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Cardiovascular magnetic resonance using T1-mapping, T2-weighted and late gadolinium enhancement imaging provides a high diagnostic yield in patients presenting with acute chest pain, positive troponin and non-obstructive coronary arteries

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Background

Patients presenting with chest pain, raised troponin but non-obstructive coronary arteries pose a clinical challenge in diagnosis, prognosis and management. We hypothesized that early, multiparametric cardiovascular magnetic resonance (CMR) imaging can localize areas of injury and provide a diagnosis these cases.

Methods

We prospectively studied 120 patients (mean age 50 ± 17 yrs; 50% female) presenting with chest pain, positive troponin I (normal <0.04, median 3.99, range 0.07 to >60 μg/L) and non-obstructive coronaries. Early CMR at 1.5T (median 3 days, IQR 1-6 days) included cine, dark-blood T2-weighted (STIR), native T1-mapping (ShMOLLI) and late gadolinium enhancement (LGE) imaging (Figure 1). Findings were compared to 50 controls. Image analysis included: the detection of edema comparing T2 signal intensity of myocardium to skeletal muscle (>2.0) or remote myocardium (>2 SD); myocardial T1 times (areas of injury with an area of ≥40 mm2 with T1 >990 ms); and presence of LGE.

Results

Using only conventional CMR techniques (cine, T2W and LGE; Figure 2), there was a high diagnostic yield of 95%. Edema was detected in 79% and LGE in 61% of patients. Based on CMR findings including the type, pattern and regional distribution of injury, the commonest diagnosis was myocarditis (37%), followed by Takotsubo cardiomyopathy (23%), myocardial infarction (18%), acute regional stunning (9%; wall motion abnormality with edema but no LGE), dilated cardiomyopathy (4%), hypertrophic cardiomyopathy (3%), and missed pulmonary embolism (1%). In 11/21 (52%) of patients with MI, a patent foramen ovale (PFO) was demonstrated on echocardiography with agitated saline contrast, suggesting these patients may have suffered a paradoxical coronary embolism. The remaining 5.0% (n = 6) of patients had no findings on T2W and LGE imaging. However, native T1-mapping identified areas of injury (T1 >990 ms) in 4 out of the remaining 6 patients, improving the detection rate to 98%.

Conclusions

Using conventional T2W and LGE techniques, early CMR has a high diagnostic yield (95%) in patients presenting with troponin-positive chest pain but non-obstructive coronary arteries. Native T1-mapping

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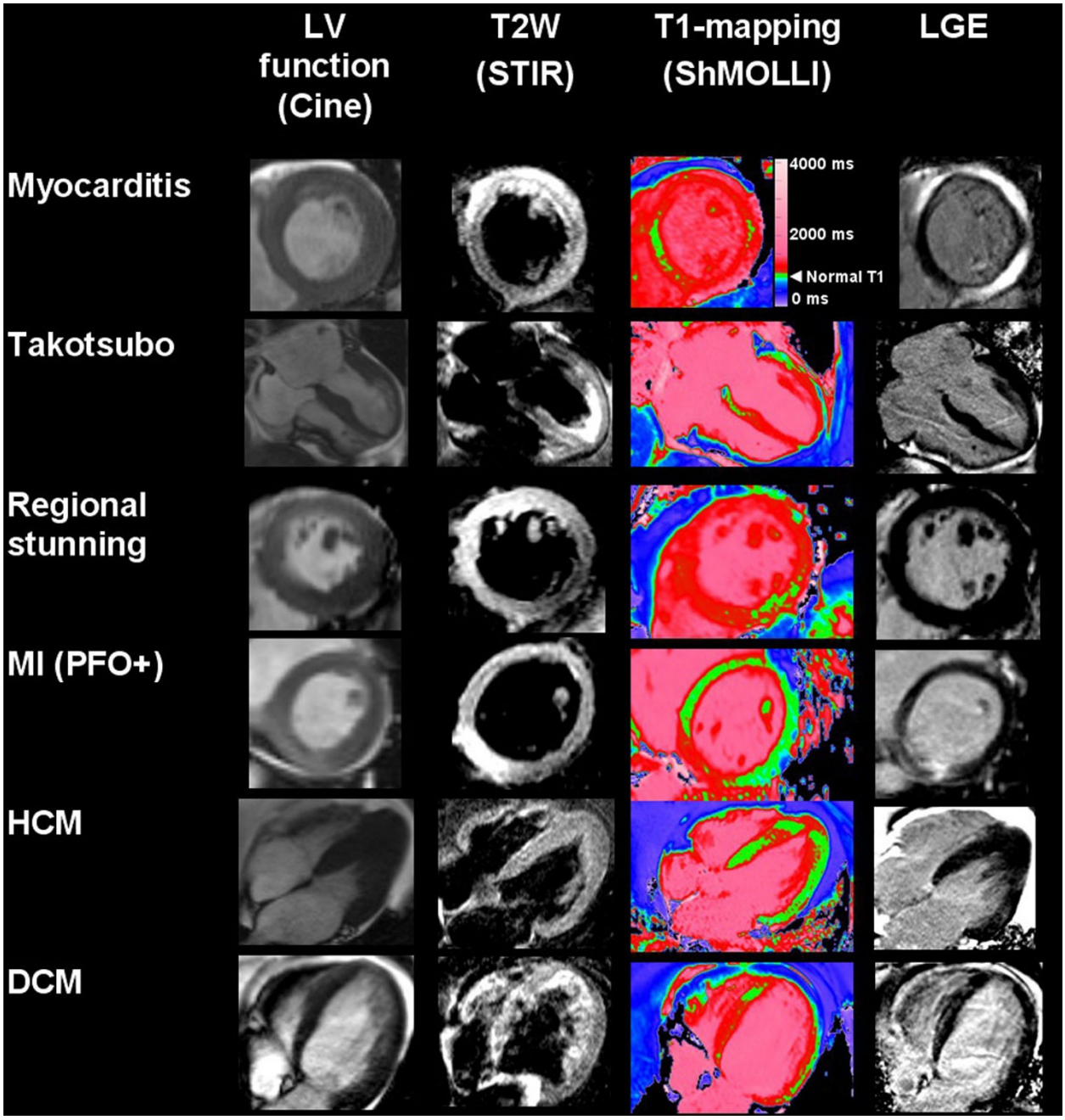

