ORIGINAL RESEARCH

Assessment of cardiovascular dysfunction in chronic liver disease

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ABSTRACT

Background: Cardiovascular (CV) dysfunction refers to any abnormality or impairment in the function of the cardiovascular system, which includes the heart, blood vessels, and blood. The present study was conducted to assess cardiovascular dysfunction in chronic liver disease. **Materials & Methods:** 68 patients of chronic liver disease of both genders were subjected to liver function test (LFT), prothrombin time/international normalized ratio (INR), abdominal ultrasound, upper gastrointestinal endoscopy, cytology and serum ascites albumin gradient, HBsAg, anti-HCV, serum ceruloplasmin, and antinuclear antibody. Child-Pugh Score was calculated to classify the severity of CLD. Parameters such as stroke volume index (SVI), cardiac index (CI), ejection fraction (EF), diastolic dysfunction (DD), left ventricular mass index (LVMI) etc. was recorded. **Results:** Out of 68 patients, males were 40 and females were 28. Chronic liver disease was mild in 12, moderate in 17 and severe in 39 cases. The difference was significant (P< 0.05). Stroke volume index (SVI) was increased in 38 and decreased in 30, cardiac index (CI) was increased in 42 and decreased in 26. Ejection fraction (EF) was increased in 40 and decreased in 28, diastolic dysfunction (DD) was seen in 25 and increased EF after paracentesis was seen in 14 cases. The difference was significant (P< 0.05). **Conclusion:** Predicting the likelihood of unfavourable cardiac events requires a high level of understanding of the presence of cirrhotic cardiomyopathy and CV dysfunction in CLD patients.

Key words: Cardiovascular dysfunction, Ejection fraction, Stroke volume index

INTRODUCTION

Cardiovascular (CV) dysfunction refers to any abnormality or impairment in the function of the cardiovascular system, which includes the heart, blood vessels, and blood.[1,2]The cardiovascular system plays a vital role in maintaining overall health by transporting oxygen, nutrients, hormones, and waste products throughout the body.[3] Cardiac disease itself can result in hepatic dysfunction. For instance, persistent congestive cardiac failure or long-term right ventricular dysfunction may result in passive hepatic venous obstruction and cardiac cirrhosis, while low cardiac output and malperfusion may result in liver and multisystem dysfunction.[4] However, liver dysfunction often has unintended consequences for the cardiovascular system. Reduced systemic venous resistance in progressive CLD is primarily caused by splanchnic arteriolar vasodilation, which creates a hyperdynamic circulation.[5]

Clinical signs of CV dysfunction are not always apparent, hence it is essentially hidden.[6] Cardiac output has increased, which is the most noticeable hemodynamic characteristic. In many cases, the left ventricular ejection fraction (LVEF) is found to be higher.[7] Patients with CLD who are exposed to various stressors like exercise, infections, or surgical procedures like transjugular intrahepatic portosystemic shunt (TIPS) or liver transplantation are particularly at risk for CV dysfunction and cirrhotic cardiomyopathy, which are important but underappreciated contributors to morbidity and mortality.[8,9] The present study was conducted to assess cardiovascular dysfunction in chronic liver disease.

MATERIALS & METHODS

The present study consisted of 68 patients of chronic liver disease of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. All were subjected to liver function test (LFT), prothrombin time/international normalized ratio (INR), abdominal ultrasound, upper gastrointestinal endoscopy, cytology and serum ascites albumin gradient, HBsAg, anti-HCV, serum ceruloplasmin, and antinuclear antibody. Child-Pugh Score was

calculated to classify the severity of CLD. Parameters such as stroke volume index (SVI), cardiac index (CI), ejection fraction (EF), diastolic dysfunction (DD), left ventricular mass index (LVMI) etc. was recorded. Data thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 68		
Gender	**Male**	**Female**
Number	40	28

Table I shows that out of 68 patients, males were 40 and females were 28.

Table II Assessment of chronic liver disease

Chronic liver disease	Number	P value
Mild	12	0.01
Moderate	17	
Severe	39	

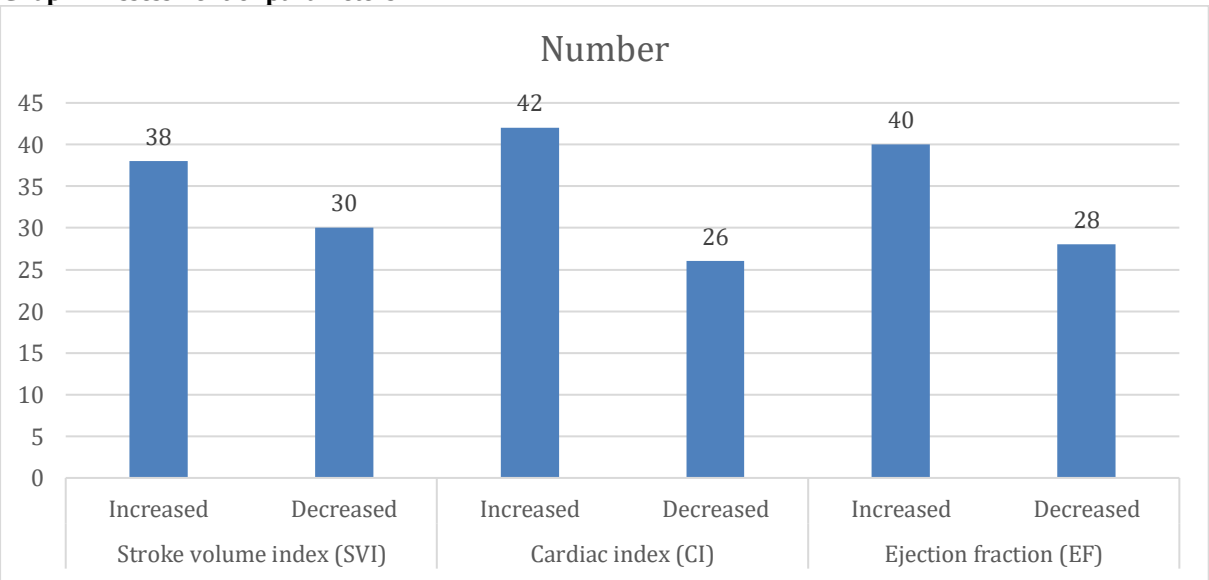
Table II shows that chronic liver disease was mild in 12, moderate in 17 and severe in 39 cases. The difference was significant (P< 0.05).

