



CARDIOVASCULAR ABNORMALITIES IN LIVER CIRRHOSIS-OUR CENTER EXPERIENCE

Gastroenterology

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ABSTRACT

Background The systemic circulation in patients with cirrhosis is hyper dynamic with an increased cardiac output and heart rate and a reduced systemic vascular resistance which contribute to significant cardiac structural and functional changes. We examined the various cardiovascular abnormalities among Cirrhotics. **Methods:** Cardiac dysfunction was studied in three groups of patients: normal controls, cirrhotics with and without ascites. Evaluation tool used primarily was Echocardiography. **Results:** Cirrhotic Patients demonstrated an increase in Left Ventricular mass and wall thickness. The atrial dimensions were increased in cirrhotic group compared to controls. Diastolic dysfunction as assessed by E/A ratio was significantly lower among cirrhotics. E/A ratio was lower in patients with ascites (median 0.94) compared with no ascites (median 1.05). **Conclusions:** Echocardiography is an important tool to evaluate cardiac dysfunction in Cirrhosis patients in terms of Left Ventricular mass, Right and Left Atrial dimensions and establishing the presence of Diastolic dysfunction

KEYWORDS

Cirrhosis / Echocardiography / Diastolic dysfunction

INTRODUCTION

Cardiovascular abnormalities in patients with Cirrhosis Liver are well known. Kowalski et al [1] were the first to describe abnormal cardiovascular function and prolonged QT interval in patients with cirrhosis. The systemic Circulation in patients with decompensated cirrhotics is hyperdynamic and characterised by increased heart rate and cardiac output with low normal or decreased blood pressure [2,3,4]. Overt heart failure is not a prominent feature in cirrhosis of liver but presence of latent cardiac function is well recognized [5, 6]. Diastolic dysfunction has been proved to be an early marker of cardiac dysfunction occurring before systolic dysfunction at rest [7].

Cirrhotic patients undergoing transjugular intrahepatic Portosystemic shunt (TIPS) are at high risk of developing cardiovascular complications. This may be the consequence of diastolic dysfunction [8,9]. Furthermore, the clinical consequences of cirrhosis related cardiovascular dysfunction are evident during and after liver transplantation [10].

We aimed at studying the echocardiographic abnormalities in patients with cirrhotics compared to healthy controls. The study also analysed the difference in the parameters among different aetiologies of cirrhosis. The cirrhotic patients were subdivided into two groups based on presence of ascites to ascertain its impact of Cardiac function and structural changes.

MATERIALS AND METHODS

A cross sectional study was carried out in the department of digestive health and diseases and department of cardiology, Kilpauk Medical College from January 2019 to December 2019 among the patients diagnosed with cirrhosis liver due to various aetiologies by clinical, biochemical and ultrasonogram and doppler study of portal venous system. Histological examination was done in select patients.

Exclusion Criterion

1. Terminal Liver failure / ACLF
2. Previous Cardiac / Respiratory illnesses / Major systemic diseases (Diabetes and hypertension)
3. Haemoglobin of <9 g/dl

After applying the exclusion criterion 70 cirrhotic patients were included. The study group was further divided into with ascites (n=38) and without ascites (n=32). Age and sex matched healthy control (n=32) were also included. Informed consent was taken from all the patients. A detailed clinical and laboratory investigations were done to minimise influence of other systemic diseases. All the patients were subjected to Blood Pressure, Heart rate measurements and

Echocardiography.

Echocardiography Study

2D, M mode and Doppler Echocardiography were done using the Left Parasternal and apical four chamber views to assess structural and functional status of the heart by standard techniques. LVDD (Left ventricular internal diameter in diastole), Right ventricular diameter, Right and Left atrial Diameter (RAD and LAD), IVST (interventricular septal thickness), LVPWT (Left Ventricular Posterior Wall) were measured. Left ventricular mass (LVM) was calculated using Penn Equation. Left ventricular wall thickness was calculated (LVWT).

