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Research Article

A STUDY ON CARDIAC DYSFUNCTION IN NONALCOHOLIC CIRRHOSIS

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A B S T R A C T

AIM :To study the presence of cardiac dysfunction namely Cirrhotic cardiomyopathy in a tertiary care centre and to assist in stratification of Cirrhotic cardiomyopathy .To assess the impact of QTc prolongation and ascites in Cirrhotic cardiomyopathy. To evaluate the problem in non alcoholic group. **MATERIALS AND METHODS**: Inclusion criteria: patients with non alcoholic cirrhosis were included in the study. Exclusion criteria: Alcoholics,severe ascites, patients with risk factors for cardiomyopathy other than cirrhosis and metabolic disorders were excluded from the study.Investigation like CBC,LFT,USG with Doppler, Viral markers, ECG, Echocardiography were done. The parameters that were assessed in Echocardiography are E/a ratio, end diastolic volume, end systolic volume, Ejection fraction. **RESULTS**: Total number of cases: 45, Female-41(91.1%); male-4 (8.9%). CTP score distribution: ClassA:29 (64.4%), ClassB:16 (35.6%) ,ClassC: Nil. Presence of Ascites: 37 had and 8 did not have ascites. Presence of Varices: 40 had and 5 did not have varices. Conduction disturbances: 25 had QTc interval more than440msec and 20 had less than 440msec. Presence of Left ventricular dysfunction (E/A ratio): Of the 45 casesE/Aratio (early diastolic and Late diastolic atrial filling velocity) was less than 1 in 38(84.4%) cases and more than 1 in 7(15.6%) patients. Of the 45cases included in the study 40 patients (88.9%) had features of Cirrhotic cardiomyopathy. **CONCLUSIONS**: Cirrhosis of Non-alcoholic aetiology have evidence of Cirrhotic cardiomyopathy. Cirrhotic cardiomyopathy independent of the aetiology.Severity of the liver disease correlated to the degree of QTc prolongation. Ascites is a significant feature of all cases with diastolic dysfunction.Gender does not have correlation with the presence of Cirrhotic cardiomyopathy.Some degree of Diastolic dysfunction is seen in almost all cirrhotics. Ventricular end diastolic volume, end systolic volume and ejection fraction are not significantly affected in cirrhotic individuals.

INTRODUCTION

Background: Liver cirrhosis is associated with a wide range of cardiovascular abnormalities. Cirrhotic patients were noted to have resting tachycardia, warm peripheries, a bounding pulse, and a wide pulse pressure, but these were attributed to the effects of alcohol on the cardiovascular system. Beginning in the late 1980s occasional reports of unexpected deaths due to heart failure following liver transplantation , TIPS insertion [2], and surgical portocaval shunts [3] led to an upsurge of interest in investigating for cardiac dysfunction related to cirrhosis. There are evidences to suggest that the presence of cirrhosis per se is associated with significant cardiovascular abnormalities, irrespective of the cause of cirrhosis. These include resting increased cardiac output; decreased systemic vascular resistance reduced myocardial contractility or systolic incompetence, especially under conditions of stress, whether physiological [4] physical [5,6] or pharmacological increased thickness of the left ventricle [7,8] associated with diastolic dysfunction; and electrophysiological abnormalities[9,10]. This constellation of abnormalities has been termed cirrhotic cardiomyopathy [11]. The prevalence of cirrhotic cardiomyopathy remains unknown at present. Features include structural, histological, electrophysiological, systolic and diastolic dysfunction. Multiple factor 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 [12]. Overt heart failure is not generally a feature of cirrhotic cardiomyopathy, because the associated marked vasodilatation accompanying the hyper dynamic circulation significantly reduces ventricular afterload. However, major stresses on the cardiovascular system such as liver transplantation, infections and insertion of TIPS can unmask the presence of cirrhotic cardiomyopathy and thereby convert latent to overt heart failure.Cirrhotic cardiomyopathy may also contribute to the pathogenesis of HRS (hepatorenal syndrome) and circulatory failure in liver

cirrhosis[12]. Diastolic dysfunction is present in majority of patients with cirrhotic cardiomyopathy, and that simple echocardiographic indices like the E/A ratio may detect diastolic dysfunction even at rest. This may therefore represent the best available screening test to diagnose cardiac dysfunction . Due to the limited number of human studies, the management of cirrhotic cardiomyopathy remains largely empirical.. Orthotropic liver transplantation seems to improve or normalize the condition generally after a period of several months [13]. If overt heart failure develops in these patients, then the same general treatment principles of noncirrhotic congestive heart failure apply, including bed rest, salt restriction, oxygen, diuretics, and careful preload and afterload reduction

Aim :1. To study the presence of Cirrhotic cardiomyopathy in a tertiary care centre 2.To assist in stratification of Cirrhotic cardiomyopathy in Chronic liver disease as per Child Turcotte Pugh (CTP) scoring.3.To assess the impact of QTc prolongation associated with CTP scoring in Cirrhotic cardiomyopathy.4.To assess the impact of ascites in Cirrhotic cardiomyopathy 5.To evaluate the problem in non alcoholic group.

