

Non-Invasive Evaluation of Liver Fibrosis; Diagnostic Performance of Ultrasound Signs

Non-Invasive
Evaluation of
Liver Fibrosis

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ABSTRACT

Objective: To assess the diagnostic performance of Ultrasonography in evaluation of liver fibrosis.

Study Design: Prospective / observational study

Place and Duration of Study: This study was conducted at the Nawaz Medicare Hospital, Faisalabad during Jan 2019 to Dec 2020.

Materials and Methods: In this prospective observational study, 130 liver patients, 70 (53.84%) males and 60 (46.15%) females confirmed upon serological examination were included for their Ultrasonography investigations that had already undergone liver biopsy for diagnostic work-up of hepatopathy. Liver nodularity was noted by studying echogenicity and echo pattern. The caudate lobe hypertrophy was measured using 3.5 megahertz transducer at the level of portal vein bifurcation; and Anterior Posterior diameter of the lobe was measured between Inferior vena cava and ligamentum venosum. The portal venous as well as hepatic venous blood flow was recorded in Doppler studies to note vascular index towards the diagnosis of portal hypertension and fibrosis. The performance of various ultrasound signs was measured into different statistical parameters. The written informed consent of every patients was taken before collecting the data for research. The permission of Ethical Committee of the Nawaz Medicare hospital was taken before collecting the data and get publishing in the Medical Journal.

Results: The incidence of liver fibrosis in male patients was 70(53.84%) and in female patients was 60(46.15%). The incidence of Chronic HBV infection was 32(24.24%), in Chronic HCV infection was 93(76.23%) and Alcohol abuse was 5(4.10%). The incidence of fibrosis was present in 76(62.30%) and fibrosis was absent in 54(41.53%). The incidence of fibrotic patients was maximum 29(23.80%) in grade 1 and was minimum 12 (9.80%) in grade 4. The incidence of performance of various ultrasound signs in prediction liver fibrosis was maximum 83% accuracy, 76% sensitivity, 93% specificity in Abnormal Hepatic venous flow and was minimum 37% accuracy, 59% sensitivity, 0% specificity in abnormal vascular index. The incidence of diagnostic performance of the level of ultrasound signs presence in liver patients was 66% accuracy, 63% sensitivity, 72% specificity and 51% accuracy, 21% sensitivity, 100% specificity.

Conclusion: The results were of the view that ultrasound might be seen as safe and non-invasive technique against liver biopsy for the diagnosis of liver fibrosis that may be considered accurate and sensitive but highly specific method.

Key Words: Non-invasive evaluation of liver fibrosis, Diffuse parenchymal liver disease, liver ultrasound, ultrasound signs.

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INTRODUCTION

Actual diagnosis of the disease seen straightway treatment procedure on the sick person stopping him from the stress of other unwanted treatments.^{1,2}

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Despite the fact liver biopsy is considered to be the reference standard, yet it shows false-negative results in nearly one third of the cases, characterized by a disease rate of three percent and death rate of zero point zero three percent as shown by the data from a large survey^{1,2}. For these reasons, non-invasive methods including various Ultrasonography methods have been suggested and tested as a method of detecting liver fibrosis (cirrhosis) quite correct¹.

Also ultrasound is less expensive, safest, effective first-line testing but insensitive test in evaluating liver and biliary system disease. Nevertheless, authenticity and accuracy of ultrasound findings may be assessed against histology (biopsy) findings to obtain a definite diagnosis and determination of liver disease^{3,4}.

The objective of this study is to assess the diagnostic performance of various ultrasound signs towards detecting the degree of liver fibrosis against histology findings taken as gold standard.