Table III Assessment of parameters

Parameters	Variables	Number	P value
Stroke volume index (SVI)	Increased	38	0.05
	Decreased	30	
Cardiac index (CI)	Increased	42	0.01
	Decreased	26	
Ejection fraction (EF)	Increased	40	0.02
	Decreased	28	
Diastolic dysfunction (DD)		25	-
Increased EF after paracentesis		14	-

Table III, graph I shows that stroke volume index (SVI) was increased in 38 and decreased in 30, cardiac index (CI) was increased in 42 and decreased in 26. Ejection fraction (EF) was increased in 40 and decreased in 28, diastolic dysfunction (DD) was seen in 25 and increased EF after paracentesis was seen in 14 cases. The difference was significant (P< 0.05).

Graph I Assessment of parameters



DISCUSSION

The management of CV dysfunction depends on the specific condition and may include lifestyle modifications, medications, surgical interventions (such as bypass surgery or valve replacement), or cardiac rehabilitation programs.[10,11] Early diagnosis, regular monitoring, and adherence to treatment plans are essential for minimizing complications and

improving outcomes for individuals with CV dysfunction.[12] The present study was conducted to assess cardiovascular dysfunction in chronic liver disease.

We found that out of 68 patients, males were 40 and females were 28. Bandyopadhyay et al[13] studied the presence, types, and severity of cardiovascular (CV) dysfunction in 50 patients of CLD, of which 14.3% were mild, 34.3% moderate and 51.4% severe CLD (by Child-Pugh Class), 28.6% had a high normal heart rate (90 to 100/min), 45.7% had increased stroke volume index, and 42.9% increased cardiac index, reflecting hyperdynamic circulation. In 42% cases, left ventricular ejection fraction was increased more than 65%, reflecting hyperdynamic circulation <55% in 23% cases, which may be an indicator of cirrhotic cardiomyopathy. Ejection fraction was significantly increased after paracentesis in 33.3% patients, reflecting the mechanical effect of ascites on cardiac function. Diastolic dysfunction was present in 60% and left ventricular mass index was increased in 45.7% cases. All the parameters correlated with increasing Child Pugh Class severity of CLD.

We found that chronic liver disease was mild in 12, moderate in 17 and severe in 39 cases. Chandey et al[14] in their study 90 patients of cirrhosis of liver of both sexes were included. QTc interval increased linearly with the severity of liver cirrhosis. Mean values of QTc in Child Pugh Class A=425.00(±20.97), Class B=437.35(±42.60), Class C=479.71(±29.48) with p value of 0.04 which is significant. Diastolic dysfunction was also related with the severity of liver cirrhosis. In Child Pugh Class A= 2 (33%) patients had grade 1 diastolic dysfunction, Class B=23 (59%) patients had grade 1 diastolic dysfunction while in Child Pugh Class C=3 (7%) had grade 1 diastolic dysfunction, 33 (73%) patients had grade 2 diastolic dysfunction and 1(2%) patients had grade 3 diastolic dysfunction with p value of 0.04 which is significant. Systolic function was found normal in all the patients.

We found that stroke volume index (SVI) was increased in 38 and decreased in 30, cardiac index (CI) was increased in 42 and decreased in 26. Ejection fraction (EF) was increased in 40 and decreased in 28, diastolic dysfunction (DD) was seen in 25 and increased EF after paracentesis was seen in 14 cases. Naik et al[15] found that history of alcohol consumption was found in 36 (72%) of the patients. Most common symptoms were ascites, jaundice and malena. Mean total count was 7144 (±1568). Mean blood urea level was 38.4 (±19.78) while mean serum creatinine was 1.0 (±0.72). Mean albumin level was 2.9 (±0.81). Mean serum billirubin total, direct and indirect was 6.1 (±8.08), 4.35 (±5.98), 1.8 (±2.19) respectively. Diastolic dysfunction was present in about 66% (33 out of 50) of patients. The patients of cirrhosis develop cirrhotic cardiomyopathy and this cirrhotic cardiomyopathy was not related to the etiology of liver cirrhosis.

Kumar et al[16] assessed the prevalence of cardiac dysfunction in patients of liver cirrhosis and to analyze its relation with model for end-stage liver disease (MELD) score. 100 patients of liver cirrhosis were enrolled for the study and divided into 3 groups according to MELD score: ≤9, 10-19, and ≥20. All study participants underwent detailed cardiac assessment with Doppler echocardiography. Prevalence of cardiac dysfunction and its relation with MELD score was determined. Prevalence of CCM and diastolic dysfunction (DD) was 48% and 30%, respectively. A total of 82%, 59%, and 50% patients had prolonged corrected QT interval (QTc), isovolumic relaxation time (IVRT), and deceleration time (DT), respectively. Prevalence of CCM, DD and prolonged QTc, IVRT, and DT had significant correlation with MELD score ($P < 0.05$).

The limitation the study is small sample size.

CONCLUSION

Authors found that predicting the likelihood of unfavourable cardiac events requires a high level of understanding of the presence of cirrhotic cardiomyopathy and CV dysfunction in CLD patients.

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