MATERIALS AND METHODS

Patients included in the study were from Govt, Mohan Kumaramangalam Medical College and Hospital, Salem. The study Period from October 2008 and September 2010. Inclusion criteria: patients with non alcoholic cirrhosis were included in the study. Exclusion criteria: Alcoholics, patients with severe ascites, Coronary artery disease, patients with risk factors for cardiomyopathy other than cirrhosis, Hypertensives, diabetics, SevereAnaemia, history of recent bleed, hypocalcemic and hypokalemic, were excluded from the study.

Investigation

CBC, LFT, USG with Doppler, Viral markers, ECG, Echocardiography. The parameters that were assessed in Echocardiography are E/a ratio, end diastolic volume, end systolic volume, Ejection fraction. QTc interval more than 440msec and E/A ratio less than 1 were considered diagnostic of cirrhotic cardiomyopathy.End diastolic volume of 90, end systolic volume of 38 and ejection fractionof 60% were noted as mean of the normal values while doing statistical analysis. The statistical analysis was done using SSPS software version 15.

RESULTS

Total number of cases: 45, Female- 41(91.1%); male-4(8.9%) *AgeGroup*: Below 40years:12, 40-50yrs: 20, above50yrs:13. *Aetiology:* HBV related Cirrhosis: 9(20%), HCV related Cirrhosis: 1(2.2%), Idiopathic:35(77.8%). CTP score distribution: Class A: 29(64.4%), Class B:16 (35.6%) ,ClassC:Nil. *Presence of Ascites*: 37 had and 8 did not have ascites.*Presence of Varices*: 40 had and 5didnot have varices.*Conduction disturbances*: 25 had QTc interval more than 440 msec and 20 had less than 440msec. Of the 25 patients with prolonged QTc 2 (8%) were males and 23(92%) were females and 9(36%)patients were in CTP class A and 16(64%) patients in CTP class B. *Presence of Left ventricular dysfunction(E/A ratio):*Of the 45 cases E/A ratio (early diastolic and Late diastolic atrial filling velocity) was less than 1 in 38(84.4%)cases and more than 1 in 7(15.6%)patients. Of these 38cases of E/A ratio less than 1, 35(92.1%) were females and 3(7.9%) were males.Of the 45cases included in the study 40patients (88.9%) had features of Cirrhotic cardiomyopathy. Since they had a prolonged QTcinterval of more than449msec or an E/A ratio less than1. Out of the 40cases with Cirrhotic cardiomyopathy 4(10%) were males and 36(90%) were females.*End diastolic volume*: Above 90 noted in 19(42.2%) patients and below 90 noted in 26(57.8%) patients. *End systolic volume*: Above38 noted in 7(15.6%) and below 38 noted in38 (84.4%).Ejection fraction: Above 60% noted in 34(75.6%) and below 60% noted in 11(24.4%).

Statistical analysis

Out of the 45 cases, 40 cases had features of Cirrhotic cardiomyopathy. 24 patients had Class A CTP score and 16patients had ClassB CTP score. 5 patients with Class A CTP score did not have Cirrhotic Cardiomyopathy. The P value of this association between CTP score and Cirrhotic cardiomyopathy is 0.078 which is not significant (Table:1) . This implies that Cirrhotic cardiomyopathy is not influenced by the Child Turcotte Pugh score. Ascites was noted in 37 of the 45 cases Out of 40cases who had cirrhotic Cardiomyopathy 36 cases present with ascites and 4 cases present without ascites. Out of 5 cases who did not have Cirrhotic cardiomyopathy ascites not seen in 4cases.The p value of association of ascites and Cirrhotic cardiomyopathy is 0.0002 which is significant. This implies presence of ascites is a significant feature of Cirrhotic cardiomyopathy. 40 out of 45 cases present with varices. Of the 40cases who had cirrhotic cardiomyopathy 35 present with varices and 5 did not have varices. 5 cases with varices did not have Cirrhotic cardiomyopathy. The p value of the association between cirrhotic cardiomyopathy and varices is 0.42 which is not significant.TheQTc interval more than 440msec noted in 25patients and less than 440 msec noted in 20patients.16patients of CTP-B had QTc more than 440msec .9 patients of CTP-A had Qtc more than 440msec. 20patients of CTP-A did not have QTc more than 440msec.P value association between Qtc more than 440msec and CTP-B is 0.0012 which is significant. This implies the presence of CTP-B is significant feature in cases who have Qtc interval more than 440msec.The Qtc interval was more than 440msec in 23(92%) females and 2(8%) males. 18(90%) females and 2(10%) males had value below 440msec.These association have a p value 0.81 which is not significant . This implies Prolongation of QTc interval is not a significant feature in patients who had cirrhosis and is not influenced by gender. Out of 45 patients, 40 had features of Cirrhotic Cardiomyopathy.19 patients had End diastolic volume above 90 and 26 had below 90. 14 patents with diastolic dysfunction had EDV above90 and 24 had EDV below90.5 patients with EDV above 90 didnot have diastolic dysfunction. The p(0.099) value of this association between EDV and diastolic dysfunction is not significant. This implies that abnormality of EDV is not a significant feature of Cirrhotic Cardiomyopathy. 38 cases had end diastolic volume below 38. 7cases had ESV above 38.32 cases with Diastolic dysfunction had ESV below38. 6cases with ESV below 38 did not have Diastolic dysfunction. 1 patient with ESV above 38 did not have Diastolic dysfunction. The p (0.919) value of this association between ESV and Diastolic dysfunction is not

