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REPLY

Use of cardiac MRI to diagnose Takotsubo syndrome

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We thank Garg and colleagues for their Correspondence (Important role of myocardial tissue characterization by cardiac MRI in diagnosing Takotsubo syndrome. *Nat. Rev. Cardiol.* doi:10.1038/nrcardio.2015.116)[1] and interest in our Review (Akashi, Y. J. *et al.* Epidemiology and pathophysiology of Takotsubo syndrome. *Nat. Rev. Cardiol.* **12**, 387–397; 2015).[2] They raise several interesting and important issues. We agree that it is important to exclude culprit coronary artery disease in patients in whom Takotsubo syndrome is suspected. This process is, by definition, at the core of the diagnosis according to all the current diagnostic criteria. Although Ibanez *et al.* published a report on a small cohort of patients with potential plaque rupture in the left anterior descending coronary artery and spontaneous recanalization,[3] one additional important diagnostic criterion for Takotsubo syndrome is that regional wall motion abnormalities (RWMAs) are observed in more than one coronary artery territory. It is, therefore, important to review carefully the diagnostic coronary angiogram, and compare the coronary anatomy with the distribution of RWMAs to ensure that this diagnostic criterion is met. In the event that the RWMA is restricted to one coronary territory, advanced intracoronary imaging technologies, including intravascular ultrasonography (IVUS) and optical coherence tomography should be applied where available. Of note, and contrary to the report from Ibanez and colleagues, Haghi *et al.* reported 100% normal IVUS studies in a small series of 10 patients with Takotsubo syndrome.[4] Investigators in another study in which IVUS was used also identified nonsignificant luminal narrowing in the left anterior descending coronary artery.[5]

We agree that cardiac MRI offers a range of advantages when investigating patients with an elevation in troponin level, acute cardiac chest pain, electrocardiogram abnormalities, and normal coronary arteries (or no culprit coronary disease). These benefits include diagnosis of other pathologies, such as hypertrophic cardiomyopathy, pericarditis, myocarditis, exclusion of myocardial infarction in coronary distribution, and evidence of acute oedema or inflammation in the typical circumferential distribution associated with the Takotsubo syndrome anatomical variants. The increasing number of reports and small series demonstrating increased T2-STIR (Short Tau Inversion Recovery) signal in the dysfunctional segments of typical cases of Takotsubo syndrome have also contributed to the body of evidence suggesting that acute stress triggers acute myocardial inflammation and/or oedema. The biopsy evidence, as discussed in our Review,[2] also supports this hypothesis. Moreover, cardiac MRI can be used to identify complications associated with acute Takotsubo syndrome, including apical thrombus, right ventricular involvement, pericarditis, and outflow tract obstruction.

At a practical level, many cases of Takotsubo syndrome are easily identifiable on the basis of diagnostic coronary angiography, RWMAs on left ventriculography or echocardiography, electrocardiographic changes, and clinical presentation. In these patients, routine use of cardiac MRI is not essential, but can be used where available. However, many cases are not straightforward, with atypical features or bystander coronary artery disease. In these 'grey' cases, the use of cardiac MRI with T2-STIR and late gadolinium enhancement is extremely helpful during the acute phase of the disease and, in our view, patients should be transferred when clinically stable to centres where cardiac MRI is available. One note of caution is the high incidence of serious acute complications during the acute phase of Takotsubo syndrome (pulmonary oedema ~15–20%, cardiogenic shock ~10%, malignant ventricular arrhythmias 2–5%),[6–8] and patients should be considered for cardiac MRI only when clinically stable. We agree with Garg and colleagues' comment regarding the need for prospective, multicentre studies to clarify the clinical role of cardiac MRI in the diagnostic algorithm for patients with diagnosed or suspected acute Takotsubo syndrome.

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Competing interests
The authors declare no competing interests.

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