Right Ventricular Strain and Dyssynchrony Assessment in Arrhythmogenic Right Ventricular Cardiomyopathy: a CMR Feature-Tracking Study

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PURPOSE

Cardiac magnetic resonance (CMR) imaging represents the gold-standard non-invasive imaging technique for the assessment of right ventricular (RV) function; however, analysis of regional dysfunction in arrhythmogenic right ventricular cardiomyopathy (ARVC) may be inadequate due to the complex contraction pattern of the RV. Aim of the present study was to determine the utility of RV strain and dyssynchrony assessment using a novel feature-tracking CMR software system in ARVC patients and its incremental value over conventional CMR imaging.

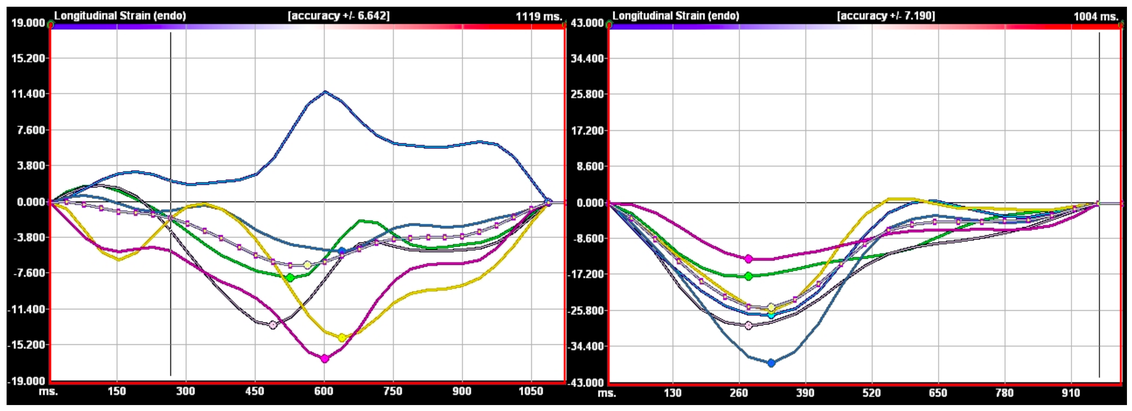

Figure 1

METHODS

32 consecutive patients with ARVC diagnosed according to the 2010 Task force criteria (45±13 years, 69% males) referred to CMR imaging were included. 32 patients with idiopathic right ventricular outflow tract (RVOT) arrhythmias and 32 control subjects, matched for age and gender to the ARVC group, were included for comparison purpose. CMR imaging using a 1.5 Tesla scanner was performed to assess biventricular function; moreover, feature-tracking analysis (2D Cardiac Performance Analysis MR©, TomTec, Munich, Germany) was applied to assess regional and global RV strain and RV dyssynchrony from the 4-chamber cine CMR images. Peak systolic longitudinal strain from basal, mid and apical RV free wall segments was measured and averaged as a measure of global RV function (global longitudinal strain, GLS). In addition, standard deviation (SD) of time-to-peak strain (TPS) was calculated as a parameter of mechanical dispersion, using a 6 RV segment model (three RV free wall and three septal segments).