significant. This implies that the abnormality of ESV is not a is not a significant feature of Cirrhotic Cardiomyopathy. 34 cases had EF above 60. 11 patients had EF below 60. 27 patients with Diastolic dysfunction had EF above 60. 11 cases with diastolic dysfunction had EF below 60.7 patients with EF above 60 did not have Diastolic dysfunction. The p value (0.168) is not significant. This implies that abnormality of EF is not a significant feature of CirrhoticCardiomyopathy

Table 1

Cirrhotic Cardiomyopathy	ClassA CTP	ClassB CTP	Total
Present	24(60%)	16(40%)	40(88.9%)
Absent	5(100%)	-	5(11.1%)
Total	29(64.4%)	16(35.6%)	45(100%)
P value:0.078 -not significant			

Table 2

Cirrhotic Cardiomyopathy	Ascites present	Ascites absent	Total
Present	36(90%)	4(10%)	40(88.9%)
Absent	1(20%)	4(80%)	5(11.1%)
Total	37(82.2%)	8(17.8%)	45(100%)
P value:0.0002 Significant			

Table3

Cirrhotic Cardiomyopathy	Varices present	Varices absent	Total
Present	35(87.5%)	5(12.5%)	40(88.9%)
Absent	5(100%)	-	5(11.1%)
Total	40(88.9%)	5(11.1%)	45(100%)
P value:0.42	Not significant		

Table 4

QTc interval	CTP-A	CTP-B	Total
>440msec	9(36%)	16(64%)	25(55.6%)
<440msec	20(100%)	-	20(44.4%)
Total	29(64.4%)	16(35.6%)	45(100%)
Pvalue:0.0012	Significant		

Table 5

QTc interval	Female	Male	Total
>440msec	23(92%)	2(8%)	25(55.6%)
<440msec	18(90%)	2(10%)	20(44.4%)
Total	41(91.1%)	4(8.9%)	45(100%)
Pvalue:0.81	Not significant		

Table 6

Diastolic dysfunction	EDV>90	EDV<90	Total
Present	14(36.8%)	24(63.2%)	38(84.4%)
Absent	5(71.4%)	2(28.6%)	7(15.6%)
Total	19(42.2%)	26(57.8%)	45(100%)
P value:0.099	Not significant		

Table 7

Diastolic dysfunction	ESV>38	ESV>38	Total
Present	6(15.8%)	32(84.2%)	38(84.4%)
Absent	1(14.3%)	6(85.7%)	7(15.6%)
Total	7(15.6%)	38(84.4%)	45(100%)
P value:0.919	Not significant		

Table 8

Diastolic dysfunction	EF>60	EF<60	Total
Present	27(71.1%)	11(28.9%)	38(84.4%)
Absent	1(100%)	-	7(15.6%)
Total	34(75.6%)	11(24.4%)	45(100%)
P value:0.919	Not significant		

