



EVALUATION OF HEART FUNCTIONS IN CIRRHOTIC LIVER PATIENTS

Medicine

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ABSTRACT

AIM: To evaluate the heart functions in cirrhotic liver patients and to evaluate incidence of cirrhotic cardiomyopathy in these patients.

METHODS: This is an observational study in which 50 cirrhotic liver patients were included. Patients with known cardiac illness and cardiomyopathy was not included. Biochemical and radiographic evaluation was done to confirm cirrhosis of liver. Non invasive tests like electrocardiogram and echocardiogram was used for heart evaluation. Statistical evaluation was using Chi square / Fisher Exact test. A p of < 0.05 was considered significant.

RESULTS: High incidence of diastolic dysfunction was found in the study. Correlation between ascites and diastolic dysfunction was found to be significant. (p=0.032). Abnormalities in cardiac function was not associated with severity of liver disease.

Conclusion: Patients with liver disease are found to have high incidence of diastolic dysfunction. Cause could be related to cirrhosis if the patient has no other cardiac causes. No relation was found between cardiac changes and severity of liver dysfunction

KEYWORDS

INTRODUCTION :

Liver cirrhosis seems to be a commonly seen disease and has become one of the leading causes for mortality and morbidity in the world. Cirrhosis is a progressive disease and once irreversible stage occurs significant morbidity occurs. Once liver starts decompensating architecture gets distorted resulting in hemodynamic alterations.

Common factors for liver disease here are alcohol, viral hepatitis and NAFLD. Other causes are auto immune hepatic diseases, toxins, drugs, Budd chari syndrome and genetic abnormalities. Significant amount have been identified as idiopathic where etiology has not been identified.

Complications of Cirrhosis of liver include hepatic encephalopathy, ascites, portal hypertension, spontaneous bacterial peritonitis, bleeding varices, and hepatocellular carcinoma and hepato renal syndrome.²

Cardiovascular abnormalities include hyperdynamic circulation, decreased peripheral resistance, low arterial blood pressure and decreased cardiac output³.

Initially these cardiac changes were thought to be secondary to alcohol. Later Lee reported these changes were due to cirrhosis. These cardiovascular changes result in several complications of the liver disease. Hence this study was done to evaluate the cardiovascular abnormalities in liver disease patients using appropriate investigations like electrocardiogram and echo cardiogram. Main objective of this study is to evaluate the cardiac abnormalities in cirrhosis patients.

PATIENTS AND METHODS :

This study was conducted from March 2016 - July 2017 in the Department of Medical Gastroenterology, Sree Balaji Medical College and Hospitals. This study was initiated after getting clearance from the Institutional Ethics Committee.

CRITERIA :

1. Established cases of cirrhosis of liver.
2. Patients with past history of cardiac diseases, cardiomyopathy were excluded from the study.

Study Design:

50 patients were included in this study. History and thorough

physical examination was done. Complete hemogram, renal function tests, liver function tests, coagulation profile, blood sugar estimation tests were done. Ultrasound Abdomen was done to look for liver size, texture, presence of collaterals, dilatation of portal vein, presence of ascites and splenomegaly. Upper Gastrointestinal Endoscopy was done to look for the presence of any varices. Electrocardiogram, chest x-ray and Echocardiography was done to assess the cardiac functions

Statistical Methods :

Results on continuous measurements are presented on Mean \pm SD (Min-Max) and results on categorical measurements are presented in Number (%). Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Statistical software :

The Statistical software SPSS 15.0 was used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

This study was done in Sree Balaji Medical college & Hospitals over a period of 18 months. This study was undertaken to assess the cardiac functions in Cirrhosis of liver and find out the incidence of cirrhotic cardiomyopathy.

Baseline data was collected from all patients. Age, gender, h/o alcohol consumption, symptoms were elicited. Investigations like complete blood count, renal function test, liver function tests, coagulation profile, ultrasound abdomen, upper gastrointestinal endoscopy, chest x-ray, electrocardiography, echocardiogram were done.

The mean age for the study population was Mean \pm SD:52.19 \pm 8.46. 44 were males and 6 were females. 75% of the study population was alcoholic whereas 25% were non-alcoholics.

