

Longitudinal Precedes Circumferential Strain Abnormality in Sickle Cell Anemia: A Cardiovascular Magnetic Resonance Feature-Tracking Study



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Background

- Sickle Cell Disease (SCD) is an autosomal recessive hemolytic disease that effects approximately 100,000 people in the United States and among African Americans, 1 in 360 newborn babies
- Treatment options include chronic transfusions, hydroxyurea and hematopoietic stem cell transplant
- Chronic transfusions result in iron overload and deposition of iron in the heart and liver leading to diastolic dysfunction.
- Systolic dysfunction with decline in global function as assessed by ejection fraction is a late finding
- Studies in non-ischemic cardiomyopathy (NICMD) demonstrate incremental predictive values of additional strain parameters over left ventricular ejection fraction (LVEF) to predict cardiovascular events
- Cardiovascular magnetic resonance feature-tracking (CMR-FT) is another modality for measuring myocardial strain. CMR-FT has the added advantage of automatically tracking features of the heart thus increasing accuracy

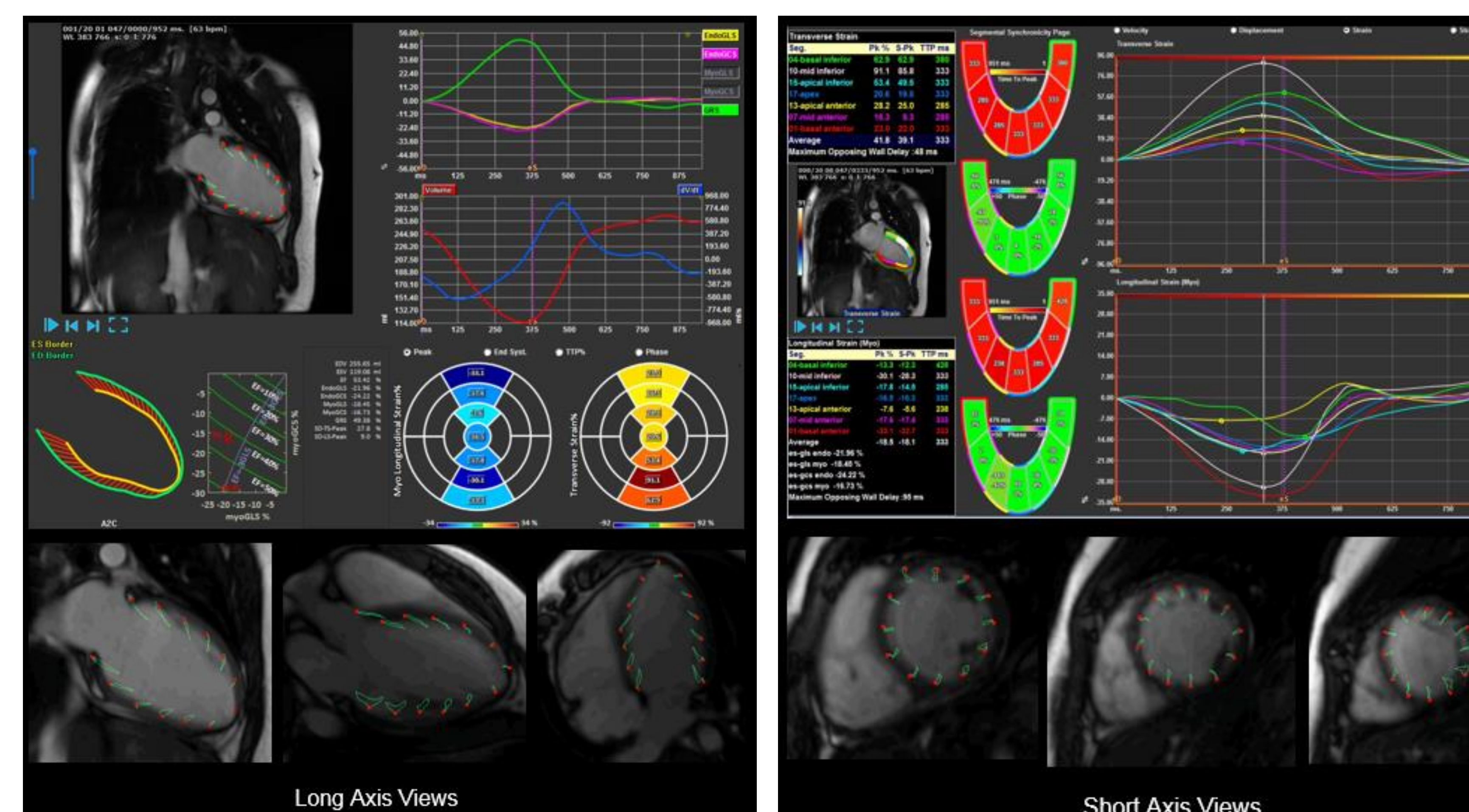
Objective

- To quantify myocardial deformation from cine cardiac magnetic resonance (CMR) images using Feature-Tracking (FT) based technique in patients with SCA compared healthy control subjects.

Methods

- Single institution retrospective study of SCA patients and control subjects with CMR evaluation.
- GLS and GCS were obtained from three long axis views and three short axis views using a commercially available CMR-FT software (Medis Medical Imaging, Qstrain 3.2, Leiden, Netherlands).
- Demographic and clinical CMR data including LVEF was collected for statistical analysis using Student's T-test.

CMR-FT Strain Analysis using QStrain



Results

- 28 SCA patients were identified with complete CMR dataset and 11 age-matched control subjects
- Indexed LV end diastolic volume was larger in SCA patients compared to controls
- There was no difference between LVEF in SCA patients and controls
- SCA patients had lower GLS and GCS magnitude compared to control
- There were no difference between GLS and GCS in control subjects but GLS magnitude was significantly lower than GCS in patients with SCA

	Age (years)	Indexed LV end diastolic volume (mL/m ²)	LV ejection fraction (%)	GLS (%)	GCS (%)
Sickle Cell Anemia (N=28)					
Mean	16.1±4.9	109.2±18.2	59.3±5.6	-14.8±2.8	-17±3.6
Controls (N=11)					
Mean	18.5±0.7	96.8±14.1	58.4±5.7	-20.3±1.5	-20.1±1.5
P-value	0.06	0.03	0.3	<.0001	0.004

Conclusion

- GLS in SCA is abnormal compared to control group
- GCS magnitude was significantly lower compared to control group
- GLS decline precedes GCS decline in SCA patients with preserved LVEF
- CMR-FT could potentially be used to evaluate myocardial strain as an early diagnostic tool to assess for occult dysfunction and perhaps lead to earlier intervention to decrease cardiovascular events
- Future larger longitudinal studies are needed to determine rate of progression and patient outcomes

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