Figure 1 Early CMR using multiparametric tissue characterization including cine, T2-weighted (T2W), T1-mapping and late gadolinium enhancement imaging to assess patients presenting with acute chest pain, positive troponins and non-obstructive coronary arteries. On T1-maps, green areas within the LV denote normal myocardium; red areas have a T1> 990 ms, consistent with acute injury.

detected additional areas of abnormality when conventional CMR was "normal", improving the detection rate to 98%. Early multiparametric CMR is able to localize areas of affected myocardium and may aid in the further management or diagnostic workup in this patient cohort.

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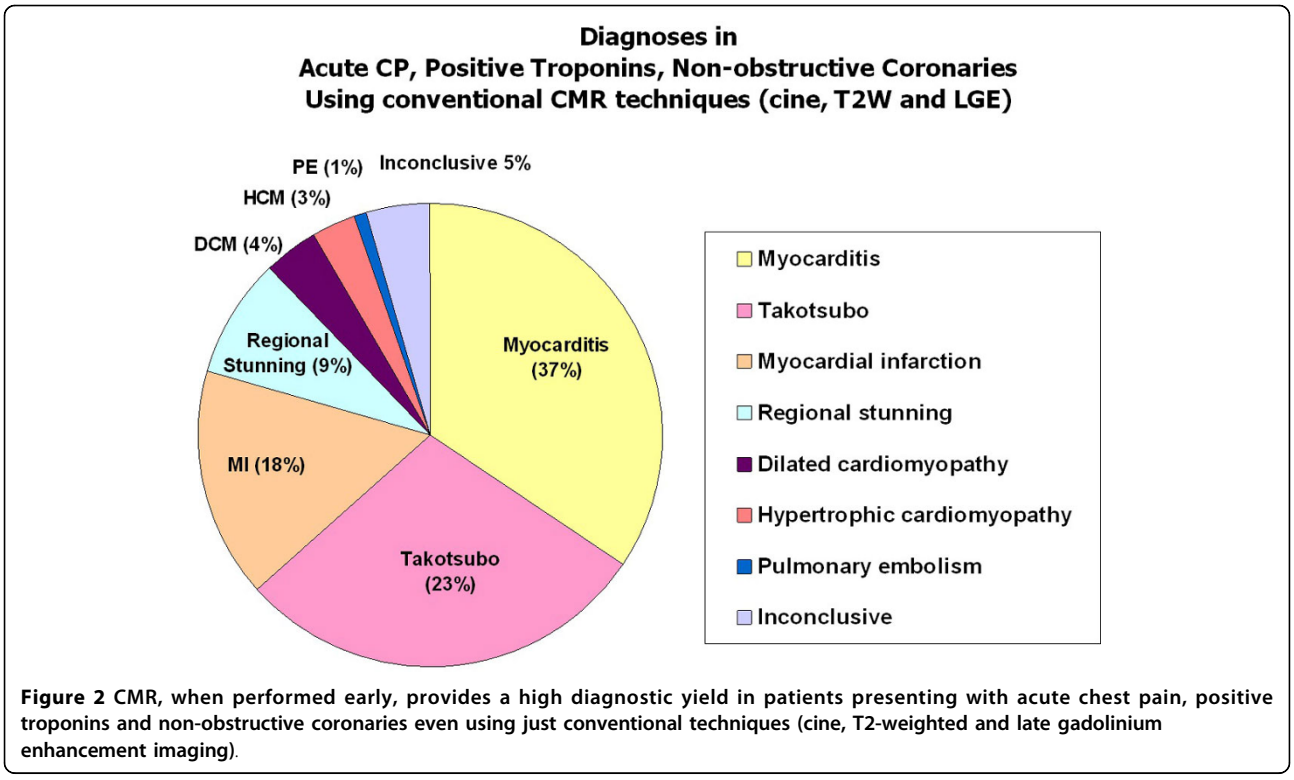

Figure 2 CMR, when performed early, provides a high diagnostic yield in patients presenting with acute chest pain, positive troponins and non-obstructive coronaries even using just conventional techniques (cine, T2-weighted and late gadolinium enhancement imaging).

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