

## Role of Shear Wave Elastography in Chronic Liver Diseases as a predictor of Gastro-Esophageal Varices with Endoscopic Correlation

BY

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### Abstract

**Introduction:** Liver fibrosis evaluation is very important for treatment and prognosis in patients with chronic liver diseases. The “gold standard” method for liver fibrosis assessment is still considered to be the liver biopsy and histopathology, but in the last years non - invasive methods have increasingly been used, especially ultrasound based elastographic ones. **Objective:** to reveal the value of shear wave elastography in Chronic Liver Diseases as a predictor of Gastro-Esophageal Varices with Endoscopic Correlation.

**Material and methods:** This is a prospective hospital analytic study enrolling 30 patients presented by hematemesis and epigastric pain and diagnosed by abdominal US, real time SWE, PV Doppler at Sohag University Hospital using device (Toshiba Aplio 500) and Esophago-gastroduodenoscopy (EGD) during the period from April 2016 to February 2017.

**Results:** Shear wave was significantly higher among cases compared to controls, there was significant correlation between Shear wave and each of Portal vein diameter, Peak systolic velocity, CBC findings, serology, US findings, oesophageal varices, gastric varices, and Child's classification, but there was nonsignificant relation between Shear wave and each of age, sex, residence of the patient.

**Conclusion:** Shear Wave elastography (SWE) is effective and non invasive tool in prediction presence of oesophageal varices in cirrhotic patients.

**Keywords:** oesophageal varices, Shear Wave elastography (SWE), liver cirrhosis.

### Introduction

Chronic liver diseases are quite frequent in daily practice, either secondary to chronic infection with hepatitis viruses C or B, or with other etiologies, such as alcohol abuse (alcoholic steatohepatitis – ASH) or non alcoholic steatohepatitis – NASH. Other chronic hepatopathies, such as autoimmune hepatitis or primary biliary cirrhosis (PBC) are also often diagnosed in daily hepatological practice

A correct evaluation of the liver fibrosis is very important for treatment

(especially for viral etiology), prognosis assessment, and long term follow-up (1). Real-time shear wave elastography (SWE) is a novel, non invasive method to assess liver fibrosis by measuring liver stiffness. SWE has the advantage of being able to image liver stiffness in real time because the shear waves are generated by US pushes. Additionally, the SWE image is guided by a higher frame-rate B-mode image. This method could result in a more accurate score of fibrosis stage resulting from the SWE and B-mode image guidance (2).

### **Aim of the study**

To evaluate the diagnostic accuracy of shear wave elastography (SWE) for selecting patients who are at risk of esophageal varices and high risk of bleeding in cirrhotic patients.

### **Methods and materials**

This is a prospective hospital analytic study.

#### **Patient selection:**

This study of 30 adult patients presented by hematemesis and epigastric pain the majority of our cases were males (80%) with only 6 cases (20%) were females. The mean age of our study population was 55 years, with a wide range from 25-75 years and diagnosed by abdominal US, real time SWE, PV Doppler at Sohag University Hospital using device (Toshiba Aplio 500) and Esophago-gastroduodenoscopy (EGD), both sex are included in this study.

#### **Ethical considerations:**

All examinations were done confidentially. An informed consent was obtained from every patient included in this study. Approval of Ethical Committee at Faculty of Medicine Sohag University.

#### **1- EGD protocol:**

Esophagogastroduodenoscopy (EGD) was performed after overnight fasting under conscious sedation and nasal oxygen using EG-2985 scope, Patients were placed in the left lateral position, and the endoscope was inserted into the esophagus and passed to the stomach down to second part of the duodenum.

Endoscopic findings of esophageal varices (EV) and gastric varices (GV) were classified according to the criteria proposed by the Japanese

Society for Portal Hypertension. The form (F) of GV or EV was classified as: straight small-calibered varices (F1), moderately enlarged, beady varices (F2), or markedly enlarged, nodular, or tumor-shaped varices (F3). According to location (L), EV were classified as: varices at the lower 1/3 of the esophagus (Li), at the middle 1/3 of the esophagus (Lm), or at the upper 1/3 of the esophagus (Ls). According to location, GV were classified as: adjacent to the cardiac orifice (Lg-c), distant from the cardiac orifice (Lg-f), or extending from the cardiac orifice to the fornix (Lg-cf).

Patients with active or recent variceal bleeding or high risk of bleeding received endoscopic management for the varices according to their criteria including site, size, location and other risk stigmata of bleeding.

All endoscopic procedures were performed by single operator with 8 years experience in endoscopic management of variceal hemorrhage.

