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Prevalence of cirrhotic cardiomyopathy

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Abstract :
Aim To study the frequency of cirrhotic cardiomyopathy in liver cirrhosis patients and its correlation with severity of liver disease.Method This is a case series study conducted in Department of Digestive health and Disease, a tertiary care hospital in Chennai over the period from july 2012 Oct-2013. First, resting ECG was done in enrolled cirrhotic patients . QTc values were calculated and value 0.44 sec were considered as prolonged. Systolic dysfunction was assessed by reduced ejection fraction (value 55). Diastolic dysfunction assessed by reduced EA ratio (value 1).Cirrhotic cardiomyopathy(CCM) is diagnosed by presence of evidence of either systolic or diastolic dysfunction, together with prolonged QTc.Results A total of 106 patients were selected for the study, out of which 96 (90.5) were male and 10 (9.5) were female. The mean age was 46.5 years (10.8 SD). Out of 106 patients 15 (14.2) belonged to child Pugh A, 21(19.8) to child-Pugh B and 70(66) in child-Pugh C. EA ratio 1 in 34(32.1) cases, prolong QT interval (0.44sec) in 29(27.8), Ejection fraction (EF) 0. 55 was present in 19(17.9) patients. Cirrhotic cardiomyopathy was present in 39(36.7) cases and frequency correlates directly with severity of liver disease. There was no significant difference in frequency of CCM among alcoholics and non-alcoholics.Conclusion Cirrhotic cardiomyopathy is present in 36 percent of cirrhotic patients and significantly more in child C group. Presence of this clinical entity may have major impact on prognosis in these patient.
Keyword : Cirrhosis,Cirrhotic cardiomyopathy,CCM

Introduction:

Cirrhotic patients exhibit circulatory and cardiac dysfunction predominantly governed by peripheral vasodilatation and thereby activation of potent vasoconstrictor system [1,2]. These aggravates hyper dynamic circulation and cardiac strain. Cardiac abnormalities in cirrhosis was initially attributed to the toxic effect of alcohol on the heart. However,

experimental studies in animals[3,4] and clinical studies have shown that cirrhosis *per se cause impaired myocardial contractility as well as electrophysiological abnormalities and it is increasingly been recognized as separate clinical entity called ''cirrhotic cardiomyopathy(**CCM**)" [5,6]. This term denotes a chronic cardiac dysfunction, characterized by blunted contractile responsiveness to stress and altered diastolic relaxation with electrophysiological* abnormalities, such as prolongation of the QT interval, all occurring in the absence of any other cardiac disease [7]. Poor cardiac response to physical stress may affect quality of life and contribute to fatigue in these patients .CCM may affect the prognosis of the patients and aggravate the course during invasive procedures such as surgery, insertion of a transjugular intrahepatic portosystemic shunts (TIPS), and liver transplantation[8,9].We attempt to study the frequency of CCM and its correlation with severity of liver dysfunction.

Methods:

This is a descriptive case series study of 106 cirrhotic patients admitted in Department of Digestive Health and Disease, Kipauk Medical College, a tertiary care hospital in Chennai during the period from July 2012 to Oct 2013.All cirrhotic patients confirmed by clinical, biochemical, and radiological evidence (reduced liver span <8 cm with ascites and splenomegaly, prolonged prothrombin time >12 seconds and reduced level of serum albumin <3.5 g/dl, increased liver echo pattern and/or portal vein diameter >1.3mm respectively) were enrolled. Patients with recent bleeding, gross ascites, severe anemia that could alter cardiovascular status, NASH related cirrhosis and prior history of myocardial infarction, valvular heart disease, conduction abnormalities, cardiac failure, Diabetes mellitus, hypertension, electrolyte imbalance, h/o drug intake such as calcium channel blockers, antiarrhythmic and digoxin were excluded.

Eligible Patient's basic demographic details were noted. Blood test for liver functions test (including proteins), prothrombin time, ultrasound of abdomen was done along with clinical assessment for degree of ascites and hepatic encephalopathy. Child Toucotte Pugh(CTP) scoring was done for each patient.

First, resting ECG was done in all the patients . QTc value > 0.44 sec was considered as prolonged. Then, cardiac structural and functional assessment was performed non-invasively using transthoracic echocardiography. Diagnostic criteria for systolic dysfunction was resting EF <55% and for diastolic dysfunction was E/A ratio <1.0[7]. Cirrhotic cardiomyopathy(CCM) was diagnosed as per world congress of Gastroenterology 2005 definition as "presence of evidence of either systolic or diastolic dysfunction, together with supporting criteria such as electrophysiological abnormalities"[7]

Results.