38 patients (76%) presented with abdominal distension whereas 48% (24 patients) presented with jaundice. Mean pulse rate was 84.60 \pm 6. Systolic blood pressure 114.30 \pm 48, diastolic blood pressure 72.50 \pm 40 and the Mean arterial pressure was found to be 85 \pm 5.80. Mean blood glucose levels were 88.22 \pm 9.56, Urea 36.87 \pm 31.33, creatinine 1.10 \pm 0.47, sodium 131.75 \pm 4.95, potassium 4.03 \pm 0.82, Chloride 103.75 \pm 6.44. Complete blood count had mean value of

8729.03±4749.46, hemoglobin 8.98±1.48, Platelet count 153750.00±92470.05

The coagulation profile done showed a mean of 27.9±15.4 for prothrombin time, 2.32±1.3 for INR, 3.48±3.83 for bleeding time, 4.77±1.90 for clotting time. Liver function test was done in which total proteins had a mean of 6.32±0.89, Albumin 2.90±0.75, Globulin 3.43±0.63, Bilirubin 7.31±6.95, AST 91.46±91.92, ALT 55.75±67.97, ALP 161.87±58.64, GGT 41.21±22.67. Ultrasound abdomen reported Cirrhosis of liver in all the subjects. 50 % (25 patients) had splenomegaly, ascites in 60 (30 patients)%. Portal hypertension was seen in 50%(25 patients) (Figure 1). Upper Gastrointestinal endoscopy showed 28% (7 patients) had Grade 1 varices, 28% (7 patients) had Grade 2 varices, 24% (6 patients) had Grade 3 varices, 20% (5 patients) had Grade 4 varices. QT prolongation was seen in 28% (14 patients) on ECG whereas 16 % (8 patients) had low voltage complexes and 56 % (28 patients) had a normal ECG (Table 2)

ECHO was done to look for cardiac dysfunction (Table 3 and 4). 38 patients had diastolic dysfunction (76 %). 57 % (22 patients) had grade 1 diastolic dysfunction and 43 % (16 patients) had grade 2 diastolic dysfunction (Figure 2). Systolic dysfunction was not found in these patients. Positive co-relation was found between ascites and diastolic dysfunction. (p=0.038) (Table 5). No correlation was found between age, gender, alcohol with the echo findings. MELD was calculated. 16 patients had scores between 19-29, 20 patients between 29-39 and 8 over 40. (Table 6) No co-relation was found between severity of hepatic dysfunction (table 7) and cardiac changes. No co-relation was found between portal hypertension and cirrhosis of liver (Table 8).

DISCUSSION :

This study was done in Sree Balaji Medical college & Hospitals over a period of 18 months. Indian data regarding the cardiac abnormalities detected in Cirrhosis of liver is less known. This study was undertaken to evaluate the heart functions in Cirrhosis of liver and find out the incidence of cirrhotic cardiomyopathy due to cirrhosis of liver.

Our study has shown an high prevalence of cardiac abnormalities in patients diagnosed with Cirrhosis of liver. Majority of the patients (76 %) were found to have diastolic dysfunction in the absence of any known cardiac abnormality. However no evidence of systolic failure was found in these patients.

No significant association could be found between age, gender and alcohol to the cardiac changes detected. Alcohol consumption also did not co-relate with the cardiac changes further proving that cardiac changes in alcoholic cirrhosis is due to cirrhosis per se and not due to alcohol. J Alexander et al compared alcoholic and non alcoholic groups and no found no co-relation between alcohol and the cardiac findings. Lee et al also stated that cardiac changes are due to cirrhosis per se rather than alcohol.⁴

Presence of hyperkinetic circulation is seen in patients with cirrhosis of liver. In our study the mean pulse rate was 84.60±6.80 which is very high compared to normal subjects. Mashford ML et al showed a mean heart rate of 86 ± 2.9.⁵ The present study thus showed that cirrhotic patients have an hyperdynamic circulatory state compared to the average heart rate of healthy subjects. The diastolic pressure was calculated to be 72.50±40. McCormick P.A; Chin J et al calculated it to be 56.⁶ However it was normal in this study. The same study calculated the mean arterial pressure to be 86. The mean arterial pressure calculated in our study was 85 ± 5.80. Mashford ML, Mahon WA et al demonstrated a mean arterial pressure of 85 ± 2.4 in cirrhotic patients.⁶ The presence of an hyperdynamic circulation proves that there is an increased venous return to the heart, increased heart rate and contractility.