DISCUSSION

In our study HBV related cirrhosis noted in 9cases, one due to Chronic HCV infection, and 35 case the cause was not known. Features of Cirrhotic cardiomyopathy were present in 40 out of 45 cases. The study group consisted of 41females out of which 36 had features of cirrhotic cardiomyopathy and all the 4 males had features of Cirrhotic cardiomyopathy. This study showed that there is no significancebetween sexdistribution.Torregrosa M *et al* [14] it was observed that the cardiac changes in cirrhosis were independent of the aetiology of cirrhosis. Lunzer *et al* in their study found that cardiac dysfunction in cirrhosis did not correlate with the aetiology of cirrhosis. Our study also observed that the presence of cirrhotic cardiomyopathy was independent of the aetiology of cirrhosis. In our study 26.7% of the cases were below 40 years, 44.4% of the cases between 40 to 50years of age and 28.9% of cases above 50years. 5 patients were not showing features of cirrhotic cardiomyopathy. Rable *et al* [15] found that diastolic dysfunction seen in cirrhosis is associated with older age. This study showed no significance between age distribution and cirrhotic cardiomyopathy. In our study 37 cases had ascites out of which 36 patients had features cirrhotic cardiomyopathy. Among 8cases who did not have ascites. 4cases had features of cirrhotic cardiomyopathy. On the other hand 90% of the patients with cirrhotic cardiomyopathy had ascites and 10% didnot have ascites. This shows the presence of ascites correlated significantly with the presence of cirrhotic cardiomyopathy (p= 0.0002). Wong *et al* [16] observed that diastolic dysfunction may be a significant factor in the development of cardiac failure ,may precede systolic dysfunction in patients with cirrhosis and play a part in the pathogenesis of sodium fluidretention in cirrhosis and thus related to ascites. Pozzi *et al* [17] found that irrespective of ascites and cause advanced cirrhosis is associated with left ventricular diastolic dysfunction. But in ourstudy ascites was asignificant features of all cases with diastolic dysfunction. 64.4% of the cases had CTP Class A cirrhosis. 35.6% of the cases had class B cirrhosis. 82.8% of CTP class A and 100% of class B patients had features of cirrhotic cardiomyopathy. 60% of cases with cirrhotic cardiomyopathy had Class A Cirrhosis and 40% had Class B cirrhosis. Since the p (0.078) value was not significant the severity of cirrhosis based on CTP score did not correlate with the presence of cirrhotic cardiomyopathy. Rable *et al* also observed the similar results in their study. 55.6% of the cases had QTc interval above 440msec. of these 41(92%) females 23(56.1%) had QTc interval more tham 440msec and 50% (2) of the 4males had prolonged QTc interval. These findings showed that sex was not a factor in influencing the QTc prolongation in Cirrhotics. Bader FaiyazZuberi *et al* [18] in their study in Pakistan observed that QTc were significantly higher in cirrhotics than in non cirrhotic controls. Lehman found that prolonged qtc interval was noted more in female cirrhotics. But our study did not show any such correlation. In our study 25 patients had QTc interval more than 440msec. Of this 25 patients all 16 CTP-B and 9 CTP - A patients had QTC more than 440msec. 20 patients with CTP class A had QTc less than 440msec. This showed prolongation of QTc interval correlated with severity of liver disease. Bernardi *et al* [19] observed that QTc interval was significantly prolonged in Cirrhotics when compared with healthy controls. 19 (42.2%) cases had end diastolic volume above 90. 14(36.8%) case with EDV above 90 had E/A ratio 1. 24(63.2%) cases with EDV below 90 also had

E/A ratio below 1. 5cases with EDV above 90 did not have diastolic dysfunction and 2 cases with EDV below 90 did not have diastolic dysfunction. These indicated that the end diastolic volume was not as significant indicator of cardiac dysfunctions (p=0.07). Alexander Jacob *et al* [20] observed in Asian cirrhotics that end diastolic volume was not statistically significant. Kelback *et al* [21] found out that left ventricular end diastolic volume is normal in cirrhotics.7(15.6%) cases had end systolic volume above 38. 6(85.7%) cases with ESV above 38 had E/A ratio below 1 . 32 (84.2%) cases with ESV below 38 also had E/A ratio below 1. One patient with ESV above 38 did not have diastolic dysfunction. These observations indicate that end systolic volume is not significant indicator of cardiac dysfunction (p=0.39).Alexander Jacob *et al* observed in their study in Asian cirrhotics that end systolic was not statistically significant.Kelback *et al* found out that left ventricular end systolic volume was normal in cirrhotics. 34 (75.6%) cases had ejection fraction above 60% and 27(71.1%) cases with EF above 60 had E/A ratio below 1. 11cases with EF below 60 had E/A ratio below1. All the cases that had E/A ratio above 1 also had EF above 60.These findings indicate that ejection fraction was not significant indicator of cardiac dysfunction (p=0.17).Alexander Jacob *et al* found out that EF was not statistically significant

CONCLUSIONS

1. In our study Cirrhosis of Non-alcoholic aetiology have evidence of Cirrhotic cardiomyopathy. They have features in the form of diastolic dysfunction manifesting as E/A ratio less than 1 and Prolonged QTc interval.
2. Cirrhotic cardiomyopathy is independent of the aetiology
3. Severity of the liver disease is correlated to the degree of QTc prolongation.
4. Ascites is a significant feature of all cases with diastolic dysfunction
5. Gender does not have correlation with the presence of Cirrhotic cardiomyopathy.
6. Some degree of Diastolic dysfunction is seen in almost all cirrhotics.
7. Ventricular end diastolic volume, end systolic volume and ejection fraction are not significantly affected in cirrhotic individual

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