Background and Aim: Compromised exercise capacity is the main symptom in patients with heart failure (HF) and reduced left ventricular (LV) ejection fraction (EF). Six-minute walk test (6-MWT) is popular for objective assessment of exercise capacity in these patients but is confined to heart centres. The aim of this study was to prospectively examine functional parameters that predict 6-MWT in patients with HF and reduced LVEF.

Methods: In 111 HF patients (mean age 60 ±12 years, 56% male), a 6-MWT and an echo-Doppler study were performed on the same day. In addition to conventional ventricular function measurements, global LV dyssynchrony was indirectly assessed by total isovolumic time - t-IVT [in s/min; calculated as: 60 — (total ejection time — total filling time)], and Tei index (t-IVT/ejection time). Also, LV and right ventricular function were assessed by mitral and tricuspid annular plane systolic excursion (MAPSE and TAPSE, respectively). Based on the 6-MWT distance, patients were divided into: Group I: 300 m and Group II: >300 m.

Results: The 6-MWT distance correlated with t-IVT and Tei index (r=0.37, p<0.001, for both), lateral and septal e’ velocities (r=0.41, p<0.001, and r=0.46, p<0.001, respectively), E/e’ ratio (r=0.37, p<0.001) and TAPSE (r=0.45, p<0.001), but not with the other clinical or echo parameters. Group I patients had longer t-IVT, lower E/e’ratio, TAPSE and lateral e’ (p<0.001 for all) compared with Group II. In multivariate analysis, TAPSE [0.076 (0.017-0.335), p=0.001], E/e’ [1.165 (1.017-1.334), p=0.027], t-IVT [1.178 (1.014-1.370), p=0.033] independently predicted poor 6-MWT performance (<300 m). Sensitivity and specificity for TAPSE 1.9 cm were 66% and 77%, (AUC 0.78, p<0.001); E/e’ 10.7 were 66% and 62% (AUC 0.67, p=0.002) and t-IVT 13 s/min were 64% and 60% (AUC 0.68, p=0.002) in predicting poor 6-MWT. Combined TAPSE and E/e’ had a sensitivity of 68% but specificity of 92% in predicting 6-MWT. Respective values for combined TAPSE and t-IVT were 71% and 85%.

Conclusion: In patients with HF, the limited exercise capacity assessed by 6-MWT, is multifactorial being related to severity of right ventricular systolic dysfunction as well as raised LV filling pressures and global dyssynchrony.

KEYWORDS: six-minute walk test, Doppler echocardiography, right ventricular function, heart failure, exercise capacity.

Figure 1. ROC curve of TAPSE in predicting limited exercise capacity in HF patients.

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