Viability

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Indications and purpose of the scan

- The evaluation of myocardial viability is a common clinical question in patients with ischemic cardiomyopathy and myocardial dysfunction. Late gadolinium enhancement cardiovascular magnetic resonance (LGE-CMR), can accurately identify the location, size and extent of myocardial fibrosis providing clinical information regarding prognosis in patients post myocardial infarction and likelihood of functional recovery with revascularization in patients with ischemic cardiomyopathy.

Why CMR (specific advantages)

- Much higher special resolution when compared to single-photon emission computed tomography (SPECT) with technetium-99m sestamibi or thallium-201.
- Accurately identify the presence, location and extent of myocardial necrosis.
- Direct quantification of viable myocardium compared to indirect assessment with dobutamine echocardiography or SPECT.
- Evaluation of viable and non-viable myocardium.
- No radiation exposure.

Evidence examples from the literature

- Kim et al. in a landmark study of LGE-CMR performed in 50 patients to assess viability prior to revascularization highlighted the spatial resolution of CMR identifying viable and non-viable myocytes. The likelihood of functional improvement was very high in the segments without hyperenhancement. In the segments with hyperenhancement the likelihood of functional recovery was proportional to the extent of hyperenhancement of these segments with a significant lower likelihood of increased contractility in those segments with more than 51% hyperenhancement. [1]
- Gerber et al. in an observational study to assess the prognostic value of LGE-CMR in a cohort of 144 patients with CAD, 86 patients were treated with revascularization and 58 patients with optimal medical therapy (OMT), they were followed for three years. The medical therapy group with viable myocardium by LGE-CMR had the worst outcomes and LGE-CMR was an independent predictor of mortality in this population. [2]
- There are no randomized trials of viability testing. While meta-analyses of observational studies have shown benefit of revascularization in the presence of viability [3], an observational subgroup analysis of the STITCH trial evaluating the impact of viability showed that viability, in this case assessed by SPECT and dobutamine echocardiography, was not associated with better outcomes after CABG. [4]

Contraindications

- Any implanted device that is not MRI conditional
- Inability to lie flat
- Inability to tolerate the scan
- Altered mental status/ inability to follow verbal commands in scanner
- Severe arrhythmias
- Patients renal disease and GFR<30 mL/min or patients with selected metallic implants or prostheses non-compatible to MRI. [5]
**Appropriateness**

- LGE-CMR is appropriate in these scenarios: [6]
- Determine the location and extent of myocardial necrosis;
- Post myocardial infarction;
- Determine viability prior to revascularization;
- Establish the likelihood of functional recovery with revascularization;
- Viability assessment by SPECT or dobutamine echo has provided “equivocal or indeterminate” results.

**References**