ORIGINAL ARTICLE

Comparison Between Shear Wave Elastography and Serological Findings for Evaluation of Fibrosis in CLD Patients

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ABSTRACT

Background: With advancement in the field of medicine yet there is a need of non-invasive method for detecting fibrosis in patients suffering from chronic liver disease.
Aim: To find an agreement between Shear Wave Elastography and APRI & FIB-4 score in patients of CLD.
Study design: Descriptive, cross-sectional.
Methodology: The current project was conducted at department of Radiology, Shaukat Khanum Hospital, Lahore from 01-06-2019 to 1-12-2019. Current study comprised of 80 patients of both genders. Stages of fibrosis were defined on SWE. FIB-4 and APRI score were determined using serological markers. The collected data was analyzed by using SPSS version 24. Mean with standard deviation was calculated for age, AST, ALT, Platelet count.
Results: In our study, 62.5% were males while 37.5% were females. With mean age of 43.47 SD±13.85. APRI & FIB-4 scores predicted F4 patients using cutoff values of 0.47 (Sn. 72%, Sp. 70%) and 1.27 (Sn. 78%, Sp. 73%) respectively.
Conclusion: The diagnostic accuracy of FIB-4 for predicting liver fibrosis was better than that of APRI in all stages of liver fibrosis when compared with SWE.
Keywords: APRI, FIB-4, Liver Fibrosis, Chronic Liver Disease and Shear Wave Elastography.

INTRODUCTION

Liver cirrhosis is the basic cause of death and disability globally. Its reported incidence was 6–7% among adult population typically associated with non-alcoholic fatty liver disease according to literature review[1,2]. In the following study the stages of fibrosis were defined according to Greek National Insurance Program[3]. Those with no risk factors had only a 0.4% prevalence of significant liver fibrosis.

Traditionally, liver biopsy was considered as the 'gold standard' procedure for identification of liver impairments like fibrosis and cirrhosis[4]. Liver histological scoring systems are used to assess liver architecture and fibrosis[5,6]. Hence, it is invasiveness so it encouraged researchers to look for noninvasive methods of evaluating stages of liver fibrosis.

Non-invasive liver tests include indirect serum markers, direct serum markers and imaging modalities[7]. The most widely used imaging modality is transient elastography (TE) or Fibroscan. It is an alternative technique for biopsy as it is safe and noninvasive. SWE is an innovative method that is established on shear waves applied on a diagnostic ultrasound system as revealed by literature review[8].

However, use of SWE in Pakistan, being a developing country with limited resources, is low. Few studies are available which show various degrees of success, safety and efficacy of SWE. Therefore, the present study was planned to compare the performance of ultrasound based SWE with routine serological markers; APRI and FIB-4 for evaluating liver fibrosis in the patients with chronic liver disease.

The objective of the study was to find an agreement between Shear Wave Elastography and APRI & FIB-4 score in patients of CLD**.**

METHODOLOGY

Current project was conducted at department of Radiology, Shaukat Khanum Hospital, Lahore from 01-06-2019 to 1-12-2019 following the approval by the Hospital's Ethical Committee. Current study comprised of 80 patients of both genders. FIB-4 and APRI score were determined using serological markers. Consent was taken from subjects. Willing patients who underwent fibro-scan or ultrasound shear wave elastography were enrolled. Patients who were unwilling to SWE and had other medical issues like ascites, severe obesity and pregnancy were ruled out. To interrogate the liver, place the ROIs at a least of 1cm depth underneath the liver capsule to evade reverberation artifacts. The ROI sample box was a small area with a fixed stature of 12 mm that could move up to 8cm deep from the skin surface, the size of the box modify automatically from 5mm near surface of transducer to 9.3mm at 8cm depth. Sample box was positioned with care to elude vascular structures. The rate of the generated SW (m/s) is calculated by observing tissue disarticulation over time.

Statistical analysis: Data analyzed by SPSS version 24. Qualitative data e.g. gender, SWE (ordinal) was presented in the form of frequencies and their respective percentages. Parameters like age, AST, ALT, Platelet count, Elastographic values, APRI/FIB-4 score were presented as mean±SD. ROC curve was generated to show the connection/trade-off between clinical sensitivity and

specificity for every possible cut-off in liver fibrosis between shear wave elastography and serological finding.

RESULTS

General parameters like age and gender for all enrolled patients in present study were presented as frequency and percentage with their respective means±SD in table-1.
Results for the serum markers of chronic liver disease among 80 subjects were shown as means±SD with their minimum and maximum values in table-2.
Results for Shear wave elastography to evaluate liver fibrosis stages among 80 enrolled patients was shown as frequency and percentage in table-3.
Results for the serum marker (ALT) with respect to shear wave elastography among 80 enrolled patients was shown as means±D in table-4.

Implementation of APRI score in the likelihood of F4 patients consistent with S.W.E we assume F0, F1, F2 and F3 as one group and F4 in another group, the area under the receiver operator characteristic curve (AUROC) was 0.74 (95% CI 0.63-0.85; P< 0.001). With APRI optimal cut off value >0.46, we found that F4 fibrosis having sensitivity 0.72 (72%) and specificity 0.70 (70%) (Figure 1).