MATERIALS AND METHODS

In this prospective observational study, 130 liver patients, 70 (53.84%) males and 60 (46.15%) females confirmed upon serological examination were included for their Ultrasonography investigations that had already undergone liver biopsy for diagnostic work-up of hepatopathy. Liver nodularity was noted by studying echogenicity and echo pattern. The caudate lobe hypertrophy was measured using 3.5 megahertz transducer at the level of portal vein bifurcation; and Anterior Posterior diameter of the lobe was measured between Inferior vena cava and ligamentum venosum. The portal venous as well as hepatic venous blood flow was recorded in Doppler studies to note vascular index towards the diagnosis of portal hypertension and fibrosis. The performance of various ultrasound signs was measured into different statistical parameters. The written informed consent of every patients was taken before collecting the data for research. The permission of Ethical Committee of the Nawaz Medicare hospital was taken before collecting the data and get publishing in the Medical Journal.

RESULTS

Table No.1: Gender distribution

Sex	No of Patients	Percentage
Male	70	53.84%
Female	60	46.15%
Total	130	100.00%

The incidence of liver fibrosis in male patients was 70(53.84%) and in female patients was 60(46.15%) as shown in table no 1.

Table No.2: Distribution of causes of liver disease

Category	No of Patients	Percentage
Chronic HBV infection	32	24.24
Chronic HCV infection	93	76.23
Alcohol abuse	5	4.10
Total	130	100.00

The incidence of Chronic HBV infection was 32(24.24%), in Chronic HCV infection was 93(76.23%) and Alcohol abuse was 5(4.10%) as shown in table no 2

Table No.3: Distribution of the patients into present and absent states of fibrosis

Patients Status	No of Patients	Percentage
Fibrosis present	76	62.30
Fibrosis absent	54	41.53
Total	130	100.00

The incidence of fibrosis was present in 76(62.30%) and fibrosis was absent in 54(41.53%) as shown in table no 3.

Table No.4: Distribution of the fibrotic patients into different grades of fibrosis

Grade of Fibrosis	No of Patients	Percentage
1	29	23.80
2	22	18.00
3	13	10.70
4	12	9.80
Total	76	62.30

The incidence of fibrotic patients was maximum 29(23.80%) in grade 1 and was minimum 12 (9.80%) in grade 4 as shown in table no 4.

Table No.5: Diagnostic performance of various ultrasound signs in prediction of liver fibrosis

Ultrasound Signs	Accuracy (%)	Sensitivity (%)	Specificity (%)	Positive Likelihood Ratio	Negative Likelihood Ratio	Positive Predictive Value (%)	Negative Predictive Value (%)
Surface nodularity	53	26	98	12.11	0.75	95	45
Surface lobe hypertrophy	75	62	98	28.45	0.39	98	61
Abnormal Portal venous flow	67	47	100	0.00	0.53	100	53
Abnormal Hepatic venous flow	83	76	93	11.70	0.25	95	70
Abnormal Transverse CL/RL ratio	70	54	96	12.41	0.48	95	56
Abnormal Vascular index	37	59	0	0.59	0.00	49	0

Table No.6: Diagnostic performance of the level of ultrasound signs presence in the liver patients

Ultrasound Signs	Accuracy (%)	Sensitivity (%)	Specificity (%)	Positive Likelihood Ratio	Negative Likelihood Ratio	Positive Predictive Value (%)	Negative Predictive Value (%)
At least one Present	66	63	72	2.23	0.51	79	54
All six Present	51	21	100	0.00	0.79	100	43

The incidence of performance of various ultrasound signs in prediction liver fibrosis was maximum 83% accuracy, 76% sensitivity, 93% specificity in Abnormal Hepatic venous flow and was minimum 37% accuracy, 59% sensitivity, 0% specificity in abnormal vascular index as shown in table no 5.

The incidence of diagnostic performance of the level of ultrasound signs presence in liver patients was 66% accuracy, 63% sensitivity, 72% specificity and 51% accuracy, 21% sensitivity, 100% specificity as shown in table no 6.

DISCUSSION

The present work judge the role of measured and valid ultrasound signs, as nodule of liver surface, hypertrophy of caudate lobe, abnormal flow of portal vein, abnormal flow of hepatic vein, abnormal ratio of transverse caudate lobe/right lobe, and abnormal vascular index.

