

Reduced left atrial strain in magnetic resonance imaging is associated with abnormal P-waves in patients after acute myocardial infarction

Wester M.¹; Pec J.¹; Fisser C.¹; Debl K.¹; Hamer O.²; Poschenrieder F.²; Buchner S.³; Maier LS.¹; Arzt M.¹; Wagner S.¹

¹University hospital Regensburg, University Heart Center, Regensburg, Germany

²University hospital Regensburg, Department of Radiology, Regensburg, Germany

³Cham Hospital, Department of Internal Medicine, Cham, Germany

Funding Acknowledgements: Type of funding sources: Public hospital(s). Main funding source(s): ReForM-B-Program

Background: Abnormal P-wave terminal force in lead V1 (PTFV1) is associated with atrial remodeling. The relationship between PTFV1 and atrial function after acute myocardial injury is insufficiently understood and may be elucidated by detailed feature tracking (FT) strain analysis of cardiac magnetic resonance images (CMR).

Purpose: We investigated the relationship between PTFV1 and left atrial (LA) strain (measured by CMR) in a patient cohort presenting with acute myocardial infarction (MI).

Methods: 56 patients with acute MI underwent CMR within 3-5 days after MI. PTFV1 was measured as the product of negative P-wave amplitude and duration in lead V1 (Fig. A). A PTFV1 >4000 ms*μV was defined as abnormal. CMR cine data were retrospectively analyzed using a dedicated FT software. LA strain (ε) and strain rate (SR) for atrial reservoir ([εs]; [SRs]), conduit ([εe]; [SRe]) and booster function ([εa]; [SRa]) were measured in two long-axis views (Fig. A).

Results: Patients with abnormal PTFV1 had significantly reduced LA conduit function εe and SRe (Fig. B + D). There was a significant negative correlation between the extent of PTFV1 and both εe and SRe (Fig. C + E). In univariate and multivariate regression models, both PTFV1 and age predicted atrial conduit function. In contrast, multiple clinical co-factors had no significant influence on εe (Table). Interestingly, linear regression models revealed only mild dependency of PTFV1 on conventional parameters of cardiac function such as left ventricular ejection fraction (p = 0.059; R²(adj.)=0.047), and no dependency on structural parameters such as LA area (p = 0.639; R²(adj.)=0.016), or LA fractional area change (p = 0.825; R²(adj.)=0.020).

Conclusion: Abnormal PTFV1 was associated with reduced LA function independent from numerous clinical co-factors in patients presenting with acute myocardial infarction.

Table

N = 56	Linear Regression Analysis				Multiple Linear Regression Analysis (R ² (adj.)=0.376, p = 0.016)		
Variable	B	95% CI	P value	R ² (adj.)	B	95% CI	P value
PTFV1 [μV*ms]	-1.628	17085.298 to 27210.854	0.013	0.092	-1.315	-2.614 to -0.016	0.047
Age [y]	-425.775	24985.168 to 54634.995	0.002	0.145	-610.815	-982.78 to -238.849	0.001
Body mass index [kg/m ²]	-185.653	-3259.187 to 47020.775	0.671	-0.015	-506.096	-1327.357 to 315.165	0.219
Creatinine kinase [U/l]	-1.571	14806.991 to 24842.272	0.121	0.027	-1.791	-3.72 to 0.138	0.067
Male sex	-893.28	10701.206 to 23504.066	0.802	-0.017	4275.631	-3842.517 to 12393.78	0.292
Estimated glomerular filtration rate [ml/min/1.73m ²]	88.617	-4564.177 to 21395.361	0.202	0.012	-163.981	-331.343 to 3.381	0.054
Systolic blood pressure [mmHg]	-2.001	14045.786 to 22037.253	0.095	0.038	29.331	-108.243 to 166.906	0.668
nt-pro brain natriuretic peptide [pg/ml]	24.629	-4060.804 to 30920.828	0.716	-0.016	1.015	-1.778 to 3.809	0.466

Univariate and multivariate linear regression models for left atrial conduit strain
Abstract Figure

