

Right ventricular function in patients after acute pulmonary embolism

Igor Ilasz, MD¹, Olga Dzikowska-Diduch, MD, PhD¹, Iwona Dudzik-Niewiadomska, MD¹, Piotr Pruszczyk, MD, PhD¹

¹ Clinic of Internal Medicine and Cardiology with the Center for Diagnostics and Treatment of Venous Thromboembolism, Medical University of Warsaw, Warsaw, Poland

Introduction: Right ventricular (RV) longitudinal strain may detect persistent systolic dysfunction after acute pulmonary embolism (APE) despite preserved conventional echocardiographic indices. We investigated whether acute myocardial injury and PE severity are associated with RV deformation during follow-up.

Methods: We evaluated 56 patients following APE (mean follow-up 8.57 ± 1.88 months), stratified by initial PE risk category and troponin elevation. Patients with significant cardiovascular disease, insulin-dependent diabetes, end-stage renal failure, or active malignancy were excluded. Follow-up echocardiography assessed global, free-wall, and segmental RV longitudinal strain, TAPSE, tricuspid annular S', and TRPG. Groups were compared using appropriate parametric or nonparametric tests.

Results: Mean age was 45.82 ± 10.87 years; 29 patients had low-risk, 9 intermediate-low-risk, 17 intermediate-high-risk, and 1 high-risk PE. Troponin was elevated in 18 (32.1%). Compared with patients without troponin elevation, those with elevated troponin had less negative RV free-wall strain ($-23.46 \pm 3.52\%$ vs $-26.98 \pm 3.89\%$; $p=0.002$), mid-wall strain ($-23.02 \pm 3.73\%$ vs $-25.70 \pm 4.24\%$; $p=0.026$), and apical strain ($-17.68 \pm 3.16\%$ vs $-22.36 \pm 4.37\%$; $p<0.001$). Strain also differed across PE risk categories, particularly free-wall strain ($-23.22 \pm 3.50\%$ in intermediate-high/high-risk vs $-27.11 \pm 3.78\%$ in low-risk PE; three-group $p=0.003$) and apical strain ($-17.47 \pm 3.00\%$ vs $-22.34 \pm 4.13\%$; three-group $p<0.001$). TAPSE and S' did not differ significantly by troponin status or PE risk.

Table 1. Comparison of follow up parameters according to APE risk category. Data presented as mean $\pm$ standard deviation. Comparisons were performed with one-way ANOVA.

Variable	APE risk category			p
	LR (n=29)	ILR (n=9)	IHR/HR (n=18)	
RV strain base, %	-33.19 ± 5.61	-30.48 ± 5.30	-28.94 ± 5.47	0.040
RV strain mid, %	-25.40 ± 4.13	-27.14 ± 4.07	-22.79 ± 3.83	0.023
RV strain apex, %	-22.34 ± 4.13	-22.83 ± 5.09	-17.47 ± 3.00	<0.001
RV strain free wall, %	-27.11 ± 3.78	-27.00 ± 4.04	-23.22 ± 3.50	0.003
RV strain global, %	-21.87 ± 3.03	-21.79 ± 4.13	-19.35 ± 3.45	0.041
TAPSE, mm	24.13 ± 4.12	24.11 ± 2.93	24.17 ± 3.45	0.999
TV S', cm/s	13.63 ± 2.72	13.33 ± 2.18	13.44 ± 2.01	0.934

APE – acute pulmonary embolism; LR – low risk; ILR – intermediate low risk; IHR – intermediate high risk; HR – high risk; TAPSE – tricuspid annulus plane systolic excursion; S' TV – tricuspid annular systolic velocity; RV strain – right ventricular longitudinal strain;

Conclusions: Greater initial PE severity and troponin elevation were associated with less negative RV longitudinal strain approximately nine months after APE, despite similar conventional RV systolic indices. RV free-wall and apical strain may identify persistent subclinical dysfunction.