Total number of cirrhotic patients enrolled were 132. After exclusion of 26 patients based on above criteria, 106 patients were selected for the study analysis. Majority (90.5%) were male with mean age of 46.5years(range: 32 – 62).The etiology of cirrhosis was alcohol related in 85% and remaining(15%) being related to HBV,HCV and cryptogenic cause. Out of 106 patients, 15 (14.2%) belonged to child-pugh A, 21 (19.8%) belonged to child-pugh B and 70(66%) belonged to child-pugh C. (Table:1)

Demographic Profile	
Mean Age(in years)	46.5
Male ; n(%)	96(90.5%)
Female ; n(%)	10(9.5%)
Character of Liver Disease; n(%)	
Alcoholic	91(85.8%)
Non Alcoholic, Non NASH	15(14.2%)
CTP A	15(14.2%)
CTP B	21(19.8%)
CTP C	70(66%)

Resting ECG showed prolonged QTc (>0.44sec) in 39(27.3%) patients. Echocardiogram revealed systolic and diastolic dysfunction in 19(17.9%) and 34(32.1%) patients.39 (36.7%) was found to have cirrhotic cardiomyopathy based on the diagnostic criteria as described earlier.(Fig:1)

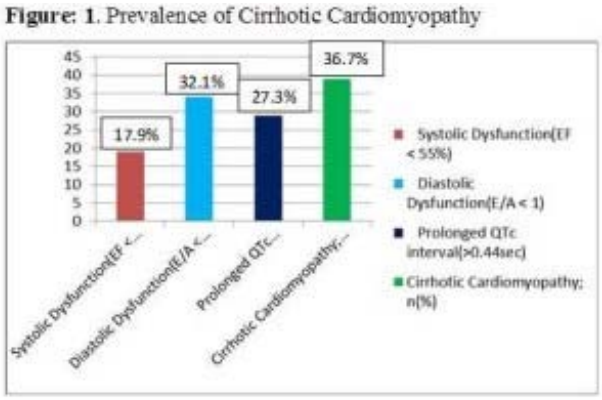

Figure: 1. Prevalence of Cirrhotic Cardiomyopathy

On subgroup analysis, there is no significant difference between alcoholic and other group in frequency of CCM(Table:2).Mean duration of liver disease was >2.5years in both groups and frequency of occurrence was more in advanced cirrhosis(CTP C > B >A)(Fig: 2)

Table: 2

Correlation of Cirrhotic Cardiomyopathy with etiology, duration & severity of liver disease.

Total number of patients with cirrhotic Cardiomyopathy - 39

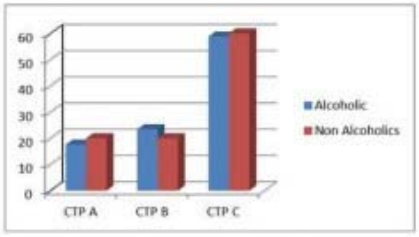

Figure: 2 Correlation of CCM with Severity of Liver Disease

Figure: 2 Correlation of CCM with Severity of Liver Disease

Discussion:

About 50 years ago,cirrhosis has not been associated with any cardiac abnormalities, despite the fact that a hyperdynamic circulation has been described [10]. Later circulatory changes like resting tachycardia, warm peripheries, a bounding pulse, and a wide pulse pressure were noted and were attributed to the effects of alcohol on the circulation. In late 1980's,case reports of unexpected deaths

Parameters	Alcoholic(A) n(%)	Non- Alchololic(NA) n(%)
No. of cases	34(35.7% among A)	5(33.3% among NA)
Mean Duration of liver disease	2.8 years	3.1 years
CTP A	6(17.6%)	1(20%)
CTP B	8(23.4%)	1(20%)
CTP C	20(58.8%)	3(60%)

due to heart failure following liver transplantation [11] and transjugular intrahepatic portosystemic stent shunt (TIPS) insertion [12] led to investigation for cardiac dysfunction related to cirrhosis.

