

European Heart Journal

Cardiovascular Imaging Supplements

EuroCMR 2017 Meeting Abstracts

25-27 May 2017, Prague

QUICK FIRE ABSTRACTS - SESSION VI

092. REFERENCE VALUES OF LEFT ATRIAL STRAIN AND STRAIN RATE FROM CMR FEATURE TRACKING IN COMMUNITY HEALTHY ADULTS

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Objectives: Left atrial (LA) function deteriorates with aging and heart failure, is associated with adverse cardiovascular prognosis; but is difficult to, and hence not, routinely quantified. Using novel cardiac magnetic resonance (CMR) image post-processing feature tracking methods, we measured LA strain and strain rate parameters in a community cohort.

Methods: Healthy adult volunteers from the community without physician-diagnosed cardiovascular disease or diabetes mellitus were invited for CMR examination. The distance (L) between the left atrioventricular junction and a user-defined point at the mid posterior LA wall on CMR two- and four-chamber views. Longitudinal strain (LS) at any time point (t) in the cardiac cycle from end-diastole (time 0) was calculated as: $LS(t) = (L(t)-L_0)/L_0$. LA reservoir strain (LSr), conduit strain (LSc) and booster strain (LSb) were calculated at t equals left ventricular (LV) end-systole, diastasis and pre-LA systole, respectively, and their corresponding peak strain rates (LSR) derived (Figure 1). LS and LSR parameters from both four- and two-chamber views were averaged to obtain mean results for analysis. 10 subjects have been randomly selected for intra- and inter-observer variability test.

Results: There were 123 male and 108 female subjects; mean age 66.4 ± 15.2 years and 63.2 ± 16.2 years, respectively; age range 20 to 87 years (see Table 1). Data showed the overall intra-observer agreement rates were ranging from 0.990 to 0.999 and inter-observer agreement rates were ranging from 0.954 to 0.999 for strain and strain rate. LSs ($r = -0.53$ in males; -0.64 in females; -0.59 overall) and LSc ($r = -0.76$ in males; -0.82 in females; -0.79 overall) were inversely associated with age (all $p < 0.0001$). Similarly, negative age-dependencies were observed for reservoir strain rate (LSRs), conduit strain rate (LSRs), and the ratio LSRb/LSRa ($r = -0.47$, -0.83 , and -0.68 , respectively; all $p < 0.0001$). LSc and LSRa were not age-dependent.

Conclusion: Novel feature tracking LA LS and LSR parameters derived from standard CMR images reveal age-dependent reductions in LA reservoir and conduit, but not booster, function in healthy males and females; and provide useful age- and sex-specific normal reference ranges for LA function quantitation.

093. DYNAMIC ASSESSMENT OF TRICUSPID ANNULAR MOTION IN HEALTHY SUBJECTS AND PATIENTS WITH CONGENITAL HEART DISEASES USING LONG-AXIS CMR IMAGING

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Objectives: To quantitatively evaluate the tricuspid annular (TA) motion with radially rotational long-axis cardiovascular magnetic resonance (CMR) imaging in healthy volunteers and patients with congenital heart diseases (CHD).

Methods: A small group of 4 normal subjects (39 ± 24 years) and 4 CHD patients (43 ± 19 years) were recruited. Cine CMR was performed in the right ventricle (RV) in the long axis with 18 radially rotational planes and 10° angular equidistance (Fig. 1(A)). The in-house built image post-processing program was used to automatically locate the TA throughout cardiac cycle, and to derive the following clinical parameters: peak systolic velocity (Sm); peak early diastolic velocity (Em); peak late diastolic velocity (Am); and tricuspid annular plane systolic excursion (TAPSE). In addition, 3 selected planes that are typical routinely-acquired – 4-chamber, RV inflow/outflow, and RV 2-chamber (Fig. 1(B-C)) – were compared to 18 planes as ground truth.