Cirrhotic Cardiomyopathy is characterized by chronic cardiac dysfunction in patients with liver cirrhosis in the absence of previous heart disease, with reduced cardiac contractile response to physiological or pharmacological stress, but with normal cardiac output (CO) at rest.

To diagnose cirrhotic cardiomyopathy presence of one or more of the following is required.⁷

1. Baseline Increased Cardiac Output But Blunted Ventricular Response To Stimuli.

2. Systolic And/Or Diastolic Dysfunction.
3. Absence Of Overt Left Ventricular Failure At Rest.
4. Electrophysiological Abnormalities Including Prolonged Q-T Interval In Electrocardiography And Chronotropic Competence.

Electrocardiogram taken showed 28 % had QT prolongation whereas 16 % had low voltage complexes. Bernardi M et al stated QT prolongation as the major ECG abnormality in Cirrhotic patients.⁸ S Samuillah et al reported 21.6 % of the study population had prolongation of QT interval which correlated with the severity of liver disease.⁹ However present study did not find any significant correlation between QT prolongation and Cirrhosis of liver. A larger sample size could have given a clearer picture. Definitive lack of evidence between QT prolongation and life threatening arrhythmias in cirrhotics could be the reason and needs to be investigated further.

Our study showed Diastolic dysfunction on 76 % of patients Echocardiography. J Alexander et al studied Indian patients with cirrhosis and found evidence of diastolic dysfunction.¹⁰ He attributed these cardiac changes to cirrhotic cardiomyopathy. Shaikh S et al studied 74 cirrhotics in Pakistan and found diastolic dysfunction in 15 patients.¹¹ Corelation with severity of cirrhosis was also done.

Sun et al demonstrated diastolic dysfunction in 48.8% of cirrhotics.¹² The author also associated the cardiac changes with MELD score. Ruiz-Del-Arbol et al also found diastolic dysfunction in patients with cirrhosis.¹³ He found that grade 2 diastolic dysfunction had an increased mortality and higher risk of developing hepatorenal syndrome type 1. The present study showed 57 % of the patients with diastolic dysfunction had grade 1 diastolic dysfunction whereas 43 % had grade 2 diastolic dysfunction. Merli et al detected 64% to have diastolic dysfunction at rest.¹⁴ But the author did not find any association between the cardiac abnormalities detected and cirrhosis of liver.

Diastolic dysfunction is an early marker for cardiac impairment and precedes systolic failure leading to subsequent heart failure.¹⁵ Our study showed 76% (38 patients) had diastolic dysfunction. It has also been demonstrated that diastolic dysfunction could contribute to the progression to HRS Type 1.

Valeriano et al inferred that patients with cirrhosis of liver along with ascites had higher incidence of diastolic dysfunction than patients without ascites.¹⁶ The E/A ratio was decreased in patients with ascites compared to those without (0.9±0.2 vs. 1.3±0.4, P<0.05). Similarly Pozzi M et al stated in the presence of ascites cirrhosis was associated with left ventricular diastolic dysfunction and increased wall thickness.¹⁷ It was speculated whether the neurohumoral overactivity was causing the impaired ventricular relaxation.

Torregrosa M et al showed a significant relationship between ascites and diastolic dysfunction at rest and during stress compared to non ascitic patients.¹⁸ Merli M et al demonstrated that diastolic dysfunction is prevalent in patients with ascites compared to non ascitic patients (77% vs 56% p=0.04).¹⁴

Riuz-Del-Arbol et al compared diastolic dysfunction with ascites and elevated neurohumoral markers and ascites with normal neurohumoral markers.¹³ On comparison the author found that severity of diastolic dysfunction was more when the neurohumoral markers were elevated along with ascites. Recent studies show that diastolic dysfunction is an independent marker for mortality.²⁰ In the absence of any known risk factors for cardiac illness diastolic dysfunction can be attributed to cirrhotic cardiomyopathy.

