Myocardial Tagging and Tissue Velocity MRI:

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Evaluation of Myocardial Function using Tagging MRI

Myocardial Strain Imaging

- Measurement of fractional change in length (%) from resting state to the state following myocardial contraction
  - Contraction or shortening: (-) values
  - Lengthening: (+) values

Normal strains
E_{cc}: Circumferential shortening
E_{rr}: Radial thickening
E_{ll}: Longitudinal shortening

Principal strains
E_{1(1,1)}: Maximal principal strain
E_{2(2,2)}: Minimal principal strain

Castillo et al. Radiology 2003

Myocardial tagging MRI

- Cine MRI by applying a special RF pre-pulse
  → induces a local saturation depicted on images as a dark line superimposed on myocardial tissue

Quantitative Analysis of Regional Wall Motion on Tagged MRI - Harmonic phase (HARP) analysis

Assessment of Regional LV Function in HCM
High-dose dobutamine MR with myocardial tagging
For detection of myocardial ischemia

High-dose dobutamine-CMR with myocardial tagging improves the detection of new wall motion abnormalities, which are indicative of myocardial ischemia. Dobutamine-CMR with myocardial tagging detected more NWMA compared with dobutamine-CMR without tagging.


Assessment of Regional LV Function in ICM

Minimal principal strain (maximal myocardial contraction)


Constrictive Pericarditis

Evaluation of Myocardial Function using Tissue Velocity MR

Tissue Doppler

Tissue Velocity MRI

Tissue Doppler

Tissue Doppler

Evaluation of Myocardial Function using Tissue Velocity MR

Tissue Doppler
Velocity encoding MR (Phase Contrast MR)

- Evaluation of Diastolic Function by MR
  - Mitral inflow velocity using VENC MR
  - Tissue velocity using VENC MR

M/61 HCMP

Evaluation of Diastolic Function by MR

- Mitral Inflow Velocity MR
  - Routine VENC-MR
    - at the level of mitral valve tip
    - TR 5.3ms, TE 3.0ms, FA 15°
    - 128 x 256 matrix, ST 8mm, 1NEX
    - 30~40 phase per cardiac cycle
    - SENSE factor=2
    - $V_{ENC}=100\text{cm/sec}$
  - Valsalva VENC-MR
    - During Valsalva maneuver at the same level
    - same parameters

- Tissue velocity MR
  - $V_{ENC}=50\text{cm/sec}$
  - ROI: posterior basal septum