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Original Research Article

Clinical Utility of Child Pugh Class for Myocardial Dysfunction in Chronic Liver Disease Patients

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Abstract:

Background: Chronic liver disease is progressive destruction of liver parenchyma over a period of 6 months leading to fibrosis and cirrhosis .Clinical course of patients with chronic liver disease is complicated by progressive impairment of circulatory function. Three major pathophysiologic features of cardiac dysfunction of these patients are – structural and functional ventricular abnormality (in form of left ventricular hypertrophy and diastolic dysfunction, electrophysiological abnormality (prolonged corrected QT interval), ventricular dysfunction in response to stress or exercise.

Objectives: To evaluate the echocardiographic changes in chronic liver disease patients and to correlate the severity of chronic liver disease according to child – pugh class with cardiac dysfunction.

Study design: Observational Cross sectional study design

Materials and Methods: 100 patients with chronic liver disease were included. All the study participants were subjected to do routine blood investigations and ultrasound scan abdomen to confirm the diagnosis of chronic liver disease. The parameters that were assessed in echocardiography are E/A ratio, end diastolic volume (EDV), end systolic volume (ESV), ejection fraction. QTc interval more than 440 msec and E/A ratio less than 1 were considered diagnostic of cirrhotic cardiomyopathy.

Results: Out of 100 patients studied, 81% were males. The mean years of age of the patients were 44.4 + 7.32. The Mean years of duration of illness was 2.38 +1.57years. Alcohol was the leading etiological cause followed by hepatitis. Association between Child Turcotte Pugh Class B& C and myocardial dysfunction were found to be significant.

Conclusions: Patients with Child-Pugh C cirrhosis showed increased systolic and diastolic myocardial dysfunction and also longer QT interval than Child-Pugh A or B patients. Thus, an evaluation of myocardial function should be considered in patients with chronic liver disease especially for Child- pugh class C.

Key words: Chronic Liver Disease, Child Pugh Criteria, Myocardial Dysfunction.

Introduction

Chronic liver disease is progressive destruction of liver parenchyma over a period of 6 months leading to fibrosis and cirrhosis .Clinical course of patients with chronic liver disease is complicated by progressive impairment of circulatory function. [1]

Three major pathophysiologic features of cardiac dysfunction of these patients are – structural and functional ventricular abnormality (in form of left ventricular hypertrophy and diastolic dysfunction, electrophysiological abnormality (prolonged corrected QT interval), ventricular dysfunction in response to stress or exercise. [2] The leading cause of hyper dynamic circulation in cirrhotic patients is peripheral and splanchnic vasodilatation, due to an increased production/activity of vasodilator factors (such as nitric oxide [NO], carbon monoxide [CO], and endogenous cannabinoids) and decreased vascular reactivity to vasoconstrictors.[3-5] The prevalence of cirrhotic cardiomyopathy remains unknown at present. Features include structural, histological, electrophysiological, systolic and diastolic dysfunction.

Multiple factors are considered as responsible, including impaired beta-adrenergic receptor signal transduction, abnormal membrane biophysical characteristics, and increased activity of cardio depressant systems mediated by cGMP. [6] Cirrhotic patients undergoing Tran's jugular intrahepatic portosystemical (TIPS) enclosure are at high risk of emerging cardiovascular

complications. This may be the result of diastolic dysfunction, common feature in this patient population. [7,8] Furthermore, the clinical consequences of cirrhosis-related cardiovascular dysfunction are evident during and after liver transplantation (LT), and this may be manifestation of occult cirrhotic cardiomyopathy.[9,10] Diastolic dysfunction is present in the vast majority of patients with cirrhotic cardiomyopathy, and that simple echocardiographic indices such as the E/A ratio may detect diastolic dysfunction even at rest. This may therefore represent the best available screening test to diagnose cardiac dysfunction. [11] Due to the limited number of human studies, the management of cirrhotic cardiomyopathy remains largely empirical. Treatment of this condition is mainly supportive. Orthotropic liver transplantation appears to improve or normalize the condition, generally after a period of several months.[12]Hence the present study was precisely designed to evaluate the myocardial dysfunctions with echocardiogram in the Chronic Liver Cirrhosis.

Objectives: To analyse the electrocardiographic changes in chronic liver disease patients and to determine the incidence of myocardial dysfunction in chronic liver disease patients.

Materials and Methods

Study sample and participants: The sample size was arrived to 100 due the feasibility based on the case census from medical record during the previous years. Inclusion criteria - Patients (Age 18- 60 years) diagnosed to have chronic liver disease irrespective of etiology will be taken for study. Exclusion Criteria- Previous History of Coronary Artery Disease, Risk factors for cardiomyopathy other than chronic Liver Disease, History of DM/ Hypertension/Anaemia.