Diastolic dysfunction was assessed by measuring the peak filling velocity during early ventricular diastole (E wave), the peak filling velocity during atrial systole (A wave). E/A ratio and deceleration time of E wave (dt of E), a measure of impedance to ventricular filling were studied.

Statistical Analysis

Results were expressed as medians and ranges. Differences between two study groups were assessed by Kruskal-Wallis test, and p value of <0.05 was considered statistically significant.

RESULTS

A total of 70 patients were studied under two groups, one with ascites (n=38) and without ascites (n=32). Baseline characteristics of both the groups including aetiology are summarised in the table 1 below.

Table 1. Base Line Characteristics of the study Population

	With Ascites (n=38)	Without ascites (n=32)
Age in years	35.1 (20-40)	33.5 (20-40)
Sex (male:female)	33:5	28:4
Albumin in g/dl	2.8 (1.8-3.3)	3.0 (2.1-4.0)
Globulin in g/dl	3.5 (2.6-5.0)	3.5 (2.8-3.9)
Bilirubin mg/dl	2.6 (0.9-6.1)	2.3 (0.7-8.0)
AST IU/L	81.8 (35-108)	118 (22-171)
ALT IU/L	51.5 (19-102)	79 (15-153)
ALP IU/L	131.3 (51-224)	174 (55-368)
CTP	9 (7-13)*	6.5 (5-11)
Aetiology Alcohol/Hep B/Hep C/ Cryp.	14:12:8:4	12:8:6:6

*P<0.01

Mean arterial Blood Pressure and Heart Rate was comparable in both the groups .RAD, LAD, LVWT, LVM were increased in both groups .Cardiac index was statistically significant in ascitic cirrhotic only. Left ventricular ejection fraction was preserved in both the groups compared to controls.

Assessment of Diastolic dysfunction revealed a marked increase in A wave , a significant decrease of E/A ratio and a significant increase in deceleration time of E wave in both groups compared to control .The decrease of E/A ratio was statistically significant in the ascitic cirrhotics .Results are summarised in Table 2

Table 2. Cardiac assessment among controls and cirrhotics

	Control (n=32)	With ascites (n=38)	Without ascites (n=32)
Heart Rate (Beats/min)	82 (63-99)	92(66-112)	87.5 (69-103)
MAP (mmHg)	90.33(80.7-97.3)	86.55(73.3-96.6)	86.16 (80-96.6)
Ejection Fraction %	69.65(57.9-77)	70.1(53.5-82)	67.15 (59.7-79.7)
Stroke volume index(ml/m ²)	41.51(29.38-48.8)	42.02(24.2-69.1)	43.77(24.7-60.8)
Cardiac index (l/min/m ²)	3.26(2.2-3.8)	3.98(2.32-6.1)*	3.43(2.1-5.35)
LAD mm	32.5(26-37)	40.7 (31.7-48.6)*	36.7(30-42)*
RAD mm	36.7(25-48)	45.7(28.4-53.3)*	41.9(34.9-49.3)*
LVIDD mm	45.8(40.0-53.5)	48.6(35.9-57.1)	45.8(37.3-53.1)
RV dimension mm	17.65(10.7-23.0)	20.9(13-26.6)	17.8(13.6-23.7)
E wave	84.9(62.8-101)	69.5 (41.2-120)	74.25(49.2-103)*
A wave	53.2(36.6-69.6)	73.4(49.4-149)*	67.2(44.3-117)*
E/A	1.52(1.2-2.2)	0.94(0.56-1.51)* ^	1.05(0.5-1.9)*
Deceleration of E	145(120-165)	171(115-245)*	170(115-220)*
LVWT	17.0(13.8-19.8)	19.75(14-25.4)*	18.48(15.8-1.6)*
LVM	147.4(95.7-199.3)	176.6(116.8-316)*	168.9(118.4-302.6)*

*p<0.05 vs control ^p<0.05 ascites Vs no ascites

In subgroup analysis among cirrhotics there was no statistically significant difference in the E/A ratio, Left ventricular mass, Left ventricular wall thickness among the different aetiologies of cirrhosis

DISCUSSION

In the present study we have examined the cardiac changes in cirrhotic patients compared to age and sex matched controls .The study showed that there are significant morphological changes in the heart consisting of significant Right and Left atrial dimensions among cirrhotics . The result was consistent with a similar study by B.K De Et al 11.These Changes in cirrhotics can be accounted for by cardiac adaptations to a persistent increase in preload due to increased central blood volume.