Implementation of FIB-4 score in the likelihood of F4 patients consistent with S.W.E we assume F0, F1, F2 and F3 as one group and F4 in another group then AUROC was 0.795 (95% CI 0.698-0.89; P< 0.001). With FIB-4 optimal cut off value >1.27, we found that F4 fibrosis having sensitivity 0.78 (78%) and specificity 0.73 (73%) as shown in Figure-2.

Figure 1: Area under receiver operator Curve for Performance of APRI score to S.W.E

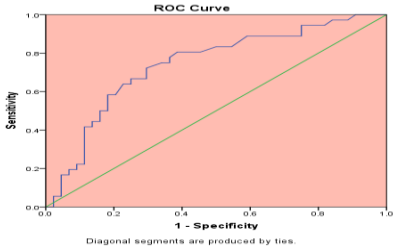

Figure 2: Area under receiver operator Curve for Performance of FIB-4 score to S.W.E

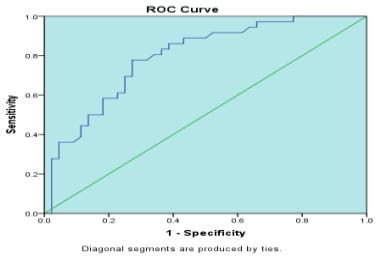

Table 1: Baseline parameters among enrolled patients

Variables	Groups	Frequency	%age
Gender	Males	30	37.5
	Females	50	62.5
	Total	80	100.0
Age (Mean±SD)	43.47 ± 13.85 years		

Table 2: Serum Markers Of Chronic Liver Disease Among All Enrolled Patients

Variables	Min.	Max.	means ± SD
ALT	5	485	61.3375±86.23
AST	14	343	56.2525±52.22
PLT	12	556	239.0125±113.87
APRI	0.104	5.417	0.77483±0.836
FIB4	0.062	26.094	2.28855±3.42
Elastography mean	4.3	109.7	17.805±17.89

Table 3: Shear Wave Elastography Evaluation Of Different Liver Fibrosis Stages

Variables	Stages	Frequency	%age
Different Fibrosis Stages	F0	12	15.0
	F1	18	22.5
	F2	11	13.8
	F3	3	3.8
	F4	36	45.0
	Total	80	100.0

Table 4: Shear Wave Elastography Evaluation Of Different Liver Fibrosis Stages

Variables	Stages	Frequency	Means ± SD of ALT(U/L)
S.W.E Liver Fibrosis Stage	F0	12	27.92±12.2
	F1	18	55.22±55.3
	F2	11	43.18±49
	F3	3	128.00±6.9
	F4	36	73.03±116.9

DISCUSSION

Though, shear wave elastography measurement is not far and wide existing owing to technical and practical field together with its unusual cost, on the other hand its use is not well renowned in low and middle income nations[9,10] whereas APRI&FIB-4 scores have been shown quite reliable for evaluating liver fibrosis[11].

A pilot study was performed 2012 by Giovanna Ferraiolion, *et al.* on realtime shear wave elastography for considering liver fibrosis in CH-C. Purpose of that study was to assess the diagnostic precision of realtime SW Elastography in the evaluation of liver fibrosis in patients with chronic hepatic cirrhosis, in contrast with transient elastography, by using the histologic METAVIR classification as the reference system. In that study, Realtime SW Elastography measurements assessed well to that of T-Elastography in severe fibrosis and cirrhosis. Realtime shear wave elastography validated a substantial step-up in the detection of significant fibrosis when compared with T-Elastography[12].

In another research done by Lun-Gen Lu, *et al.* in 2003 on categorizing and staging of hepatic fibrosis and its correlation with noninvasive investigative considerations. The goal of that study was to see the sights of the grades and stages of pathology and also their inter relationship with hepatic fibrosis and noninvasive indicative factors. It was concluded in that study that the categorizing and staging of liver fibrosis are interconnected with serum markers, doppler ultrasound, CT scan and/or MRI. The combination of the above stated noninvasive factors were recognized relatively sensitive and specific in finding of Liver fibrosis[13]. As, in our study we compare two non-invasive techniques, ultrasonographic Shear wave elastography with two biomarkers i.e., APRI and FIB-4.

In present study we found different cut-off values for APRI & FIB-4 in different groups of fibrosis. To distinguish their optimal cutoff values according to AUROC and the diagnostic accuracies (sensitivity and specificity) of APRI and FIB-4 (Normal AST level up-to 40 IU/L) for predicting the performance of APRI & FIB-4 accompanying with ultrasound SW Elastography. In a similar type of research performed in 2018 examined the optimum cutoff values of the two compound surrogates for envisaging cirrhosis by AST level[14].

CONCLUSION

We concluded that the systematic accuracy of FIB-4 for predicting liver fibrosis was achieved to be better than that of APRI in all stages of liver fibrosis. This study also provided optimal cutoff values for different group of fibrosis for both serum markers. It is therefore suggested that this technique should be made a routine in our clinical setups.

Limitations: Our study had several limitations like financial constraints, time limitation, small sample size and fewer resources. In this study we only observe an agreement between two non-invasive procedure i.e., Shear Wave Elastography and Serological findings. Hence it lacks further evaluation and detailed analysis for liver disease.

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