Study Design: This was a cross sectional study conducted on 100 cases K.A.P.V Govt. Medical College & MGMGH, Tiruchirappalli from June 2018 to June 2020 for the period of two years. Patients with Ultrasonographic evidence of chronic liver disease/cirrhosis and admitted or treated as outpatient in Department of Medicine were selected for the study. At the same visit, patients underwent a clinical evaluation, ECG and Child-Pugh score calculation.8 The Child-Pugh score was used to divide patients in groups A, B and C.

Study procedure and Data collection: This study obtained the Institutional Ethics Committee and Research Committee approval. All the cardinal principles of the ethics was considered throughout the study. All 100 participants were given the written and oral consent. The consent form was given in the local language. The patients were given the autonomy to leave the study or not participated. All the patients were included as voluntarily.

After obtaining the informed written consent in English and Tamil (local language) the participants was included in the study. A thorough clinical history was taken from the patient with especially regarding cardiovascular symptoms. Followed by detailed physical examination on patients and recorded the heart rate & rhythm, blood pressure, jugular venous pulse and pressure and precordial examination.

All the study participants were subjected to do routine investigations such as Blood urea sugar, complete haemogram, serum cholesterol, liver function tests and ultrasound scan abdomen to confirm the diagnosis of chronic liver disease. ECG were taken for all the subjects.

The parameters that were assessed in echocardiography are E/A ratio, end diastolic volume (EDV), end systolic volume (ESV), ejection fraction. QTc interval more than 440 msec and E/A ratio less than 1 were considered diagnostic of cirrhotic cardiomyopathy in this study. End diastolic volume of 90, end systolic value of 38 and ejection fraction of 60%were considered mean of the normal values while doing statistical analysis.

Statistical analysis: The data was entered in the Microsoft Excel sheet after checking the missing/duplicate data's. The Microsoft Excel sheet was imported to the SPSS software version 18. Descriptive analysis was done use frequencies and percentages and Chi-Square test was used to find the test of significance. Comparison of continuous variables across patient with different grades of CLD according to child pugh criteria was done using ONE WAY ANALYSIS OF VARIANCE (ANOVA) and categorical variables using chi square test. The comparison of continuous variables within patients who had diastolic dysfunction and those who did not was done using independent t test.

Table 1: Baseline demographic, clinical and laboratory characteristics of patients (n=100) with chronic liver disease by Child-Pugh classification

	A (n= 14)	B (n= 52)	C (n= 34)	P value
Age	39.33 ± 2.6	43.4 ± 0.92	45.54 ± 1.12	0.844
Duration in years	8.0 ± 0.5	8.22 ± 1.094	8.57 ± 0.8	0.631
Bilirubin	1.98 ± 0.14	2.68 ± 0.16	6.5 ± 0.73	0.007
Direct bilirubin	1.06 ±0.11	1.34 ±0.07	3.32 ±0.46	0.006
INR	1.41 ± 0.03	1.48 ± 0.02	1.76 ± 0.03	0.084

ALBUMIN	3.14 ± 0.03	2.98 ± 0.026	2.84 ± 0.02	0.303
EF %	60 ± 0.9	60 ± 0.4	56 ± 1	0.000
EA RATIO	1.3 ± .06	1.25 ± .05	1.24 ± 0.08	0.412
QT INTERVAL	0.48 ± 0.003	0.44 ± 0.001	0.46 ± 0.001	0.000

