The prognostic role of left atrial strain in young patients after ST elevation myocardial infarction: a 3D echocardiographic study

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Funding Acknowledgements: None.

Background: LA volume previously demonstrated its role as significant predictor of adverse events after AMI. The prognostic value of LA strain is less studied. Left atrial strain has been used as a more accurate alternative to assessing LA performance. 3D echocardiography compared with 2D measurements better reflect the entire atrial myocardium, leading to a more accurate estimation of LA function.

Purpose: In this study we aimed to assess the prognostic value of LA strain parameters determined by 3D echocardiography in young patients after STEMI.

Patients and methods: We enrolled 112 patients in this study - 84 young patients with a first STEMI treated by primary PCI and 28 healthy age and sex matched controls. All patients underwent standard transthoracic echocardiography. In addition to conventional echocardiographic parameters, 3D acquisitions of the left atrium were performed. 3D LA longitudinal strain parameters were determined using the automated function 4D Auto LAQ. Patients were followed up for one year after STEMI, the primary endpoint being the occurrence of MACE.

Results: Compared to the control group, patients with STEMI had lower values of all LA strain parameters. There were also significant differences between MACE and non-MACE groups. Patients with MACE at follow up had lower reservoir strain (15.16 ± 2.58 vs. 22.71 ± 5.25), lower conduction strain (-8.62 ± 1.77 vs. -10.97 ± 1.44) and lower pumps strain (-9.36 ± 1.51 vs. -12.73 ± 2.53), compared to those from the non-MACE group. All LA strain parameters proved to have very good predictive abilities for MACE in ROC analysis (AUC = 0.894, 95 %CI, P < 0.0001 for LASr 3D, AUC = 0.854, 95 %CI, P < 0.0001 for LASct 3D, and AUC = 0.883, 95 %CI, P < 0.0001 for LAScd 3D). For each variable we determined a cut off value as follows: 17.5 (Sb 91.7%, Sp 86.7%) for LASr 3D, -10.5 (Sb 75% Sp 86.7%) for LASct 3D, and -9.05 (Sb 75% Sp 91.7%) for LAScd 3D. LASr 3D under 17, and LASct 3D over -10.5 determined an approximately 2-fold increase in adverse events after STEMI.

Univariate COX regression analysis showed that all parameters had a significant effect on MACE, while multivariate analysis identified only reservoir and pump functions as independent predictors for adverse events.

LASr 3D values showed a proportional decrease with worsening diastolic dysfunction, demonstrating significant differences between diastolic dysfunction grades. We determined LASr 3D cut-off values for discriminating between different degrees of diastolic dysfunction.

Conclusion: 3D LA reservoir and pump strain proved to be independent predictors for MACE at one year follow up after STEMI in young patients. Beyond its prognostic role, LASr 3D may be helpful as a complementary method to evaluate diastolic dysfunction in young STEMI patients. Further larger scale studies are needed to validate these findings.