In corroboration with previous studies we have also found evidence of diastolic dysfunction in both groups of cirrhosis. E/A ratio was decreased more in patients with ascites .An increased atrial contribution to late ventricular filling ,leading to a reduced E/A ratio suggest Grade 1 diastolic dysfunction .Diastolic dysfunction is often linked to increased stiffness of the myocardial wall, due to combination of myocardial hypertrophy ,fibrosis and subendothelial edema 12

In our study the cirrhotic patients showed a preserved ejection fraction implying a fair systolic function .However Left ventricular mass and Wall thickness were significantly increased in Cirrhotics. This is in consensus with previous studies by Wong et al and De Marco et al 13,14..This did not differ statistically from cirrhotics with ascites .

We could not demonstrate any difference in the cardiac dysfunction

among different aetiologies of Cirrhosis

CONCLUSIONS

Detailed Echocardiatic assessment is helpful for early identification of cardiac dysfunction in patients with cirrhosis .The important findings are increased atrial dimensions, increased ventricular thickness and diastolic dysfunction. Diastolic dysfunction seems to be more pronounced in cirrhotics with ascites

REFERENCES

1. KOWALSKI HJ, ABELMANN WH. The cardiac output at rest in Laennec's cirrhosis. J Clin Invest. 1953 Oct;32(10):1025-33.
2. Llach J, Ginés P, Arroyo V, et al Prognostic value of arterial pressure, endogenous vasoactive systems, and renal function in cirrhotic patients admitted to the hospital for the treatment of ascites. Gastroenterology 1988;94:482-7.
3. Möller S, Wiinberg N, Henriksen JH. Noninvasive 24-hour ambulatory arterial blood pressure monitoring in cirrhosis. Hepatology. 1995 Jul;22(1):88-95.
4. Möller S, Henriksen JH. Circulatory abnormalities in cirrhosis with focus on neurohumoral aspects. Semin Nephrol. 1997 Nov;17(6):505-19
5. Ma Z, Lee SS. Cirrhotic cardiomyopathy: getting to the heart of the matter. Hepatology 1996;24:451-459.
6. Pozzi M, Carugo S, Boari G, Pecci V, Ceglia SE, Maggiolini S, et al.Evidence of functional and structural cardiac abnormalities in cirrhotic patients with and without ascites.Hepatology 1997;26:1131-1137.
7. Grossman WE. Diastolic dysfunction and congestive heart failure.Circulation 1990;81(Suppl. III):1
8. Merli M, Valeriano V, Funaro S, et al. Modifications of cardiac function in cirrhotic patients treated with transjugular intrahepatic portosystemic shunt (TIPS). Am J Gastroenterol 2002;97:142-148.
9. Rodriguez-Laiz JM, Banares R, Echenagusia A, et al. Effects of transjugular intrahepatic portosystemic shunt (TIPS) on splanchnic and systemic hemodynamics, and hepatic function in patients with portal hypertension. Preliminary results. Dig Dis Sci 1995;40:2121-2127.
10. Fouad TR, bdel-Razek WM, Burak KW, Bain VG, Lee SS. Prediction of cardiac complications after liver transplantation. Transplantation 2009;87:763-770
11. B.K De et al. Cardiac dysfunction in portal hypertension among patients with cirrhosis and non cirrhotic portal fibrosis. Journal of Hepatology 39 (2003) 315-319
12. Anish P G,Jayaprasad N, Madhavan S,George R.Echocardiographic abnormalities in patients with cirrhosis and relation to disease severity Heart India 2019;7:26-30