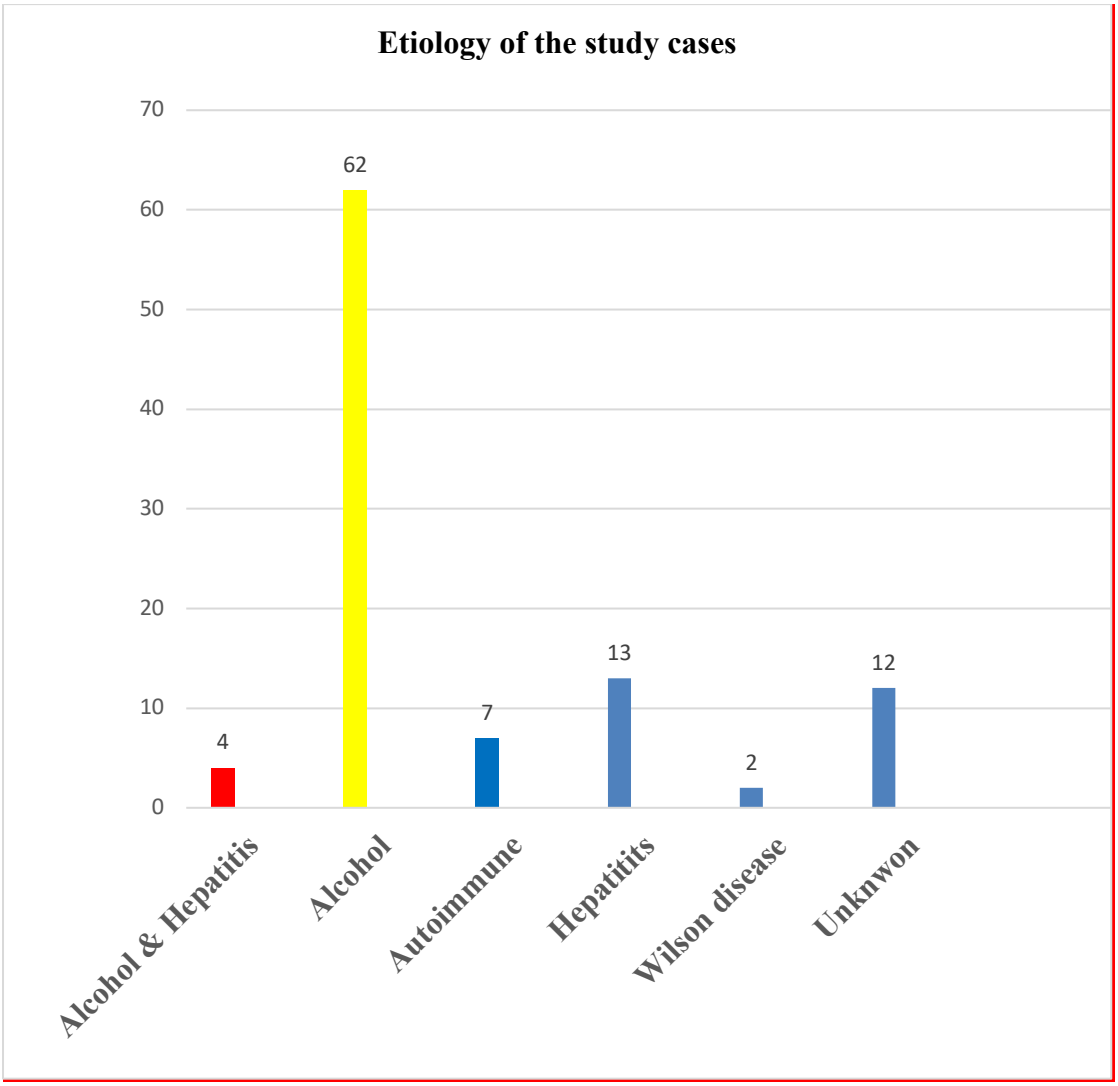

Figure 1: Etiology of Chronic Liver Disease among the Present Study Group

Table 2: Distribution of etiologies among child pugh class of chronic liver disease

Etiology *					
Count					
		Child_PUGH			**Total**
		Grade A	**Grade B**	**Grade C**	
Etiology	unknown	3	4	5	12
	alcohol	3	37	27	67
	hepatitis	5	6	2	13
	autoimmune	3	2	2	7
	wilson	1	1	0	2
Total		15	50	35	100