MELD score was calculated to find any association between cardiac abnormalities and severity of liver dysfunction.^{20,21} Sun et al showed a positive correlation between the two.¹² It was also suggested by the author that the scoring is useful in patients awaiting liver transplant. J Alexander et al did not find any association between the two parameters.¹⁰ Merli et al did not find a positive relation between cardiac changes and severity of liver dysfunction. Though the present study did not find any association between the two further Indian studies are required in order to establish an association between the two parameters especially for patients awaiting liver transplant in India. The Study sample size was not large enough to prove systolic failure in patients with Cirrhosis of liver. However the study proves an significant association between Cirrhosis of liver and diastolic

dysfunction which can be attributed to cirrhosis itself. Due to lack of sufficient Indian data it requires further investigations. The study design was such that liver cirrhosis was diagnosed on the basis of ultrasound . Liver biopsy is the gold standard for diagnosing cirrhosis of liver. It is important to note that a normal echocardiogram does not rule out cardiac dysfunction in Cirrhosis of liver. Tissue Doppler imaging is a better diagnostic tool than ECHO to detect cardiac abnormalities. Blunted cardiac response to stress using pharmacological agents would be ideal to look for systolic failure in cirrhotics.

CONCLUSION :

This study showed a very high prevalence of Diastolic dysfunction in Cirrhosis of liver.

Diastolic dysfunction in Cirrhotics where no other known cardiac risk factors are present should be attributed to Cirrhotic Cardiomyopathy.

Echocardiography is an cheap and non invasive method to detect cardiac abnormalities and can be used for patients with cirrhosis of liver.

No of patients :-

TABLE 1 : Vital parameters of patients studied

Vital parameters	No of patients (n=50)	%	Mean + sd
Pulse rate			84.60±6.80
<60	10	20	
60-80	18	36	
80-100	22	44	
SBP			114.30±48
<120	28	56	
120 – 139	16	32	
140 – 159	6	12	
160 - 200	0	0	
> 200	0	0	
DBP			72.50±40
<80	32	64	
80 - 89	18	36	
90 - 99	0	0	
100 - 119	0	0	
> 120	0	0	
MAP			85 ±5.80
< 70	4	8	
70 - 100	46	92	
> 100	0	0	

TABLE 2 : ECG FINDINGS

ECG FINDINGS	NO. OF PATIENTS = 50	%
NORMAL	28	56
QT PROLONGATION	14	28
LOW VOLTAGE COMPLEX	8	16

TABLE 3 : ECHO FINDINGS

ECHO FINDINGS	N= 50	%
NORMAL	12	24
DIASTOLIC DYSFUNCTION	38	76
LV SYSTOLIC DYSFUNCTION	0	0

TABLE 4 :

DIASTOLIC DYSFUNCTION	N=50	%
GRADE 1	22	57
GRADE 2	16	43

TABLE 5 :

ASCITES	DIASTOLIC DYSFUNCTION		
	YES	NO	
NO	8	6	14
YES	30	6	36
TOTAL	38	12	50

Ascites is statistically significant associated with ECHO findings with p=0.028

TABLE 6 :

MELD SCORE	N = 50	%
9	2	4
9-19	4	8
19-29	16	32
29-39	20	40
> 39	8	16
TOTAL	50	

TABLE 7 :

MELD SCORE	N= 50	ECHO FINDINGS	
		DIASTOLIC DYSFUNCTION	NORMAL
9	2	0	2
9-19	4	2	2
19-29	16	12(75%)	4
29-39	20	18 (90%)	2
> 39	8	6 (90%)	2
TOTAL	50	38	12

MELD SCORE is not statistically associated with ECHO findings with p=0.217

TABLE 8 :

PORTAL HYPERTENSION	N=50	ECHO FINDINGS	
		DIASTOLIC DYSFUNCTION	NORMAL
NO	16	8	8
YES	34	30	4
TOTAL	50	38	12

Portal hypertension is not statistically associated with ECHO findings with p=0.47

FIGURE 1 : ECHO FINDINGS

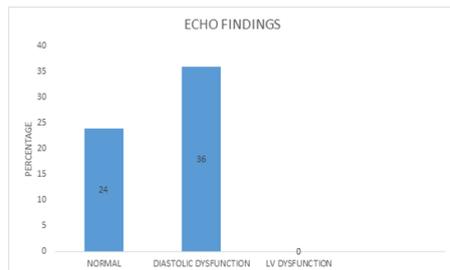


FIGURE 2 : GRADES OF DIASTOLIC DYSFUNCTION



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