

Analysis of Cardiac Profile in Patients with Liver Cirrhosis: An Observational Study

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Abstract

Background: Cirrhosis is defined as the histological development of regenerative nodules surrounded by fibrous bands in response to chronic liver injury that leads to portal hypertension and end stage liver disease. Studies suggested that underlying cardiac dysfunction precedes the development of Hepato-renal syndrome. hence; under the light of above mentioned data, we planned the present study to assess the cardiac profile in patients with liver cirrhosis. **Subjects and Methods:** A total of 30 liver cirrhosis patients were included in the present study. Routine haematological profile of all the patients was carried as assessed. Transthoracic 2 D echo with Doppler was done in all patients and parameters (Left atrial enlargement, Left ventricular diastolic dysfunction) were assessed. Liver disease was staged according to Child-Pugh's score. All the results were compiled and analyzed by SPSS software. **Results:** Significant results were obtained while correlating the patients with left atrial enlargement and severity of liver cirrhosis. Also, significant results were obtained while correlating the patients with diastolic dysfunction and severity of liver cirrhosis. **Conclusion:** Cardiac parameters are directly correlated with the severity of the disease in liver cirrhosis patients.

Keywords: Cardiac, Cirrhosis, Liver

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Introduction

Cirrhosis is defined as the histological development of regenerative nodules surrounded by fibrous bands in response to chronic liver injury, that leads to portal hypertension and end stage liver disease.^[1,2] The etiology of cirrhosis can usually be identified by the patient's history combined with serologic and histologic evaluation. Alcoholic liver disease and hepatitis C are the most common causes in the Western world, while hepatitis B prevails in most parts of Asia and sub-Saharan Africa.^[3-5]

After the identification of the hepatitis C virus in 1989 and of nonalcoholic steatohepatitis (NASH) in obese and diabetic subjects, the diagnosis of cirrhosis without an apparent cause (cryptogenic cirrhosis) is rarely made. It is important to know the etiology of cirrhosis, since it can predict complications and direct treatment decisions. The circulatory dysfunction and the abnormal activation of systemic and renal neurohormonal regulation in advanced cirrhosis are the main determinant in the development of the hepatorenal syndrome (HRS).^[6,7] However some studies suggested that underlying cardiac dysfunction precedes the development of HRS.⁸ hence; under the light of above mentioned data, we planned the present study to assess the cardiac profile in patients with liver cirrhosis.

Subjects and Methods

The present study was conducted in the department of internal medicine of the medical institute and it included assessment of cardiac profile of liver cirrhosis patients. Ethical approval was obtained from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 30 liver cirrhosis patients were included in the present study.

Inclusion criteria for the present study included:

- Patients suffering from cirrhosis of either sex, due to various aetiologies
- Patients within the age group of 25 to 65 years

Exclusion criteria for the present study included:

- Patients of acute liver illness.
- Patients with chronic renal failure.
- Patients with rheumatic heart disease.
- Patients with collagen disease.

Complete physical examination of all the patients was carried out for detecting the stigmata of chronic liver disease like clubbing in fingers and toes, central and peripheral cyanosis etc. Routine haematological profile of all the

patients was carried was assessed. Transthoracic 2 D echo with Doppler was done in all patients and parameters (Left atrial enlargement, Left ventricular diastolic dysfunction) were assessed. Liver disease was staged according to Child-Pugh's score which is mentioned below.^[5-7]

Table 1: Child Pugh score

Factor	1 point	2 points	3 points
Total bilirubin (mg/dL)	<2	2 – 3	>3
Serum albumin (g/L)	>3.5	2.8-3.5	<2.8
INR	<1.7	1.71-2.30	>2.30
Ascites	None	Mild	Moderate to Severe
Hepatic encephalopathy	None	Grade I-II (or suppressed with medication)	Grade III-IV (or refractory)

Table 2: Grading of Child Pugh score

Child Pugh Grade	Points
A	5- 6
B	7- 9
C	10- 15

All the results were compiled and analyzed by SPSS software. Chi- square test, one- way ANOVA and Mann Whitney U test were used for assessment of level of significance. P- value of less than 0.05 was taken as significant.

Results

In the present study, a total of 30 patients with liver cirrhosis were analyzed. Mean age of the patients of the present study was 48.5 years. 14 patients belonged to the age group of more than 50 years. 24 patients out of 30 were males while the remaining 6 were females. Majority of the patients in the present study belonged to the Child Pugh score of B. In the present study, significant results were obtained while correlating the patients with left atrial enlargement and severity of liver cirrhosis (P- value < 0.05). Also, significant results were obtained while correlating the patients with diastolic dysfunction and severity of liver cirrhosis (P- value < 0.05).

