

Editorial

The Integral Nature of Cardiac Magnetic Resonance Imaging in the Work-up for Ischemic Heart Disease



Sobre el carácter integral de la cardiorresonancia magnética en el proceso diagnóstico de la cardiopatía isquémica

Guillem Pons Lladó

Unidad de Imagen Cardíaca, Servicio de Cardiología, Hospital de Sant Pau, Universitat Autònoma de Barcelona, Barcelona, Spain

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Cardiac magnetic resonance (CMR) imaging has formed part of clinical practice for 3 decades now¹ and the first experience with this technique in Spain dates from more than 20 years ago.² This imaging modality differs from others in that it can be used in a wide variety of ways and situations by using different types of sequences, all of which can be useful in the work-up of cardiac patients. Patients with ischemic heart disease are no exception; in the early 2000s, appropriate sequences were developed to visualize the presence of contrast abnormally retained by myocardial scar tissue.³ The technique soon became the gold standard for diagnosis of myocardial necrosis and measurement of lesion extension.

In what is probably the most significant article in the history of CMR, with more than 1000 citations, Kim and Wu⁴ discussed the precision with the transmural distribution of myocardial scarring could be determined and the implications of transmural for the potential viability of the lesioned myocardial segments. The possibility, unheard of at the time in live patients, of accurately quantifying the extent of infarcted myocardial tissue led in turn to studies that demonstrated the prognostic value of this parameter, which was greater than that of other prognostic factors available at the time.⁵ This has all contributed to the widespread popularity of CMR for measuring cardiac function and viability. In this mode, CMR can generate precise and reproducible information on ventricular volume and function, as well as information on the presence of infarction and potential myocardial viability. Simple indices derived from such measurements are also useful in the prognostic stratification of patients after acute infarction.⁶

Despite the importance of this information, appropriate clinical documentation of patients with suspected or confirmed coronary artery disease requires a demonstration of myocardial ischemia. Cardiac magnetic resonance also offers an alternative to recording sequences of first-pass kinetics of contrast agent under the action of a pharmacological stress agent. The technique has been available for many years⁷ and was validated in Spain 10 years

ago.⁸ More recently, a study has confirmed that this alternative is of prognostic value for the development of myocardial ischemia.⁹ In contrast, measurement of myocardial perfusion by CMR is not as well established as studies of function and viability. Valid reasons, which will not be discussed here, may well explain this difference, which is nevertheless surprising, given that we are ignoring a resource able to offer integral information on any patient with ischemic heart disease.

The article by Husser et al,¹⁰ published in *Revista Española de Cardiología*, addressed the prognostic value of ischemia detection by CMR. The study population was broad, as it included patients with left ventricular dysfunction, and was also heterogeneous in terms of underlying disease, as patients with ischemic and nonischemic heart disease could be included; indeed, those with nonischemic heart disease accounted for approximately 30% of the sample. The authors concluded that the strongest predictor of major events was the presence of inducible myocardial ischemia, including acute myocardial infarction and cardiac death, whether due to infarction, heart failure, or fatal arrhythmia. Interestingly, in contrast to previous studies, the presence of myocardial scarring in delayed enhancement CRM was not a significant prognostic factor.^{5,11} As the authors explain in the discussion, this result was probably influenced by the sample studied. Patients with nonischemic heart disease would be expected to have events related to ventricular dysfunction itself, thereby diluting the effect of myocardial scarring, which may be an epiphenomenon in these patients. A separate analysis of these 2 populations would have shed some light on the issue. What does not seem appropriate is the authors' affirmation that the presence of delayed contrast (in the absence of a perfusion defect) is an indicator of good prognosis when 7% of such patients experienced major events after 18 months of follow-up.

The methodology used for myocardial perfusion studies is worthy, in my opinion, of some comments. If the operators have the option to leave the perfusion study at rest until the end of the procedure, the specificity of this stress study for detecting true perfusion defects decreases. Rest perfusion images are always helpful, as indicated in the protocols recommended by the corresponding societies.¹² In turn, recording images at each heart beat is recommended, even though anatomical coverage is reduced because the sensitivity of the technique decreases with images

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Servicio de Cardiología, Hospital de Sant Pau, Sant Antoni Maria Claret 167, 08025 Barcelona, Spain.

E-mail address: gpons@santpau.cat

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taken every second beat.¹³ Finally, obtaining delayed contrast images after a total gadolinium dose of 0.1 mmol/kg is slightly less sensitive for the detection of myocardial necrosis than when the agent is administered at the usual recommended dose of 0.2 mmol/kg.¹⁴ Although these deficiencies probably do not invalidate the results of the study, given the proven experience of the authors in CMR, appropriate standardization of the technique is important, particularly when there are several groups in Spain that are just starting to use it.

The message of this study is, in my opinion, that it confirms the relevance of demonstrating inducible ischemia for patient prognosis, in this case, with ventricular dysfunction. The study also highlights the importance of having all the information provided by CMR available in the work-up of patients with ischemic heart disease. If this information is not used, the diagnostic process is negatively affected, leading in turn to additional tests and increased costs.

CMR is not omnipotent, and the study of coronary artery anatomy has not been shown to be practicable, although fortunately other noninvasive techniques are available to collect this information. Thus, although the announcement of CMR as a one-stop shop has proved premature, in the case of ischemic heart disease—with the exception of coronary artery anatomy—the technique provides all the information required by cardiologists to address the 3 concerns in the management of any patient: accurate diagnosis of the anatomic and functional consequences of the disease, prognosis, and therapeutic decisions.¹⁵

The elements traditionally cited as weaknesses of CMR, such as its complexity, high cost, and limited availability, are all relative if its integral nature and high resolution are considered, which usually render further tests superfluous. Thus, well-grounded clinical decisions can be made on the basis of the results of CMR. The full introduction of CMR into clinical practice requires a favorable climate of opinion, which is the responsibility of cardiologists and radiologists. Obviously, such opinion should be based on solid clinical evidence, and the article discussed here is undoubtedly of relevance in this respect and should therefore be welcomed.

CONFLICTS OF INTEREST

None declared.

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