Myocardial work – new insights from deformation imaging in patients with advanced heart failure

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Background: The evaluation of myocardial contractility appears to be a major determinant for the prognosis and allocation of treatment strategies in advanced systolic heart failure (HFrEF). Non-invasive measurement of myocardial work is currently emerging as a new promising method for the assessment of myocardial contractility, as it additionally accounts for hemodynamic loading conditions of the ventricle.

Objectives: This study sought to assess the prognostic impact of myocardial work in patients with advanced heart failure and to compare it with routinely used deformation imaging parameters.

Methods: We included 234 patients with HFrEF under guideline directed therapy and comprehensively assessed myocardial work, as well as global longitudinal strain (GLS) by speckle tracking echocardiography. The primary endpoint was all-cause mortality.

Results: Median age of the patients was 68 years (IQR 60–75) and 78% were male. Over a 5-year follow-up period, 107 patients died. Median GWI was 526 mmHg% (IQR 366–779) and median GCW was 730 mmHg% (IQR 523–988). Parameters of myocardial work displayed a strong and in- dependent association with long-term mortality, even after careful adjust- ment for clinical and echocardiographic confounders (Table 1). Additionally, we observed a significantly better calibration towards long-term mortality for GCW compared to GLS as the current golden standard for myocardial deformation imaging (AUC 0.63 vs. 0.60; P=0.007).

Conclusion: This is the first study to comprehensively assess global my- ocardial work in patients with advanced heart failure. Important treatment decisions rely on the assessment of myocardial contractility and risk strat- ification, specifically in late stages of the disease where exact guiding of treatment success and timely allocation of more aggressive treatment strategies are warranted. By incorporating loading conditions, myocardial work seems to be able to sensitively detect changes in myocardial con- tractility thath predict a dismal course of the disease. Furthermore, our data suggests that global constructive work is a more sensitive parameter to predict long-term outcome compared to the currently used echocardio- graphic deformation imaging parameters (i.e. GLS).

Table 1

	Univariable model					Multivariable model		
	SD	HR	95% CI	P-value	ROC	Adj. HR*	95% CI	P-value
Global work index, mmHg%	324	0.75	0.61–0.93	0.008	0.585	0.73	0.58–0.92	0.006
Global constructive work, mmHg%	370	0.68	0.52–0.88	0.003	0.625	0.66	0.50–0.88	0.004
Global longitudinal strain, %	3	1.33	1.08–1.63	0.007	0.596	1.37	1.08–1.73	0.009