

Correlation of global longitudinal strain with disease severity in liver cirrhosis

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Introduction/purpose

Cirrhotic cardiomyopathy is characterized by high cardiac output, reduced peripheral resistance and diastolic dysfunction and has been correlated with cirrhosis severity and prognosis. Global longitudinal strain (GLS) is a sensitive marker of cardiac dysfunction which is considered relatively independent of preload and afterload conditions and thus may be of high diagnostic significance in this special population. We sought to investigate alterations of GLS relating to disease severity in cirrhotic patients.

Methods: Echocardiographic analysis of 51 consecutive cirrhotic patients was performed. Images were acquired and analyzed off-line. GLS was calculated with a semi-automatic way using dedicated software. Clinical and biochemical examination were used to assess severity of liver disease by calculating Child-Pugh class (class C patients have more severe disease than class B and A patients) and MELD-Na score (increased score as the disease progresses).

Results: Mean age was 58.4 ± 8.7 years, 38 (74.5%) were males. Among patients, 22 (43.1%) were Child-Pugh class A, 17 (33.3%) Child-Pugh B and 12 (23.5%) Child-Pugh C and mean MELD-Na score was 15.3 ± 7.5 . Mean left ventricular end-systolic volume (LVEDV) was 117 ± 29 ml, mean stroke volume (SV) 72.5 ± 19.9 ml, mean left ventricular ejection fraction (LVEF) $61.0 \pm 5.0\%$, mean systolic blood pressure (SBP) 128 ± 13 mmHg, mean ratio of peak transmitral to peak annular (septal) velocity during early diastole (E/e' ratio) 10.4 ± 4.5 , mean left atrial volume index (LAVI) 37.4 ± 11.8 ml/cm² and mean GLS $-21.6 \pm 2.6\%$. GLS of Child-Pugh class A patients (-20.3 ± 2.4) was higher (less negative) than GLS of Child-Pugh class B (-22.2 ± 2.2) and class C (-23.0 ± 2.8) patients. Difference between groups B and C was non-significant (figure). Severity of cirrhosis as determined by higher MELD-Na score correlated with LAVI ($r = 0.592$, $p < 0.001$), SV ($r = 0.554$, $p < 0.001$), GLS ($r = -0.441$, $p = 0.001$) and LVEDV ($r = 0.428$, $p = 0.002$). GLS correlated with SV ($r = -0.369$, $p = 0.008$) but not with preload (LVEDV), or afterload (SBP). In a linear regression model, GLS was independently associated with Meld-Na score when adjusting for age, SBP, LVEDV and NASH etiology [$B = -0.139$ (-0.252 ; -0.025), $p = 0.018$].

Conclusions: GLS is lower (more negative) in patients with liver cirrhosis as disease progresses a relation not affected by preload and afterload conditions. Further research works are required to explain the underlying pathophysiology and to assess prognostic significance of reduced GLS values in patients with advanced cirrhosis.

Abstract Figure. GLS stratified by Child-Pugh score