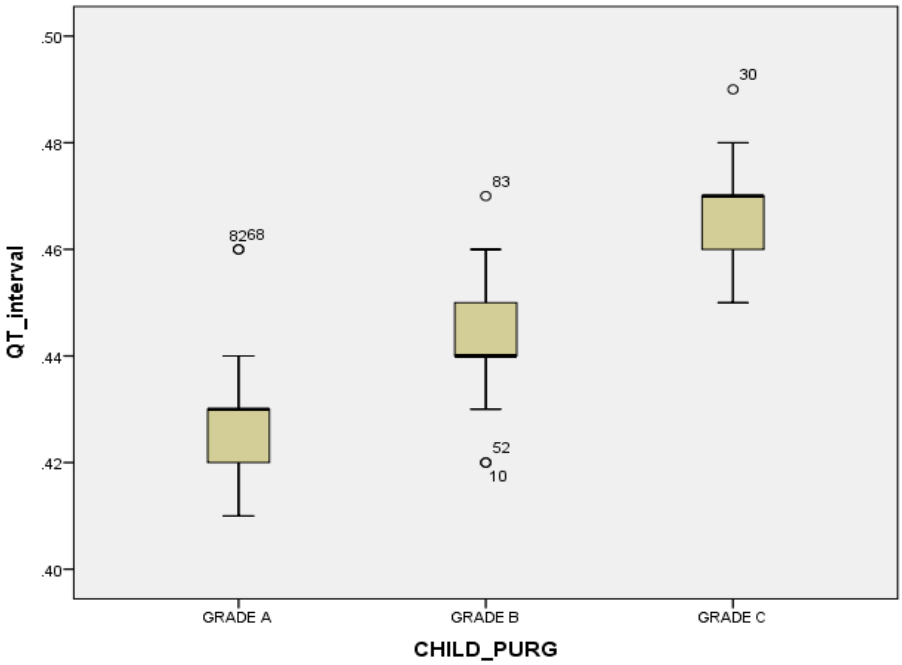

Figure 2: QT intervals in the Child-Pugh A, Child-Pugh B and Child-Pugh C groups. QT intervals are presented as the means + standard deviation. *, p < 0.05 by ANOVA

Table 3: Grades of Diastolic Dysfunction in Chronic Liver Disease between Child Pugh Class A, B & C

Diastolic dysfunction	A (n= 14)	B (n= 52)	C (n= 34)	P value
Grade 0	14	38	68	0.005
Grade1	1	12	14	
Grade 2	0	0	1	
Grade 3	0	0	4	

Table 4: Systolic Dysfunction in Chronic Liver Disease between Child Pugh Class A, B & C

Systolic Dysfunction	A (n= 15)	B (n= 50)	C (n= 35)	P value
Normal	15	50	30	0.008
Present	0	0	5	

Discussion

Cardiac dysfunctions associated with liver cirrhosis were attributed to the direct toxic effects of alcohol on the heart. However, in 1953, Kowalski and Abelmann et al, [13] showed the existence of a circulatory dysfunction specific to liver cirrhosis. Since then, several studies have consistently reproduced those findings. Interference of liver disease with the cardiac and circulatory performance would be expected, considering that the liver receives 25% of the cardiac output. [14,15,16]

In the present study almost 62% were due to alcohol, 13% were due to hepatitis, 12% with unknown etiology, 7% cases with autoimmune disorders, 4% cases presented with both alcohol and hepatitis and only 2 %cases with Wilson disease. In Kundal V et al study, of 51.33% patients with alcoholic liver disease, 13% had underlying HBV infection. [17]Alcoholism (34.3% of 4413) was the commonest cause of cirrhosis, while HBV (33. 3%) was the major cause of chronic liver disease in general and noncirrhotic chronic liver disease (40.8% out of 8163).[18]Very less study had been done in Asian countries, it shows the hepatitis being the common cause for chronic liver disease. Our findings correlate with other Indian authors such as Gautam Ray, [19] Dhiman and Duseja,[20] Patel ND et al [21] and Jain et al. [22]The higher incidence of alcoholic liver disease in our study is also supported by vast data from western authors such as Thomson et al,[23] Mc Ayoy and Hayes[24], Belt et al [25] and liang et al.[26] A study of Maskey et al in Nepal reported that 85.7% of patients had alcoholic liver disease. In our study, the Child Turcotte Pugh class for the patients involved in our study. 14 % cases were in Class A, 52 % were in Class B and 34% were in Class C. The association between child turcotte pugh class A and the myocardial dysfunction, all 14 cases belonged in class A was normal in Myocardial dysfunction. The association between Child Turcotte Pugh Class B and myocardial

dysfunction. Out of 52 cases, all 52 cases were normal. Regarding the diastolic dysfunction, about 14 were had diastolic dysfunction and 40 were in normal. It was found to be significant since the p value was 0.0001. The association between Child Turcotte Pugh Class C and myocardial dysfunction. Out 34 cases, 6 patients had systolic dysfunction and 28 were normal.

About 18 had diastolic dysfunction and 16 had normal. It was statistically significant since the p value was 0.0013.Bernardi et al [27] in their found that the frequency of cardiac dysfunction was dependent on the severity of cirrhosis as assessed by Child Turcotte Pugh score. Similar observation was done by Rabie et al [28] in their study on diastolic dysfunction in cirrhotics.

Conclusion:

Patients with Child-Pugh C cirrhosis showed increased systolic and diastolic myocardial dysfunction and also longer QT interval than Child-Pugh A or B patients. Thus, an evaluation of myocardial function should be considered in patients with chronic liver disease especially for Child- pugh class C.

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