#### **2- Shear Wave Elastography (SWE):**

The patient is placed in supine position with the right arm in maximum abduction. The convex probe is placed between the ribs, using the best acoustic window available for liver evaluation. The SWE™ box has to be placed in vessel free parenchyma, in a uniform zone, not too close to the liver capsule. The patient has to hold breath in the expiration phase to acquire a stable image.

#### **Statistical analysis:**

Data analysis was performed using SPSS version 16 continuous data were expressed.

**Results**

**AS REGARD SHEAR WAVE ELASTOGRAPHY AND ENDOSCOPIC FINDINGS:**

the majority of our cases were males (80%) with only 6 cases (20%) were females. The mean age of our study population was 55 years, with a wide range from 25-75 years, and the majority of cases (75%) were over 45 years as shown by the 25 percentile). A little more than half of the cases lived in rural areas, and up to 47% of them were living in urban areas in Sohag governorate. Nearly two thirds of our cases had HCV infection, with 4 cases had HBV infection and the remaining quarter (7 cases, 23.3%) were negative for both HBV and HCV. Non of our cases had combined HBV and HCV infection. Abdominal ultrasound of our study cases shows that shrunken liver was seen in one third of our cases (30%). Regrading spleen, splenomegaly was seen in over 76% of cases, most of them was moderate splenomegaly, with non cases had huge splenomegaly. Ascites was present in half of cases, and those were equally divided into mild, moderate and marked ascites.

**Table (1) Shear wave between cases and controls**

	Group	N	Mean	Std. Deviation	Std. Error Mean
Shear wave	Case	30	41.750	11.5413	2.1072
	Control	10	16.500	3.6591	1.1571

T test = 10.504, p value <0.001 (HS)

This table shows that the Shear wave was significantly higher among cases compared to controls.



Figure (1) shows Esophageal varices located at the lower 1/3 of the esophagus (Li), medium size (F2), bluish in color (Cb) with positive red color sign (RC+ve).

Figure (2) shows SWE findings:20kPa

**Discussion**

Chronic liver diseases are an important public health issue. Regardless of the nature of liver injury, the pattern of progression toward inflammation, necrosis, fibrosis and then cirrhosis, dysplasia and possibly hepatocellular

carcinoma is observed. An important step in this process is fibrogenesis. The development of liver cirrhosis and portal hypertension (PH), one of its major complications, are structural and functional alterations of the liver,

occurring in many patients with chronic liver diseases (CLD)(3).

Regarding correlation between SWE and other data, we found that the Shear wave was significantly higher among cases compared to controls, there was significant correlation between Shear wave and each of PVD, PSV, CBC findings, serology, US findings, oesophageal varices, gastric varices, and Child's classification, but there was non significant relation between Shear wave and each of age, sex, residence of the patient.

Our findings were similar to results of *Hahn et al. (2013)*(4) as their results showed that SW were significant correlated with PLT and ALB which reflected the extent of portal hypertension and synthesis function of liver, also in their study SW appeared to be moderately correlated with bilirubin (TBIL or DBIL).

A recent meta-analysis *Shi et al. (2013)*(5) which included 5 studies of the diagnostic accuracy of SWE for significant portal hypertension, also indicated that SWE had a high accuracy for the detection of significant portal hypertension. The hierarchical summary receiver operating characteristic (HSROC) for the diagnosis of significant portal hypertension by SWE was 0.93 (95% CI: 0.90-0.95). The Fagan plot analysis showed that SWE could be used to diagnose significant portal hypertension (when pre-test probability = 50%), with 81% probability of correctly diagnosing significant portal hypertension following the "positive" measurement.

There is significant relation between esophageal varices and shear wave elastography as high Kps increase the incidence of esophageal varices.

Also there is relation gastric varices and shear wave elastography we found that high Kps increase incidence of gastric varices. The severity of the varices correlate with high Kps at more than 45Kps. To our knowledge no research in literature has been done on the use of SWE to predict incidence of esophageal and gastric varices, so no comparison to previous research.

### Conclusion

The current study describes Shear Wave elastography (SWE) is effective and non invasive tool in differentiation between cirrhotic and non cirrhotic patients at cut off point 26 and can predict presence of oesophageal varices in cirrhotic patients.

### Conflicts of Interest

The authors declare

\*Small numbers of the patients.

\*Other parameters not included in the study as hepatic venous pressure.

\*No comparison between SWE and fibroscan, However it is the first study in our locality to detect cirrhosis and esophageal varices.

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