Constrictive pericarditis: assessement of diastolic function by velocity encoded flow measurements and by assessement of septal motion

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Purpose:
To analyze, whether assessment of transmitral and transtricuspid flow curves using velocity encoded flow measurements and assessment of septal flattening during diastole allows to identify pathological diastolic function in patients with constrictive pericarditis

Materials and Methods:
23 patients with constrictive pericarditis (CP) were examined with MRI. 10 healthy subjects served as controls. Cine TrueFISP, HASTE and Spin-Echo sequences were performed to evaluate cardiac morphology and function. Pericardial thickness, septal wall motion and systolic and diastolic right and left ventricular diameters were measured by two experienced radiologists.

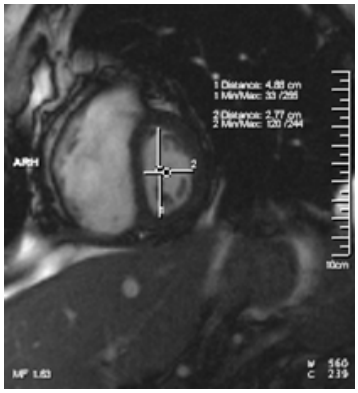

Fig. 2 Measurement of left ventricular diameters in diastole

Transmitral and transtricuspid velocity-time curves were examined with velocity encoded flow measurements with retrospective ECG-Gating (TR/ TE/ Bandwidth/ Matrix/ VENC: 41 msec/ 3.2/ 391/ 256 x 100/ 100-150cm/sec). The reconstructed images had a temporal resolution of 20 msec. The amplitude of E and A wave and the ratio of the amplitudes of the E and A-Wave were calculated. To evaluate septal flattening, septal motion was assessed on short-axis cine MR images and the ratio between the largest and shortest diameter of the left ventricle was calculated to express septal flattening. This approach was set in comparison to the method established by Giorgi et al[1]. Student´s t-test was used to differentiate patients with CP from healthy volunteers.

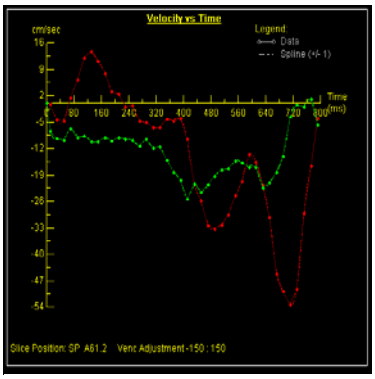

Fig. 1 Transmitral (red) and transtricuspid (green) velocity-time curves

Results:
The E/A-ratio of transmitral flow velocity was significantly smaller in CP (1.39 ± 0.45%) than in healthy subjects (2.8 ± 1.5%) p< 0.01, as was the E/A ratio of transtricuspid flow velocity in CP (1.06 ± 0.24%) in comparison to normal volunteers (2.7 ± 1.7%) p< 0.01.
The ratio of left ventricular diameters was significantly higher in CP (1,64 ± 0,42%) than in healthy subjects (1,28 ± 0,15%) p < 0.02. This method showed a significant correlation (r= 0,59) with the approach by Giorgi et al. p< 0.01.

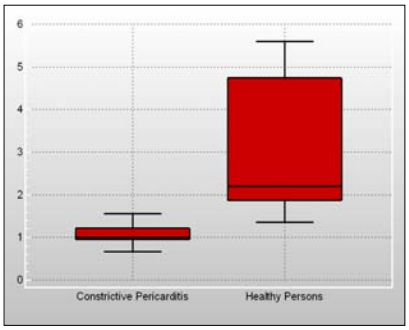

Fig. 3 E/A ratio of transtricuspid flow velocity in CP in comparison to healthy volunteers

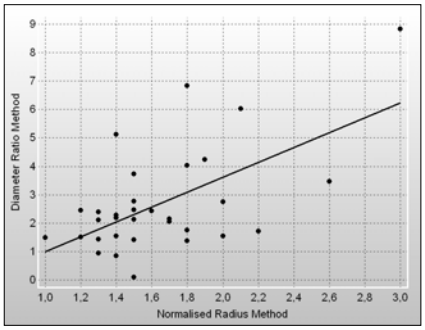

Fig. 4 Correlation of our method to evaluate septal flattening to method published by Giorgi et al.

Conclusion:
In addition to the assessment of morphology MRI is able to identify pathological diastolic function by flow measurements of atrioventricular valves and additionally by evaluation of septal motion in cine function. Our results indicate, that MRI flow measurements support to distinguish systolic from diastolic causes for heart failure in patients with CP as the assessment of septal motion does.

[1] Giorgi B. et al. Clinically suspected constrictive pericarditis: MR imaging assessment of ventricular septal motion and configuration in patients and helthy subjects. Radiology 2003, Aug.228(2): 417-24