



Cardiac MRI Essentials

Myocarditis

When should we perform CMR for suspected myocarditis? When there are:

1. New onset or persisting symptoms suggestive of myocarditis
 - *Dyspnea or orthopnea or palpitations or effort intolerance/malaise or chest pain*

PLUS
2. Evidence for recent/ongoing myocardial injury
 - *Ventricular dysfunction or new or persisting ECG abnormalities or elevated troponin*

PLUS
3. Suspected viral etiology
 - History of recent systemic viral disease or previous myocarditis
 - *or* absence of risk factors for coronary artery disease or age <35 yrs
 - *or* symptoms not explained by coronary stenosis on coronary angiogram
 - *or* recent negative ischemic stress test

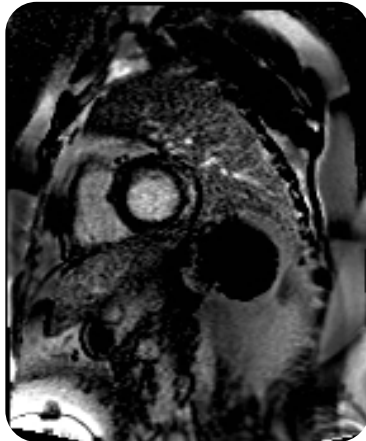
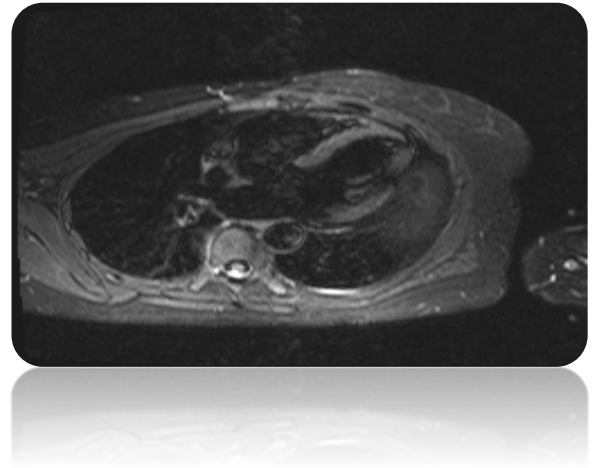
The Lake Louise diagnostic criteria for CMR in myocarditis



- In the setting of clinically suspected myocarditis, CMR findings are consistent with myocardial inflammation if at least two of the following criteria are present:
 - Regional or global myocardial signal intensity increase in T2-weighted images
 - Increased global myocardial early gadolinium enhancement ratio between myocardium and skeletal muscle in gadolinium-enhanced T1-weighted images
 - There is at least one focal lesion with non-ischemic regional distribution on late gadolinium enhancement
- Presence of left ventricular dysfunction or pericardial effusion provides additional, supportive evidence for myocarditis

Myocardial edema

- CMR can show evidence of myocardial edema during acute myocarditis
- Use T2-weighted imaging to identify regions of edema (appear bright)



Late gadolinium enhancement

- Look for at least one focal region of LGE in a non-ischemic distribution
- Example (left) shows lateral subepicardial LGE in myocarditis

How do we assess myocarditis with CMR?

- Assess left ventricular volume and function
 - Left ventricular volumes
 - Left ventricular stroke volume and ejection fraction
 - Cardiac index
 - Left ventricular wall thickness and mass
- Look for evidence of myocardial inflammation/injury
 - Myocardial edema
 - Early myocardial contrast uptake
 - Late gadolinium enhancement
- Look for any pericardial effusion

Further reading

Cardiovascular magnetic resonance in myocarditis: a JACC white paper. *Journal of the American College of Cardiology* 2009; **53**: 1475-1487 [[click here to access online](#)]