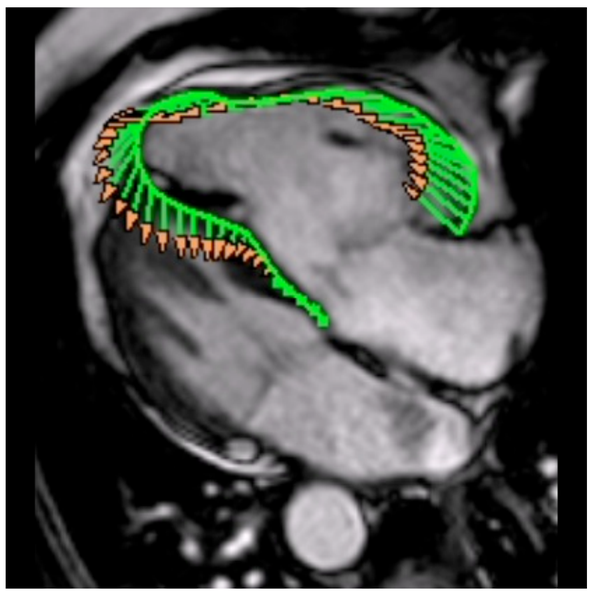

Figure 2

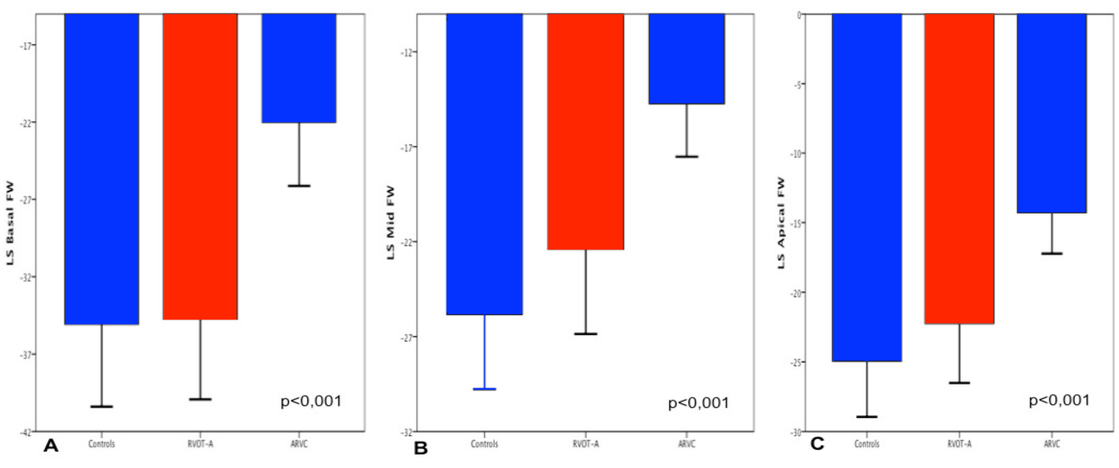

Figure 3

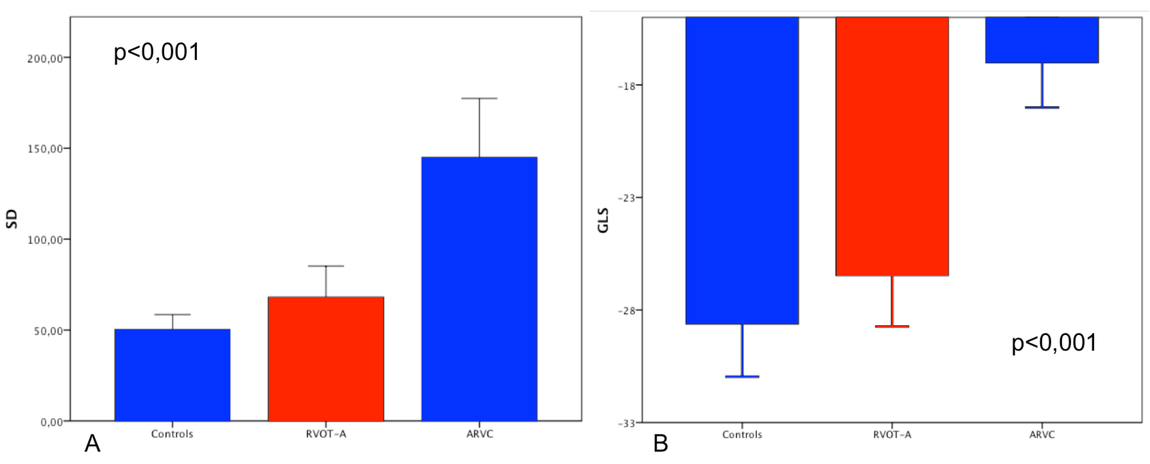

Figure 4

RESULTS

Examples of the strain pattern of a ARVC patient compared to a control are displayed in **figure 1**, whereas in **figure 2** is showed an example of tracking on a 4-chamber cine image. Systolic strain at RV basal (-22±11% vs. -35±14% vs.-35±15%; p <0.001), mid (-15±8% vs. -22±12% vs.-26±11%; p<0.001) and apical level (-14±8% vs. -22±12% vs.-25±11%; p < 0.001) (**figure 3**) were significantly lower in the ARVC group. Moreover the global RV strain (GLS: -17±5% vs. -26±6% vs.-29±6%; p<0.001) was significantly lower whereas RV SD-TPS (145±90ms vs. 68±47ms vs. 50±23ms; p<0.001) was significantly higher among ARVC patients compared to RVOT patients and controls (**figure 4**). Except for RV basal free wall systolic strain, differences remained significant even when considering only ARVC patients with RV ejection fraction ≥50% or RV segments without wall motion abnormalities. At ROC curve analysis, RV GLS >-23.19% and RV SD-TPS >113.13ms had the highest sensitivity and specificity for identification of patients with ARVC (91% and 75% and 59% and 95%, respectively) (**figure 5**). According to these cut-off values, RV GLS and RV SD-TPS allowed correct identification of 7 out of 8 (88%) and 6 out of 8 (75%) ARVC patients with no or minor CMR criteria for ARVC diagnosis according to the 2010 TF criteria (**figure 6**).

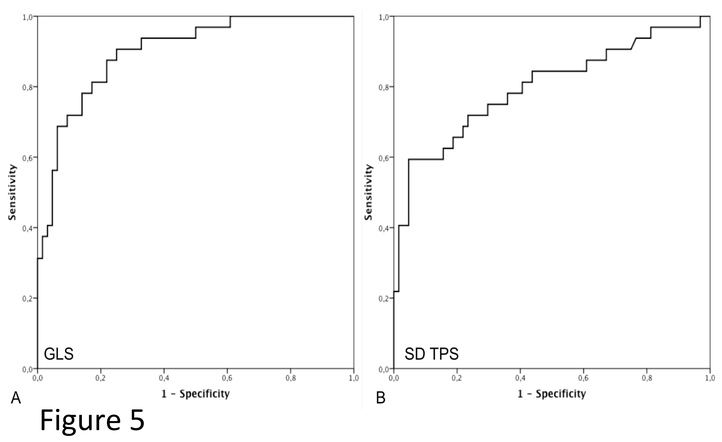

Figure 5

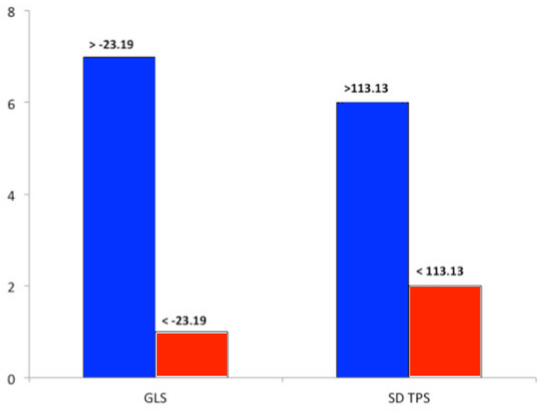

Figure 6

CONCLUSIONS

Strain analysis by feature-tracking CMR helps to objectively quantify global and regional RV dysfunction and RV dyssynchrony in ARVC patients; in addition it provides incremental value over conventional CMR imaging, allowing the identification of abnormalities even when RV ejection fraction is preserved or regional wall motion is normal.

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Disclosures: none