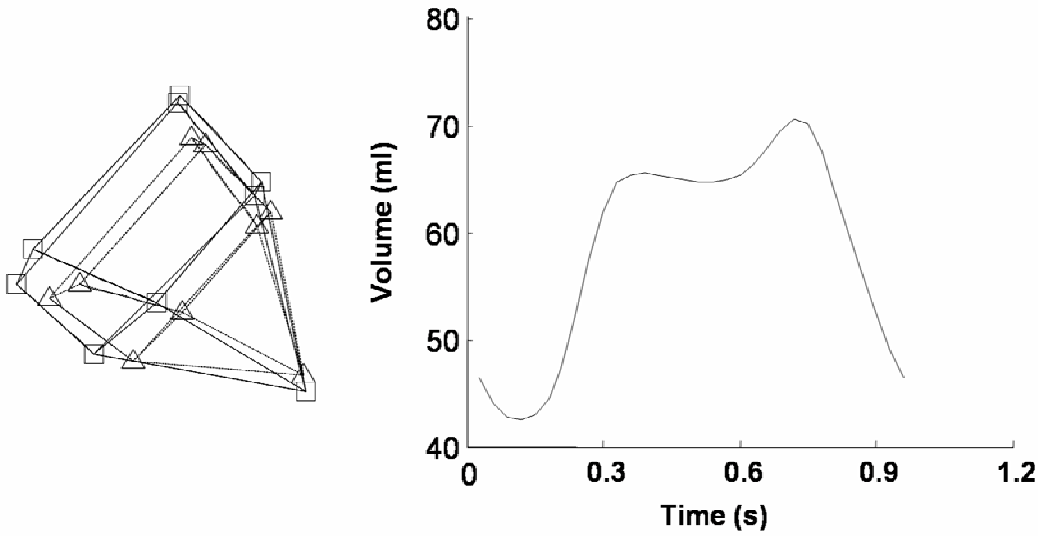
VIRTUAL MARKERS FOR NONINVASIVE ASSESSMENT OF MYOCARDIAL DYNAMICS

JPE Kvitting[1,2], A Sigfridsson[2], L Wigström[2], AF Bolger[3], and M Karlsson[2]
Department of Surgery[1] and Center for Medical Image Science and Visualization[2], Linköping University, Linköping, Sweden. Department of Medicine[3], University of California, San Francisco, San Francisco, USA.

OBJECTIVES: Surgically implanted markers are the gold standard for determination of time-resolved three dimensional (3D) myocardial dynamics. We have studied a new magnetic resonance imaging (MRI) method for tracking *virtual markers* noninvasively. **MATERIAL AND METHODS:** Velocity vector information was acquired from ten normal volunteers (3 females) aged 40 (range, 25-56) using a retrospectively gated 3D phase contrast pulse sequence on a 1.5 T MRI scanner with TR=27ms, VENC=18cm/s, and spatial resolution of 1x4x4 mm. Spatial saturation pulses were applied superiorly and inferiorly to the acquired volume. Nine points were manually placed in the apex and in the basal and midventricular segments of the lateral, septal, anterior, and posterior walls. The points were automatically tracked using numerical integration of the velocity field. **RESULTS:** The figure shows a wire-frame (left) of the end-systolic (□) and end-diastolic (Δ) configuration of the left ventricle measured with the *virtual markers*. The changes in volume over time are shown on the right. The wire-frame excludes the sub-annular area, underestimating the left ventricular volume. **CONCLUSIONS:** *Virtual markers* may allow noninvasive investigation of ventricular volume dynamics and volume-based parameters. This approach may also be extended to develop new tools for imaging regional behaviour such as ventricular torsion and myocardial strain.