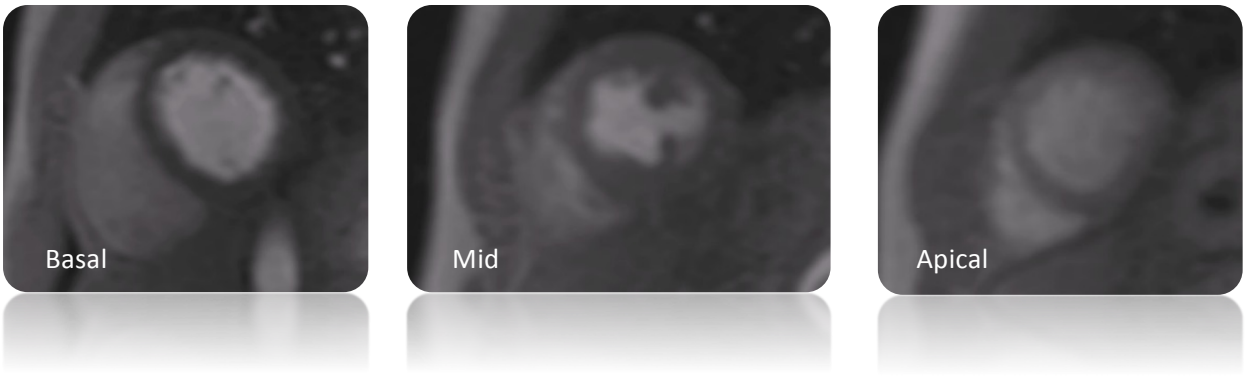
Cardiac MRI Essentials

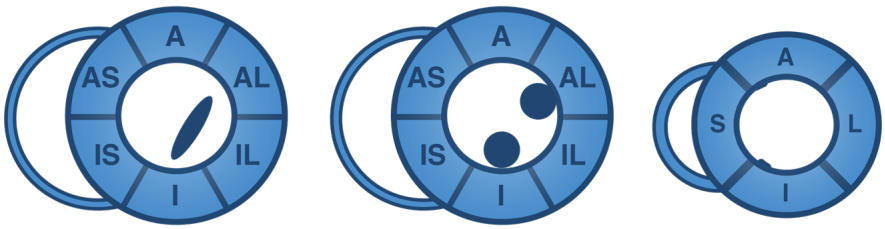
Myocardial ischemia

- CMR offers excellent sensitivity (86.5%) and specificity (83.4%) in the detection of myocardial ischemia
- CMR offers a superior performance to nuclear (SPECT) imaging
- CMR provides the clear identification of affected myocardial territories, and therefore helps in the identification of culprit coronary lesions
- CMR also permits the assessment of myocardial viability post-infarction, left ventricular size and function, valvular function, and aortic dimensions - all in a single imaging study

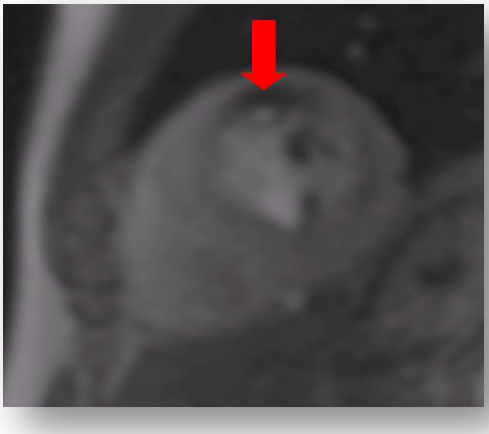
Myocardial ischemia can be assessed in an adenosine stress perfusion study, looking at myocardial perfusion in the basal, mid and apical short axis views:



Any areas of myocardial ischemia should be described with reference to the standard myocardial segments:



Myocardial perfusion imaging is performed during stress and also at rest, following administration of an intravenous bolus of gadolinium contrast. Three sets of images are obtained - showing short axis view of the basal, mid and apical left ventricle - and the stress and rest images are compared side-by-side, looking for areas of hypoperfusion during stress.



Anterior ischemia (red arrow) in a patient with a stenosis in the left anterior descending coronary artery.

Inferolateral ischemia (red arrow) in a patient with stenoses in the circumflex and right coronary arteries.

Regional wall motion abnormalities

Myocardial ischemia can also be assessed with the use of dobutamine stress, which induces hypokinesia in areas of myocardial ischemia. Cine images are obtained at rest and during stress, and compared side-by-side tom identify any areas of inducible hypokinesia.

How do we assess myocardial ischemia using CMR?

- Myocardial perfusion imaging uses a first-pass imaging technique
- Gadolinium contrast agent
- Two sets of images to assess myocardial perfusion:
    - Stress images (using adenosine, regadenoson, or sometimes dobutamine)
    - Rest images (≥10 minutes after stress images)
- Three short-axis slices of the left ventricle:
    - Base, mid, apex
- If dobutamine is used, can also look for regional wall motion abnormalities

Further reading

Cardiovascular magnetic resonance and single-photon emission computed tomography for diagnosis of coronary heart disease (CE-MARC): a prospective trial. *Lancet* 2012; **379**: 453-460 [click here to access online]