Table 3: Distribution of subjects according to age and gender

Parameter		Number
Age group (years)	Less than 40	6
	40 to 50	10
	More than 50	14
Gender	Female	6
	Male	24

Table 4: Distribution of patients according to Child Pugh score grading

Parameter	Number
A	8
B	15
C	7
Total	30

Table 5: Distribution of patients with Left atrial enlargement and severity of liver cirrhosis

Left atrial enlargement	Child Pugh Score			Total	P- value
	A	B	C		
Present	2	7	4	13	0.019*
Absent	5	10	2	17	
Total	7	17	6	30	

*: Significant

Table 6: Distribution of patients with Diastolic dysfunction and severity of liver cirrhosis

Diastolic dysfunction	Child Pugh Score			Total	P- value
	A	B	C		
Absent	7	11	1	19	0.000*
Grade I	0	5	0	5	
Grade II	0	1	5	6	
Total	7	17	6	30	

*: Significant

Discussion

The heart and liver are organs that are closely related both in health and disease. The cardiac causes of hepatic dysfunction include constrictive pericarditis, severe pulmonary arterial hypertension (PAH), mitral stenosis, tricuspid regurgitation (TR), cor pulmonale, ischemic cardiomyopathy, and postoperative consequences of the Fontan procedure for pulmonary atresia and hypoplastic left heart syndrome. All of these causes can lead to passive congestion due to the elevated right ventricular (RV) pressure and right sided heart failure. The outcomes of heart failure have dramatically improved, due to the increased efficiency of medical treatment, as a result, cardiac cirrhosis prevalence is declining.^[5,6]

In the present study, a total of 30 patients with liver cirrhosis were analyzed. Mean age of the patients of the present study was 48.5 years. 14 patients belonged to the age group of more than 50 years. 24 patients out of 30 were males while the remaining 6 were females. Majority of the patients in the present study belonged to the Child Pugh score of B. Chronic liver diseases may induce systolic and diastolic dysfunctions in addition to electrophysiological changes, and the prolongation of QT interval in conditions of cirrhotic cardiomyopathy; all of these may improve completely after liver transplantations. Recent studies have found cardiac changes in patients with NAFLD, hepatitis C and primary biliary cirrhosis. On the contrary, acute and chronic heart failure have been shown to lead to acute hepatic injury and chronic congestive hepatopathy with manifestations of liver failure and laboratory data specific to ischemic hepatitis or congestive hepatopathy.^[7-9]

In the present study, significant results were obtained while correlating the patients with left atrial enlargement and severity of liver cirrhosis (P- value < 0.05). Also, significant results were obtained while correlating the patients with diastolic dysfunction and severity of liver cirrhosis (P- value < 0.05).

Dyastolic dysfunction, with an impaired passive and active filling of the left ventricle during diastole, leads to an inability to adequately increase stroke volume in response to stimuli, and may be responsible for the development of heart failure. Thus, diastolic dysfunction may precede systolic dysfunction in cirrhosis, and may be responsible to the reported low physical activity seen in cirrhotic patients. Additionally, diastolic dysfunction probably contributes to the pathogenesis of fluid retention in these patients. Prolonged QT interval on the electrocardiogram has been documented in cirrhosis, with a prevalence that exceeds 60% in patients with an advanced disease, and has been related with the severity of liver disease. Moreover, these abnormalities disappear after LT.^[10-12]

Yap EML et al described the electrocardiographic and echocardiographic findings of Filipino patients with liver cirrhosis. A retrospective analytical study of 148 patients with liver cirrhosis was done. The clinical characteristics, median QTc interval, systolic and diastolic functions on echocardiography of these patients were described. Spearman rho correlation was employed to determine the rank order correlation between QTc prolongation and the severity of liver cirrhosis. The 10-year prevalence rate of liver cirrhosis at the Philippine Heart Center was 0.001% (148/137,584). The mean age was 72.4 ± 14 years with a female/male ratio of 1.1:1. The most common etiology of cirrhosis was hepatitis B or C infection (20%, 29). The Child-Pugh Classification (CPC) and Model for End-Stage Liver Disease (MELD) score were used to determine the severity of liver cirrhosis and to assess their prognosis. There were 31 patients (24%) with CPC-A, 84 patients (64%) with CPC-B and 15 patients (11%) with CPC-C. Fifty-five percent ($n = 69$) had a MELD score of 16 and below. Prolongation of the QTc interval was only seen among those with CPC A (median QTc of 470 ms) and a MELD score of 9 and below (median QTc of 485 ms). The mean left ventricular ejection fraction was $54.40 \pm 28.63\%$. There were five patients with a left ventricular ejection fraction of $< 55\%$. A higher mean age of Filipinos with liver cirrhosis was reported in our study. Prolongation of the QTc interval was seen among those with early and late stage of cirrhosis (CPC A or MELD score ≤ 9 and CPC C).^[12]

Conclusion

Under the light of above obtained data, the authors conclude that cardiac parameters are directly correlated with the

severity of the disease in liver cirrhosis patients. However; further studies are recommended.

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