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Imaging – Echocardiography, Systolic and Diastolic Function

Myocardial work indices predict response to diastolic stress testing in hypertensive diabetic patients

M. Kolesnyk[1], Y. Majstrovych[1]

[1]Zaporizhzhia State Medical and Pharmaceutical University, Zaporizhzhia, Ukraine
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Background: Early recognition of heart failure with preserved ejection fraction (HFpEF) remains challenging. Clinical symptoms are often mild and non-specific, particularly at early stages. Arterial hypertension (AH) and type 2 diabetes mellitus (T2DM) are major risk factors for HFpEF development. Diastolic stress echocardiography may identify patients with abnormal filling pressure responses during exercise in this population. However, indications for diastolic stress testing remain insufficiently defined. Myocardial work (MW) assessment is a sensitive diagnostic approach that may improve patient selection. The aim of this study was to evaluate the role of MW indices in predicting diastolic stress testing results in hypertensive diabetic patients.

Methods: Ninety patients (mean age 62 ± 7.9 years; 43 men, 47 women) with AH and T2DM were enrolled. None had a previous diagnosis of HFpEF. Standard echocardiography and speckle-tracking echocardiography were performed. Left ventricular (LV) global longitudinal strain (GLS) was assessed. Myocardial work parameters, including global myocardial work index (GWI), global constructive work (GCW), global wasted work (GWW), and global work efficiency (GWE), were calculated. Diastolic function was evaluated according to the 2025 ASE algorithm. Treadmill diastolic stress testing was considered positive when average E/e′ exceeded 14 and tricuspid regurgitation exceeded 2.8 m/s during exercise. Participants were divided into two groups according to stress testing results. Data are presented as mean ± standard deviation (SD) for normally distributed variables and as median with interquartile range otherwise. A p-value <0.05 was considered statistically significant.

Results: No significant differences were observed between groups in age, sex, systolic or diastolic blood pressure, glycated hemoglobin, or estimated glomerular filtration rate. LV mass index, LA volume index, and LV ejection fraction were comparable between groups (Table). LV GLS was significantly lower in patients with a positive diastolic stress testing. Among myocardial work indices, GWW was significantly higher and GWE significantly lower in patients with a positive stress testing (Figure). The AUC for GWE was 0.759, with an optimal cut-off value ≤88%, sensitivity of 50%, and specificity of 85% (p=0.0056). The AUC for GWW was 0.705 but did not reach statistical significance (p=0.065).

Conclusions: Assessment of myocardial work indices, particularly GWE, may help identify hypertensive diabetic patients with abnormal responses to diastolic stress testing. Early identification of this population may facilitate timely diagnosis of HFpEF.

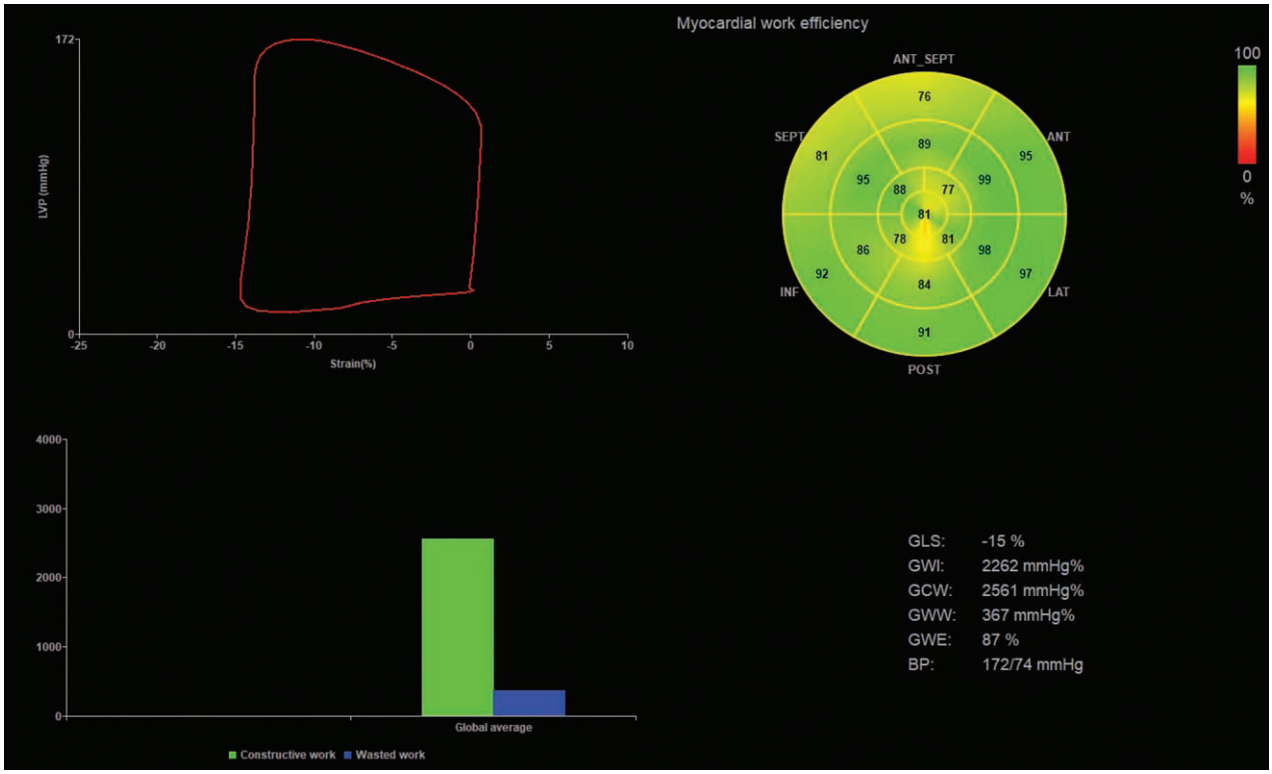
Resting myocardial work indices in patients with AH and T2DM

Variable	Negative diastolic stress testing (n=80)	Positive diastolic stress testing (n=10)		p-value
Conventional and speckle tracking echo parameters				
LV EF, %	62 (57-68)	64 (56-69)		0.95
LV mass index, g/m^2	87 (73-103)	105 (81-125)		0.07
LA volume index/ml/m^2	30.9 (27.8-36.8)	34.3 (29.9-36.5)		0.14
LV GLS, %	18.4 ± 2.1	15.9 ± 3.5		0.003
Myocardial work indices				
GWI, mm Hg %	2321.1 ± 387.1	2057 ± 662.4		0.07
GCW, mm Hg %	2491.3 ± 389.9	2316.9 ± 689		0.24
GWW, mm Hg %	130 (109-165)	198.5 (129-331)		0.036
GWE, %	94 (93-95)	90.5 (86-93)		0.007

The values are given as mean ± standard deviation (SD) or median and interquartile range

Myocardial work indices

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Example of GWE graph

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