was 58.2kpa among cirrhotic compared to 14.8kpa among controls which was statistically significant and it was comparable to study conducted by stephanscu et al⁶ where was 54.2 kpa among cirrhotic compared to 17.8 kpa among controls .LSM was also high among cirrhotic compared to controls.

Splenic stiffness among patients with esophageal varices was 69.01 compared to 42.05 among cirrhotics without esophageal Varices. It was comparable to study conducted by stephanscu et al⁷ where Splenic stiffness among patients with esophageal varices was 72 compared to 46 among cirrhotics without esophageal Varices. LSM was also high among cirrhotic with varices compared to cirrhotics without esophageal Varices.

The median value of SSM for patients with no varices (V0) was 46.05 kPa , 60.15 kPa

for patients with grade 1 varices (V1), 63.91 kPa for patients with grade 2 varices (V2) and 64.9 kPa for grade 3 varices patients. No significant difference could be observed between V1, V2, V3. In our liver cirrhosis population, SSM was significantly correlated with LSM.

Our data clearly suggest that in the natural history of chronic liver disease, starting from the healthy liver and reaching chronic hepatitis and finally liver cirrhosis, there is a significant increase in spleen stiffness.

CONCLUSION:

Spleen stiffness can be assessed using transient elastography, it's high among cirrhotic patients. In liver cirrhosis patients spleen stiffness can predict the presence, but doesn't correlate with grade of esophageal varices. Esophageal varices better predicted when both spleen and liver stiffness measurements are used.

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Conflicts of interest : None

REFERENCES:

1. Bosch J, Garcia-Pagan JC, Berzigotti A, Abraldes JG. Measurement of portal pressure and its role in the management of chronic liver disease. *Semin. Liver Dis.* 2006; 26: 348–62.
2. Wai CT, Greenon JL, Fontana RJ et al. A simple noninvasive index can predict both significant fibrosis and cirrhosis in patients with chronic hepatitis C. *Hepatology* 2003; 38: 518–26.
3. Bolognesi M, Boscato N. Spleen and liver cirrhosis: relationship between spleen enlargement and portal hypertension in patients with liver cirrhosis. In: Chen TM, ed. *New Developments in LiverCirrhosis Research*. Hauppauge, NY: Nova Science Publishers, 2006; 49–67.
4. Stefanescu H, Lupsor M, Grigorescu M, Procopet B, Maniu A, Badea R. Transient elastography of the spleen as non-invasive assessment of portal hypertension in liver cirrhosis patients. Poster abstract nr 63, Proceedings of EASL Monothematic Conference Portal Hypertension: Advances in Knowledge, Evaluation and Management, Budapest, 2009, p. 130.
5. Merkel C, Gatta A, Arnaboldi L, Zuin R. Splenic haemodynamics and portal hypertension in patients with liver cirrhosis and spleen enlargement. *Clin. Physiol.* 1985; 5: 531–9.
6. Stefanescu H, Lupsor M, Grigorescu M, Procopet B, Maniu A, Badea R. Transient elastography of the spleen as non-invasive assessment of portal hypertension in liver cirrhosis patients. Poster abstract nr 63, Proceedings of EASL Monothematic Conference Portal Hypertension: Advances in Knowledge, Evaluation and Management, Budapest, 2009, p. 130.
7. Di Marco V, Bronte F, Calvaruso V et al. Fibrospleen: measuring spleen stiffness by transient elastography increases accuracy of staging liver fibrosis and of portal hypertension in chronic viral hepatitis (abstract). *Dig. Liver Dis.* 2009; 41: A38.