Results: Feature tracking analysis was feasible in all subjects. Typical results were shown in Fig. 1(D-E) with comparison between one normal and one patient. It was well demonstrated in Fig. 2 that clinical results from three selected routine planes had excellent linear correlation to the ground truth with 18 planes ($r > 0.985$). Patients were found to have significantly smaller Sm (7.8 ± 2.1 vs 10.9 ± 1.3 cm/s), Em (6.9 ± 2.0 vs 11.3 ± 3.0 cm/s) and Am (8.3 ± 1.5 vs 12.7 ± 1.3 cm/s) than healthy subjects ($p < 0.05$ for all). TAPSE was reduced in patients but not significant (16.4 ± 4.1 vs 21.2 ± 3.4 cm, $p = 0.083$).

Conclusion: Current study has demonstrated impaired tricuspid valve annular velocities in clinically diagnosed congenital heart diseases and provided support for the use of the routine acquired views to assess global TA motion. The potential for added clinical value to be further investigated.

094. MYOCARDIAL STRAIN ASSESSED BY CARDIAC MAGNETIC RESONANCE IN ACUTE MYOCARDIAL INFARCTION: POSSIBLE CORRELATION BETWEEN FEATURE TRACKING AND TISSUE CHARACTERIZATION

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Objectives: myocardial deformation parameters, strain and strain rate, as markers of contractile dysfunction in the backdrop of myocardial infarction, appears more sensitive than standard 2-D parameters. The introduction of Feature Tracking (FT) cardiac magnetic resonance (CMR) software allows the assessment of left ventricular (LV) strain without a specific encoding pulse.

We sought to investigate if FT algorithm on CMR cine images allows the quantitation of regional LV function and its association with contrast enhanced CMR (CE-CMR).

Methods: we prospectively enrolled patients with ST-segment elevation myocardial infarction according to the following criteria: first event; successful primary PCI; scheduled for

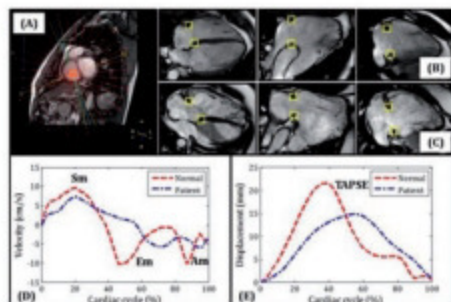


Figure 1. (A) Radially rotational long-axis RV cine CMR in 18 planes. Motion tracking of the TA (yellow rectangle) in (B) normal and (C) patient (selected planes of 4-chamber, RV inflow/outflow, and RV 2-chamber). (D) TA velocity curve. (E) TA displacement curve. Sm: peak systolic velocity; Em: peak early diastolic velocity; Am: peak late diastolic velocity; TAPSE: tricuspid annular plane systolic excursion.

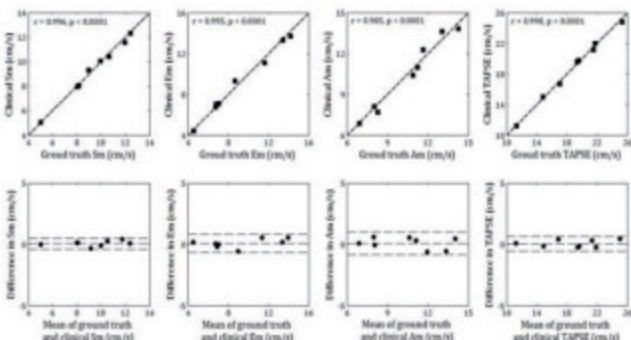


Figure 2. Correlation and Bland Altman plots for ground truth results vs. clinical results from 3 routinely-acquired planes.

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CERTIFICATE OF ATTENDANCE

This is to certify that

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EuroCMR 2017

15th Annual Meeting on CMR of the
European Association of Cardiovascular Imaging (EACVI)
held from May 25 to 27, 2017 in Prague, Czech Republic

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