Echocardiography: Systolic and Diastolic Function

Global wasted myocardial is unrelated to conventional markers of systolic and diastolic function in patients with acute heart failure

Sahiti F.1; Morbach C.1; Henneges C.2; Breunig M.1; Cejka V.2; Scholz N.2; Ertl G.1; Frantz S.1; Angermann C.2; Stoerk S.1

¹Comprehensive Heart Failure Center (CHFC), Department for Medicine I, University and University Hospital Wurzburg, Wurzburg, Germany

²Comprehensive Heart Failure Center (CHFC), Wurzburg, Germany

Funding Acknowledgements: Type of funding sources: Private grant(s) and/or Sponsorship. Main funding source(s): The AHF Register is supported by an unrestricted grant of Behringer Ingelheim, and grants of the German Ministry of Research and Education within the Comprehensive Heart Failure Center, Würzburg (BMBF 01E01004 and 01E01504)

onbehalf: AHF Registry

Background & Aim Myocardial Work (MyW) analysis quantifies myocardial performance using non-invasively derived pressure-strain loops. It is considered less load-dependent than left ventricular ejection fraction (LVEF) and longitudinal strain, since it integrates blood pressure into the assessment. We assessed associations between MyW indices, natriuretic peptide (NT-proBNP), and conventional markers of systolic and diastolic cardiac function mirroring the hemodynamic changes occurring during hospitalization, in patients hospitalized for acute heart failure (AHF).

Methods Consecutive patients (≥18 years) hospitalized for AHF with serial high-quality pairs of echocardiograms (i.e., early after hospitalization and prior to discharge) were eligible. Exclusion criteria were high output AHF, cardiogenic shock, and being listed for high urgency transplantation. The following MyW measures [definition in brackets] were analyzed from the stored recordings: Global constructive work (GCW) [sum of positive work performed during systolic shortening plus negative work during lengthening in isovolumetric relaxation (IVR)], global wasted work (GWW) [sum of negative work performed during systolic lengthening plus work performed during shortening in IVR], global work efficiency (GWE) [constructive work/(constructive work + wasted work)]; global work index (GWI) [total work performed from mitral valve closure to mitral valve opening]. Associations were determined using scatter plots and Pearson Product-Moment correlation coefficients.

Results N = 126 patients (73 ± 12 years, 37% female) were eligible. GWI and GCW proved significantly correlated with surrogates measured both on admission and at discharge, NT-proBNP, LVEF, and e' (Table). By contrast, GWW did not correlate with any of these variables. GWE was also correlated with NT-proBNP (and e' at discharge), but at both time points respective correlations were more pronounced.

Conclusion In patients hospitalized for AHF, GWI, GCW and GWE were associated with conventional parameters of myocardial stress and LV dysfunction. In contrast, GWW was unrelated with any of these established markers. Future studies in larger cohorts and with longer-term follow-up need to clarify to what extent might GWW carry complementary clinical and prognostic significance.

Abstract Figure.

Table 1. Association of myocardial work indices with conventional myocardial markers

	log NT-proBNP [N=108]	LVEF [%] [N=126]	E' wave [N=118]
GWI			
Admission	-0.375 ***	0.840***	0.370***
Discharge	-0.355***	0.870***	0.370***
GCW			
Admission	-0.394***	0.830***	0.380***
Discharge	-0.359***	0.864***	0.355***
GWW			V-8-2-2-2
Admission	0.064	-0.143	-0.120
Discharge	0.062	-0.158	-0.178
GWE [%]			
Admission	-0.213*	0.648***	0.329***
Discharge	-0.229*	0.627***	0.277***

Pearson product-moment correlation coefficient. *p<0.05, **p<0.01***p<0.001. GWI: global work index, GCW: global constructive work [mmHg%], GWW: global wasted work [mmHg%], GWE: global work efficiency [%]. Correlations <0.3 are considered weak, and correlations >0.6 strong.