

Relationship between left atrial strain and left atrial bipolar voltage in patients undergoing catheter ablation for atrial fibrillation

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Background: Low-voltage zone (LVZ) in the left atrium (LA) seems to represent fibrosis. LA longitudinal strain assessed by speckle tracking method is known to correlate with the extent of fibrosis in patients with mitral valve disease.

Purpose: We sought to identify the relationship between LA longitudinal strain and LA bipolar voltage in patients with atrial fibrillation (AF). We tested the hypothesis that LA strain can predict LA bipolar voltage.

Methods: A total of 96 consecutive patients undergoing initial AF ablation were analyzed. All patients underwent transthoracic echocardiography including 2D speckle tracking measurement on the day before ablation during sinus rhythm (SR group, N=54) or during AF (AF group, N=42). LA longitudinal strain was measured at basal, mid, and roof level of septal, lateral, anterior, and inferior wall in apical 4- and 2-chamber view. Global

longitudinal strain (GLS) was defined as an average value of the 12 segments. LA voltage map was created using EnSite system, and global mean voltage was defined as a mean of bipolar voltage of the whole LA excluding pulmonary veins and left atrial appendage. LVZ was defined as less than 1.0 mV.

Results: There was a significantly positive correlation between GLS and global mean voltage ($r=0.708$, $p<0.001$). Multivariate regression analysis showed that GLS and age were independent predictors of global mean voltage. There was a significant negative correlation between global mean voltage and LVZ areas.

Conclusions: There was a strong correlation between LA longitudinal strain and LA mean voltage. GLS can independently predict LA mean voltage, subsequently LVZ areas in patients with AF.

Multivariate regression analysis showing predictors of global mean voltage

Variables	Unstandardized coefficient		Standardized coefficients Beta	t value	P value	95% CI for B		VIF
	B	Standard error				Lower	Upper	
(Constant)	5.300	1.017	–	5.21	<0.001*	3.274	7.326	–
Age	-0.044	0.012	-0.304	-3.83	<0.001*	-0.067	-0.021	1.35
LA volume index by CT	0.001	0.002	0.046	0.53	0.596	-0.004	0.006	1.57
eGFR	0.005	0.004	0.092	1.15	0.253	-0.003	0.013	1.36
Pulmonary artery systolic pressure	-0.024	0.014	-0.130	-1.68	0.098	-0.053	0.004	1.27
Tricuspid annular plane systolic excursion	-0.026	0.024	-0.102	-1.07	0.286	-0.074	0.022	1.93
E/e' ratio	-0.007	0.029	-0.019	-0.24	0.807	-0.066	0.052	1.29
LV ejection fraction	0.001	0.009	0.008	0.10	0.919	-0.018	0.020	1.29
GLS	0.098	0.015	0.647	6.55	<0.001*	0.068	0.127	2.08

R²=0.64, Adjusted R²=0.60. CI: Confidence Interval.

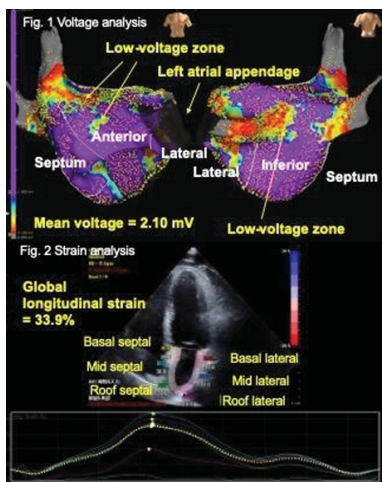


Fig. 3 The relationship between global longitudinal strain and global mean voltage

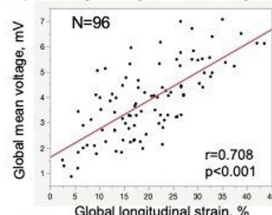


Fig. 4 The relationship between global mean voltage and LVZ area

