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**THE DETECTION OF ACUTE MYOCARDITIS USING  
CARDIOVASCULAR MRI: A CLINICAL STUDY  
COMPARING T1-MAPPING, T2-WEIGHTED AND LATE  
GADOLINIUM ENHANCEMENT IMAGING**

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**Background** The accurate diagnosis of acute myocarditis on cardiovascular MRI (CMR) often requires multiple modalities, including T2-weighted (T2W), early and late gadolinium imaging. Novel CMR techniques are now available, including bright-blood T2W-CMR, and T1-mapping which is also sensitive to changes in free water content. We hypothesised that these emerging methods can serve as new and potentially superior diagnostic criteria for myocarditis.

**Methods** We studied 45 healthy controls and 34 patients with suspected acute myocarditis. All patients presented with acute chest pain, troponin I >0.04 µg/l and had unobstructed coronary arteries on angiogram or ruled out clinically (eg, young age <35 years). CMR at 1.5 T within 12 days of presentation included (1) dark-blood T2 (STIR); (2) bright-blood T2 (ACUT2E); (3) T1-mapping (ShMOLLI); and (4) late gadolinium enhancement (LGE) (figure 1). Image analysis was performed for (1) global myocardial T2 signal intensity (SI) ratio against skeletal muscle; (2) mean myocardial T1 relaxation times; (3) LGE.

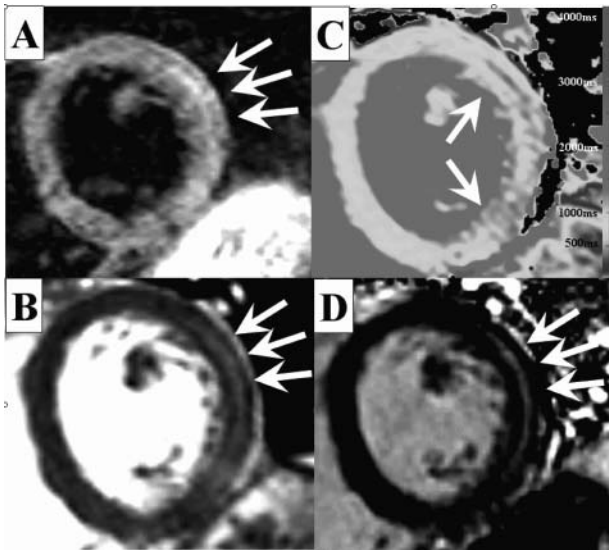


Figure 1

**Results** All patients had a CMR diagnosis of acute myocarditis based on both positive T2-STIR and typical LGE pattern. Patients with an obvious alternate diagnosis (such as Takotsubo cardiomyopathy, hypertrophic cardiomyopathy) were excluded. Compared to controls, patients had significantly higher global myocardial T2 SI ratios by dark-blood T2W-CMR ( $1.81 \pm 0.28$  vs  $1.58 \pm 0.16$ ,  $p < 0.001$ ), bright-blood T2W-CMR ( $2.90 \pm 0.33$  vs  $1.82 \pm 0.19$ ,  $p < 0.001$ ) and mean myocardial T1 ( $1027 \pm 62$  ms vs  $942 \pm 21$  ms,  $p < 0.001$ ). Receiver operator characteristic analysis showed good diagnostic performance for all methods, with T1-mapping having a significantly larger area-under-the-curve (0.95) compared to dark-blood T2W (0.79) and bright-blood T2W imaging (0.76;  $p < 0.001$  for both comparisons; figure 2).

**Conclusions** T1-mapping showed superior diagnostic performance compared to conventional dark-blood and newer bright-blood T2W-CMR in the detection of acute myocarditis. T1-mapping and bright-blood T2W-CMR may be used as novel diagnostic criteria for the assessment of acute myocarditis.

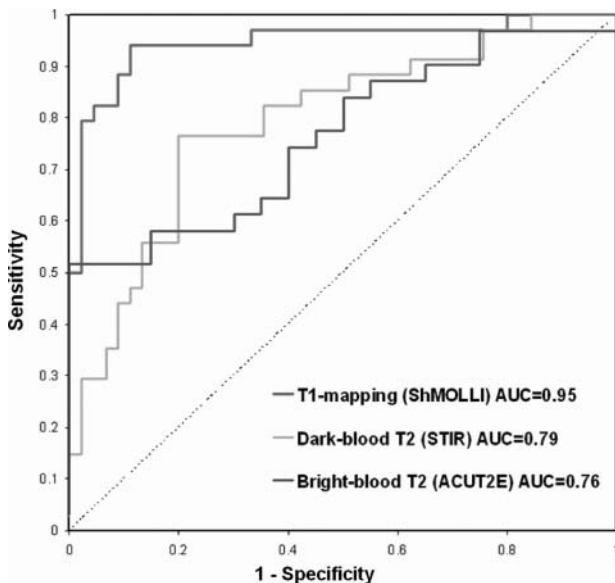


Figure 2