Stress Cardiac MRI

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Disclosure

• None
Temporal Trends in Cardiac Stress Testing


Temporal Trends in Stress Test 2005-2012 in patients aged 65 years or less

JAMA Cardiol. 2016;1(9):1038-1042
Stress CMR

1-Dobutamine Stress CMR

- Designed to detect stress induced wall motion abnormalities.

- Pharmacologic agents need to increase rate/pressure products to induce wall motion abnormalities during stress.

- Dobutamine is the agent of choice, atropine can be added to achieve at least 85% of the MPH.

- Less commonly used due to some technical difficulties.
Dobutamine stress CMR

- Dobutamine stress protocols are similar to Dobutamine stress echo
- DE images will be used to correlate characteristic ischemic scar pattern with wall motion abnormalities
- Difficulties: Patient co-operation during tachycardia (Gating is not a major issue since these are just cine images)
Dobutamine Stress CMR

- Vasodilator based stress testing.
- The most commonly used agent is adenosine (uncover regional differences in blood flow via preferential vasodilatation).
- Ischemic areas are identified by decreased enhancement during first pass imaging after intravenous administration of adenosine.
Pharmacologic CMR stress protocol

1. **Adenosine**
   - **Dosage:** peripheral i.v. line, over 3 minutes
   - **No Caffeine >24 hrs**

2. **Gadolinium contrast:** Gadoversetamide
   - **Dosage:** 0.0625 mmol/kg bodyweight (2 x, rest and stress)
   - **Infusion rate:** 3.5 mL/s, peripheral i.v. line
   - **Saline flush:** 50 mL at 3.5 mL/s

Klem et al., JACC. 47; 2006

Scout views

**Orthogonal localizers**

- Coronal
- Axial
- Sagittal
Creating standard views and assessing wall motion by cine imaging

4 Chamber HLA
4 Chamber HLA
Stress Perfusion, comparing stress and rest first pass imaging.
Stress Perfusion, comparing stress and rest first pass imaging.
DHE

Stress CMR: evidence

Cardiovascular magnetic resonance and single-photon emission computed tomography for diagnosis of coronary heart disease (CE-MARC): a prospective trial

Lancet. 2012 Feb 4;379(9814):453-60
CE-MARC Trial

- Well designed study.
- Screened patient with suspected angina and at least one risk factor for CAD.
- No verification bias "used coronary angiography as "Gold Standard"
- Pharmacologic stress modality was regadenosine in both CMR and SPECT

Lancet. 2012 Feb 4;379(9814):453-60
CE-MARC Trial

- **CMR**: Sensitivity 86.5% (95% CI 81.8–90.1), Specificity 83.4% (79.5–86.7), PPV: 77.2%, NPV: 90.5%

- **SPECT**: Sensitivity 66.5% (95% CI 60.4–72.1), Specificity 82.6% (78.5–86.1), PPV: 71.4%, NPV: 79.1%
Stress CMR: Evidence

MR IMPACT II trial

- Similar design, 33 centers in Europe and US
- 533 pt, were scheduled to undergo SPECT and/or angiography consented for Stress CMR
- Primary endpoint was non-inferiority compared to SPECT imaging.

Conclusion: In this large multicenter, multivendor study, the sensitivity of perfusion-CMR to detect CAD was superior to SPECT, while its specificity was inferior to SPECT.
Stress CMR: Evidence

JACC: Cardiovascular Imaging
Volume 9, Issue 11, November 2016
DOI: 10.1016/j.jcmg.2016.09.010

CMR First-Pass Perfusion for Suspected Inducible Myocardial Ischemia
Robert C. Hendel, Matthias G. Friedrich, Jeanette Schulz-Menger, Claudia Zerrnich, Frank Bengel, Daniel S. Berman, Paolo G. Camici, Scott D. Flamm, Dominique Le Guludec, Raymond Kim, Massimo Lombardi, John Mahmarian, Udo Sechtem and Elke Nagel

Robert C. Hendel et al. JIMG 2016;9:1338-1348
American College of Cardiology Foundation
Conclusion

- Stress Perfusion CMR is non-inferior to SPECT imaging in patients with suspected CAD.

- Stress perfusion MRI will continue to grow but it will remain limited by availability and other MRI standard limitations.

Thank you