

Cardiac magnetic resonance: a safe procedure?

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Cardiac magnetic resonance (CMR) imaging is increasingly used in daily clinical practice. However, its safety and impact on patient management have not been studied in large populations. In a recent online issue of the *Journal of the American Cardiology (JACC, August 2009)* the EuroCMR (European Cardiovascular Magnetic Resonance) registry evaluated indications, image quality, safety, and impact on patient management of routine CMR imaging in 11,040 patients from 20 European centres (including the VU Medical Centre, Amsterdam, van Rossum). All patients were enrolled between April 2007 and January 2009 and the cohort was divided into patients who underwent CMR stress testing (n=3475), and patients who did not undergo stress CMR (n=7565). The major three clinical indications were myocarditis/cardiomyopathies (32%), suspected coronary artery disease (CAD)/ischaemia in known CAD (31%), and myocardial viability (15%). CMR offered a high diagnostic imaging quality in 98% of patients. In 99% of all CMR procedures (n=10,896) no complications were observed. Mild complications occurred in 1.1% of patients (n=124), and severe complications in only 0.05% (n=5). In the group with mild complications, most events such as dyspnoea, chest pain and extrasystoles occurred during dobutamine or adenosine infusion (76%), followed by mild allergic reactions after injection of contrast media in 22% of patients (mild urticaria or exanthema). All severe complications were related to CMR stress testing. In the five patients with severe complications, there was non-sustained ventricular tachycardia (n=1) and ventricular fibrillation (n=1) during dobutamine infusion, as well as overt heart failure (n=2) and unstable angina (n=1) related to adenosine stress. As a result, resting CMR may be as safe as resting echocardiography, despite the fact that more than 88% of CMR studies involved the administration of contrast media. Importantly, the procedural safety of CMR was not dependent on the race, gender, or age of patients. In 62% of patients, there was direct impact of CMR on the clinical management by providing an unsuspected new diagnosis (16.4%) resulting in therapeutic consequences. The majority of patients (86%) did not require further imaging tests after CMR imaging. These findings document the safety of CMR and its huge potential for routine use in clinical practice.

Interestingly, the registry did not address (or mention) the safety of CMR in patients with pacemakers or automatic internal cardioverter defibrillators (ICDs), an increasing population these days. The presence of these devices has been historically considered an absolute contraindication to CMR imaging. Recent studies from Pennells' group in London (*J Cardiovasc Magn Res, 2007*) have shown that, given appropriate precautions, non-cardiac and cardiac MR can potentially be safely performed in patients with selected implantable pacemaker and defibrillator systems. Both for 0.5 and 1.5 Tesla systems, CMR studies in non-pacemaker-dependent patents proved to be safe in closely supervised circumstances where the benefit-risk assessment is considered positive. Nazarian et al. (*Circulation, September 2006*) evaluated 55 patients who underwent 68 CMR studies, of whom 31 had a pacemaker and 24 had an ICD. Pacing mode was changed to 'asynchronous' for pacemaker-dependent patients and to 'demand' for others. Magnet response and tachyarrhythmia functions were disabled. Blood pressure, ECG, oximetry, and symptoms were monitored. No episodes of inappropriate inhibition or activation of pacing were observed. Recent data by Roquin et al. (*Europace, March 2008*) underscored that in both *in vitro* and *in vivo* experiments certain pacemaker and ICD systems may indeed be CMR safe. Therefore, the risks presented by CMR imaging under specific, characterised scanning and monitoring conditions may be acceptable given the diagnostic benefit of this powerful imaging modality.

To conclude, CMR imaging is a very safe procedure, in particular under resting conditions. In patients with pacemakers and ICDs, there are no longer any absolute contraindications to standard CMR imaging. In well-defined patients, the diagnostic benefit from MR imaging may outweigh the presumed risks, but it has to be emphasised that this should always be reviewed on a case-by-case basis. These new CMR data may have major clinical implications on current imaging practice. ■

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