The individual data of ultrasound were not having higher accuracy for abnormal vascular index (37%) and liver surface nodularity (53%); the other ultrasound signs showed reasonable diagnostic performance with accuracy ranged from 67% to 83%. As regards sensitivity of the ultrasound data, it also appeared low for certain signs like liver surface nodularity (26%), abnormal portal venous flow (47%) and abnormal transverse caudate lobe/right lobe ratio (54%). However, other sensitivity statistics for remaining signs (59% - 76%) were reasonably good. It is worth mentioning that ultrasound data were found to be highly specific for most of the individual signs, like nodularity liver surface (ninety eight percent), hypertrophy of caudate lobe (ninety eight percent), abnormal flow of portal vein (hundred percent), abnormal flow of hepatic vein (ninety three percent) and abnormal ratio of transverse caudate lobe/right lobe (ninety six), but abnormal vascular index appeared to be a non-specific sign with zero point zero percent specificity for the diagnosis of fibrosis of liver.^{5,6,7,8}

Further, accuracy and sensitivity of the presence of at least one sign were considerably and fairly higher, respectively, than the presence of all six signs. Nevertheless, the specificity of the presence of all six signs (100%) appeared to be appreciably higher than that (72%) of at least one sign. Though, all six ultrasound findings were false-positive in only 1 of 51 patients with moderate fibrosis (1-2 grade), yet these supported their role in confirmation of the diagnosis of severe fibrosis.^{12,13,14,15}

As regards positive likelihood ratio, it was the highest (28.45) for caudate lobe hypertrophy and the lowest (0.00) for abnormal portal venous flow. Whereas, ratios for liver surface nodularity, abnormal hepatic venous flow, abnormal transverse caudate lobe/right lobe ratio, abnormal vascular index were 12.11, 11.70, 12.41 and 0.59, respectively. Interestingly to note that nil (0.00) ratio for the presence of all six signs was found against 2.23 for at least one sign present. Whereas, 100% positive predictive value was observed for all six signs present. Overall, the ultrasound findings were sufficiently specific to allow a diagnostic confirmatory strategy¹⁰, thus indicating that a positive result can rule-in the presence of liver fibrosis. On the contrary, the sensitivity of at least one ultrasound findings was comparatively low to support a screening diagnostic strategy, thus, indicating that negative result cannot help rule out the target to diagnose liver fibrosis.^{7,8,9,16,17,18}

The caudate and left lobe tended to be relatively less affected by marked by degeneration of cells, inflammation, and fibrous thickening of tissue of liver than the right lobe. This resulted hypertrophy in a small right lobe with left and caudate lobe. The ratios comparing size or value of the caudate lobe with that a shrunken right lobe has been used to diagnose marked by degeneration of cells, inflammation, and fibrous thickening of tissue of liver.¹¹

In disease of liver cells, the sinusoids are injured, tear down or restored and the support to flow of portal vein is increased. Whereas portal vein is dilated and portal flow in the end inside out. Flow inside out may be the only finding indicating portal increased blood pressure. In this study, abnormal flow of portal vein was present in thirty six sick persons with fibrosis. However, forty sick persons with fibrosis did not show non-forward portal flow.

Hepatic vascular index helps in diagnosis of marked by degeneration of cells, inflammation, and fibrous thickening of tissue of liver and portal increased blood pressure. In marked by degeneration of cells, inflammation, and fibrous thickening of tissue of liver, the velocity portal vein was decreased and hepatic artery pressure increased. So, index of hepatic vessel decreased. In this study, abnormal hepatic vascular index was present in thirty one sick persons and absent in forty five sick persons with fibrosis, showing it a normal indication.^{19,20}

The present findings reflect everyday clinical practice, in so far as the incidence of severe fibrosis (thirty three

percent) was similar to that reported in relating to the branch of medicine which deals with the incidence, distribution, and control of diseases studies^{8,10,11}. This study also showed that sixty two point eight percent of sick persons had fibrosis. These findings appeared to be similar with those of some previous studies as cirrhotic, and a relevant subgroup of sick persons has a decompensate clinical status.

CONCLUSION

The results were of the view that ultrasound might be seen as safe and non-invasive technique against liver biopsy for the diagnosis of liver fibrosis that may be considered accurate and sensitive but highly specific method.

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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