Impaired left ventricular myocardial mechanics in precapillary pulmonary hypertension patients with preserved LV function: CMR feature tracking study

Paulius Simkus¹, Lina Padervinskiene¹, Ausra Krivickiene², Deimante Hoppenot³, Skaidrius Miliauskas³, Algidas Basevicius¹, Antanas Jankauskas¹, Egle Eremieniene²

Department of Radiology, ² Department of Cardiology, ³ Department of Pulmonology, Medical Academy, Lithuanian University of Health Sciences

Introduction
Pulmonary hypertension (PH) is a progressive disease with substantial mortality.
Right ventricular (RV) systolic dysfunction is a main cause of morbidity and death, however, left ventricle (LV) function and mechanics could be affected in patients with RV failure as expression of ventricular interdependence.
Cardiac magnetic resonance (CMR) feature tracking (FT) is a novel method to determine impaired myocardial deformation that helps to detect early changes of LV function before deterioration of LV ejection fraction (EF).

Objective
The aim of the study was to define the changes of LV segmental and global strain parameters in precapillary PH (pPH) patients with preserved LV EF and to evaluate the relation with RV enlargement and function.

Methods
30 pPH patients with preserved LV systolic function (LV EF > 50%) and 16 control (patients without echocardiographic signs of PH) were investigated at the Hospital of Lithuanian University of Health Sciences Kaunas Clinics.
RV and LV volumes and function were measured by CMR (Syngo via, Siemens Healthcare).

Results
Global LV longitudinal and circumferential strain values were significantly lower (p<0.05) in pPH group patients when compared with control group (Figure 3).

Decreased segmental circumferential strain values were determined in basal inferoseptal segment (-21.81±9.76% vs -35.89±5.95%, p<0.001), middle inferoseptal segment (-24.41±12.76% vs -34.72±9.43%, p<0.05), apical septal segment (-43.56±13.58% vs -51.36±11.02%, p<0.05) and in apical anterior segment (-43.56±13.58% vs -51.36±11.02%, p<0.05) in pPH patients when compared with control group.

LV segmental longitudinal strain were reduced in apical septal segment (-23.4±11.1% vs -31.68±11.85%, p<0.05), apical segment (-32.0±8.28% vs -37.4±11.9%, p<0.05), and in basal anterolateral segment (-26.8±7.76% vs -32.1±9.16%, p<0.05) (Figure 4).

Conclusions
The interdependence between both ventricles is demonstrated by LV global circumferential and longitudinal strain values association with RV volumes and RV function.
LV global circumferential and longitudinal strain parameters are affected in precapillary PH with preserved LV systolic function with greatest abnormalities in the septal segments. Therefore CMR FT can help to detect early changes of LV deformation indices in patients with precapillary PH prior to LV systolic dysfunction appears.

Key words
Pulmonary hypertension, cardiac magnetic resonance, feature tracking.