The value of 3D-speckle tracking longitudinal strain for the assessment of left ventricular function recovery in ischemic heart failure patients undergoing surgical remodeling:the RECOVERY-IN study

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On behalf of RECOVER-IN

Background: Three-dimensional (3D) speckle-tracking echocardiography is largely employed to evaluate left ventricle (LV) morphology and function.
Purpose: To investigate LV function before and after surgical ventricular reconstruction (SVR) through the analysis of global (GLS) and segmental (SLS) longitudinal strain, and the derived mechanical dispersion (MD).
Methods: Twenty patients eligible for SVR, with previous LV remodelling and ischemic heart failure (HF), received 3D echocardiographic evaluation before SVR and at 6-months follow-up; 15 normal controls, matched by age and BSA, were enrolled. Standard off-line GLS analysis was performed with 4D LV-ANALYSIS©; advanced segmental analysis was accomplished automatically through in-house numerical post-processing.
Results: Before SVR, GLS deteriorated compared to normal subjects (-6.7% vs. -19.6%, $P<0.0001$) as confirmed by SLS at each LV segment basal, mid and apical level ($P<0.0001$); MD was higher than in controls ($P<0.001$) and markedly increased from basal to apical LV segment. After SVR, GLS significantly improved from -6.7% to -11.3% ($P<0.0001$). Analysis of variance showed that SLS recovery was higher in the basal region (7.25%) than in both mid (4.06%, $P=0.001$) and apical (1.92%, $P<0.0001$) segments, respectively, with adjustment for baseline values.
Conclusions: After SVR, LV longitudinal strain mostly improves in the basal segments, outlining the role of the remote myocardium in enhancing LV function through an extensive volume reduction; post-surgical MD reduction indicates a more homogeneous myocardial contraction.

		Normal	Pre-SVR	Post-SVR	P-value		
					Pre-SVR vs. Normal	Pre-SVR vs. Post-SVR	Post-SVR vs. Normal
EDVi [ml/m²]		63.1 (58.7, 70.3)	121.4 (99.2, 152.9)	79.3 (64.6, 104.5)	<0.0001	<0.0001	0.0085
ESVi [ml/m²]		25.0 (20.9, 27.0)	90.8 (67.6, 126.7)	51.6 (34.9, 64.6)	<0.0001	0.0002	<0.0001
EF [%]		60.0 (59.1, 65.8)	27.1 (21.4, 33.3)	42.3 (28.5, 44.1)	<0.0001	0.0009	<0.0001
GLS [%]		−19.6 (−20.8, −17.4)	−6.7 (−9.5, −5.3)	−11.3 (−12.3, −9.6)	<0.0001	<0.0001	<0.0001
SLS [%]	Basal	−19.3 (−20.5, −17.1)	−9.4 (−11.0, −6.8)	−12.9 (−15.7, −10.6)	<0.0001	<0.0001	<0.0001
	Mid	−18.2 (−20.5, −16.6)	−5.8 (−8.4, −2.9)	−10.6 (−12.0, −7.9)	<0.0001	0.0010	<0.0001
	Apical	−18.6 (−21.6, −17.0)	−3.4 (−7.2, −0.7)	−7.6 (−9.4, −5.11)	<0.0001	0.0064	<0.0001
MD [ms]	Basal	36 (27, 48)	64 (45, 104)	45 (30, 61)	0.0024	0.0049	0.4993
	Mid	28 (24, 30)	79 (59, 140)	60 (42, 107)	<0.0001	0.0172	<0.0001
	Apical	22 (19, 29)	113 (78, 178)	85 (42, 131)	<0.0001	0.0136	<0.0001

Data expressed as median (IQR). Wilcoxon test: Pre-SVR vs Post-SVR; Mann-Whitney U test: Pre-SVR vs Normal, Post-SVR vs Normal.

Heath map of longitudinal strain (%)