Dobutamine stress magnetic resonance (DSMR) is a well-established technique that is able to provide accurate detection of the contractile reserve in asynergic ischemic segments at low-dose dobutamine, and the assessment of reversible myocardial ischemia at high doses (1–3). The accuracy of the technique is due to the high quality of cardiovascular magnetic resonance (CMR) images, the spontaneous contrast between blood pool and the myocardium on cine sequences, and the excellent anatomic coverage of the left ventricle during stress procedures. Although it is slightly longer and probably less comfortable than stress first-pass perfusion CMR, it has been shown to be feasible in large cohorts of patients, robust, and safe (3). Not surprisingly, the direct comparison of DSMR with stress perfusion CMR for the detection of significant coronary artery disease (CAD) tends to demonstrate a slightly better specificity for DSMR, and a slightly better sensitivity for perfusion imaging techniques (2). Both DSMR and stress perfusion imaging have shown their value for risk stratification in patients with known or suspected CAD over a mean follow-up of 44 ± 24 months. After exclusion of patients who underwent early revascularization from the main analysis, the proportion of patients with cardiac events was greater in those with inducible wall motion abnormalities (WMA) on DSMR versus those without (8.0 vs. 3.1%; hazard ratio: 3.3). It is interesting to note that those patients with events during follow-up had large areas of inducible ischemia (mean, 4.4 segments). Also, those patients with inducible WMA treated medically demonstrated a trend to a higher cardiac event rates (8.0%) than those with early revascularization (5.4%). This information correlates well with the data from the COURAGE (Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation) nuclear substudy (9) and previous single-photon emission computed tomography data (10) that patients with larger amounts of ischemia have higher rates of myocardial infarction and death. Of note, a normal DSMR carries an excellent long-term prognosis, with an annual cardiac event rate of 1.1%, this rate being less during the first 3 years (0.8%). Importantly, the study also confirms in a large cohort that DSMR is safe (3). Only 94 of 1,463 (6.5%) of patients experienced arrhythmias at the time of DSMR, and there was no hard event during DSMR testing. During the study, continuous monitoring is required with MR-compatible equipment (electrocardiogram, heart rate, blood pressure every 3 min at each increase of the dose). Resuscitation equipment must be available just outside of the MR suite, and a dedicated room available outside of the scanner for emergency care. The reasons to terminate the test include new WMA in ≥2 contiguous segments, severe arrhythmias, drop of systolic blood pressure ≥30 mm Hg, severe side effects, and patient demand. Similarly, there are important recommendations to ensure the overall accuracy of the technique, such as the need for a gradual
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Decrease of oral beta-blockers several days before DSMR and a complete withdrawal at least 48 h before. Importantly, the target heart rate (or at least 85% of the target rate) must be reached to provide a reliable diagnosis, and atropine should be added when needed in the absence of contraindications.

The design of the study by Kelle et al. (8) is retrospective, and treatment strategy was based on the sole decision of the physicians, without the need to comply with a clearly defined protocol that included DSMR data. As a result, 352 patients had to be excluded from the main outcome analysis due to early revascularization procedures after DSMR. This is a clear limitation of the study, not only because this may impact the outcome data, but also because the exclusion of those patients with more extensive ischemia (number of segments with inducible WMA on DSMR, 3.3 ± 2.7 vs. 1.8 ± 2.6 in medically treated patients) may represent a bias towards the selection of lower-risk patients, as suggested by the relatively low rate of cardiac events at 44 months in the overall population (4.5%).

However, one should note that medically treated patients, included in the main outcome analysis, had a relatively high-risk profile, with 52% of patients with known CAD, an average number of 3 risk factors, and regional WMA at rest in 38.5%. At the time of CMR acquisitions (between 2000 and 2004), DSMR was not widely accepted, and the treatment option was not fully driven by the results of CMR. Thus, the secondary analysis of the outcome based on the treatment strategy and including the 352 patients who underwent early revascularization does not reflect an outcome that was clearly driven by CMR data. Since the overall number of cardiac events is relatively small, it is conceivable that the data in the 94 missing patients might have impacted the main results. Those patients lost to follow-up had similar baseline characteristics, but were slightly younger (57 ± 12 vs. 61 ± 10 years, p < 0.001) and had a lower rate of inducible WMA (17% vs. 40.7%; p < 0.001). The distinction was made throughout the paper between DSMR with inducible WMA as opposed to “normal” DSMR. It would be more appropriate to distinguish between DSMR with and without inducible WMA, since a DSMR showing WMA at rest without inducible WMA cannot be defined as a normal test. The presence of late gadolinium enhancement (LGE) in patients with known or suspected CAD is a strong and independent predictor of adverse cardiac prognosis (11). The lack of LGE imaging appears as a clear limitation of the study, but the prognostic information provided by LGE was not known at the time of the current study.

It seems clear that further studies combining DSMR, perfusion imaging, and LGE may offer additional prognostic information in those subjects with suspected ischemia. This kind of comprehensive protocol will have to be compatible with a single CMR examination, which could soon be possible with the continuous and impressive acceleration of CMR acquisitions. The possible additional value of DSMR tagging or strain-encoded sequences over cine MR, using visual qualitative analysis or fast-automated quantification algorithms, is unknown and will have to be tested in large-scale studies.

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