Although Lee coined the term ‘‘cirrhotic cardiomyopathy’’ almost 2 decades ago [13], the landmark study by Caramelo and colleagues[3] changed the perception on CCM .They infused saline into rats with carbon tetrachloride induced cirrhosis and observed a 50% decrease in cardiac output despite a 112% increase in peripheral vascular resistance suggests that the decreased cardiac contractile response observed was due to cirrhosis per se rather than related to the damaging effects of alcohol on the myocardium . Few years later, human studies in nonalcoholic cirrhosis showed similar results. Bernardi et al[8] andWong et al [14] demonstrated in both alcoholic and nonalcoholic cirrhotic patients, with or without ascites, prolonged ratio of pre-ejection period to left ventricular ejection time and inverse systolic pressure to end-systolic volume relationship,an index of myocardial contractility[15] respectively. Contractile abnormality appeared to be more severe in the ascitic cirrhotic patients, suggesting a correlation between the degree of cardiac dysfunction and the severity of liver disease. Finucci et al, Pozzi et al and Wong et al [14] found significantly reduced E/A ratio only in ascitic subjects,indicating a greater impedance to venous return than pre-ascitic cirrhotic patients.

Desai et al[16] Indian study further emphasized that diastolic dysfunction was present in majority of patients suffering from cirrhosis. QT interval prolongation frequently occurs in cirrhotic patients, irrespective of the etiology of the disease. Its prevalence is about 45% and is broadly proportional to the severity of cirrhosis, rising from 25% in class A to 51% in class B and up to 60% or more in class C of Child-Pugh classification [8] .In our study,we observed this abnormality in 27% of cases and increasing frequency correlates directly with severity of liver disease. The overall frequency of CCM was 36% comparable with 33% in an asian study by Shaikh et al[17].we observed no difference in frequency of CCM in both alcoholic and non-alcoholic group and agree that cirrhosis per se was the cause for cardiomyopathy.

Limitation of our study was that majority of study population were in child c group and not equally distributed. This may be due to referral to our hospital at advanced stage of cirrhosis with complications and patient seeking medical care after obvious symptoms occurred. Secondly, Dobutamine stress test and other biochemical markers were not done due to non-availability in our hospital. Third, majority of patients were alcoholic and exclusion of alcoholic cardiomyopathy by molecular analysis was not studied.

The impact of this clinical entity on morbidity,mortality needs long term study.Outcome of liver transplantation in this patients and reversibility of this complication after transplantation may be of future studies in liver transplantation.

Conclusion:

Cirrhotic Cardiomyopathy is one of the common complication of advanced liver disease *per se. The frequency correlates directly with severity of liver disease. Diagnosis is based on electrocardiographic and echocardiographic evidence. Impact of this clinical entity on prognosis and liver transplantation needs future studies.*

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Reply to the query:

Alcoholic Cardiomyopathy Vs Cirrhotic Cardiomyopathy

Previously, it was noted that persons with alcohol-related cirrhosis had increased cardiac output, and had symptoms and signs of heart failure.This was attributed to cardiac effect of alcohol and termed as alcoholic cardiomyopathy. Later, Cardiac hypertrophy and cardiomyocyte edema in the absence of coronary artery disease, hypertension, or valvular disease were described in an autopsy series of subjects with cirrhosis[1].Subsequent studies described an impaired hemodynamic response to physiologic (exercise) and pharmacologic stress despite a high resting cardiac output[2] . This clinical entity was described as cirrhotic cardiomyopathy, which is defined as chronic cardiac dysfunction in patients with cirrhosis characterized by blunted contractile responsiveness to stress and/or altered diastolic relaxation with electrophysiological abnormalities, in the absence of known cardiac disease and irrespective of the causes of cirrhosis, although some etiologies (e.g., iron overload and alcohol consumption) further impact on myocardial structure and function. Diagnosis of alcoholic cardiomyopathy differ from cirrhotic cardiomyopathy in echo finding as follows. Alcoholic cardiomypoathy(AC) is a clinical diagnosis made in a patient presenting with a constellation of findings that includes

1.H/o excessive alcohol intake with possible physical signs of alcohol abuse,

2.Heart failure(Dyspnea, orthopnea, and PND are the hallmark) and 3.Supportive evidence consistent with Dilated C ardiomyopathy.

4-chamber dilatationGlobally decreased ventricular functionMitral and tricuspid regurgitation

Pulmonary hypertensionEvidence of diastolic dysfunctionIntracardiac thrombi (atrial or ventricular)LV hypertrophy Diagnosis of Cirrhottic cardiomyopathy is made as per criteria proposed by world congress of gastroenterology,2005 mentioned in methods which does not include dilated heart chambers or valvular

diseases or pulmonary hypertension on echo to make diagnosis.

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