EDITORIAL

Cardiac Magnetic Resonance After an Acute Myocardial Infarction: a Rising Technique
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In Spain, the well-established practice of introducing interventionist techniques in acute myocardial infarction (AMI) has promoted interest in determining the status of myocardial segments in which successful angioplasty should prevent irreversible necrosis as this informs prognosis. Simple, though indirect and somewhat crude signs exist that indicate post-primary angioplasty prospects for AMI-affected myocardium: for example, the persistence or not of ST-segment elevation in the electrocardiogram.2 However, given the profusion of imaging techniques available, we should logically try to determine the contribution each of these can make to a more precise study of the situation. The role played by radioactive isotope studies 3 is well known but more recent techniques, such as contrast echocardiography (ECO) or cardiac magnetic resonance imaging (MRI), are still being evaluated and it is these we focus on in the present text.

The physiopathologic processes involved in early AMI revascularization, whether by pharmacologic therapy or angioplasty, can be considered on various levels. Firstly, we have restoration of repermeabilization patency to a previously occluded epicardial coronary artery, easily identified after angioplasty and judged successful in terms of TIMI flow grade. Secondly, we have restoration of regional myocardial flow, also evaluated by angiographic techniques such as contrast echocardiography (ECO) or cardiac magnetic resonance imaging (MRI), are still being evaluated and it is these we focus on in the present text.

The abrupt reopening of an occluded artery to the functional recovery of the myocardial segment it irrigates, this series of processes is what we would hope might happen in every patient. In practice, though, developments are not always so linear. In effect, the fact that apparently successful primary angioplasty is occasionally not followed by adequate myocardial reperfusion has been observed in all series and is caused by regional microvascular dysfunction.9 Achieving apparently adequate reperfusion does not guarantee long-term recovery of myocardial function.5,6 The final outcome of the process is conditioned by many factors. Some of these appear easy to understand: for example, time elapsed after opening the vessel or presence of collateral circulation; others, such as the very concepts of hibernation and myocardial stunning,10 have yet to be fully understood.

In short, although early revascularization in patients with AMI unquestionably entails clinical benefits, in each patient our knowledge of the status of the myocardium involved and its future remains a cause of concern for the cardiologist. Similarly, we have yet to determine the role that may finally be played by two promising new imaging techniques: contrast ECO and contrast MRI.

The current issue of REVISTA ESPAÑOLA DE CARDIOLOGÍA presents 2 insights into the subject, both of which make valuable contributions by virtue of excellent research design. Peteiro et al11 focus on the study of myocardial perfusion ECO following successful primary angioplasty. They report that normal perfusion occurs in only just over half of the segments involved although, in turn, long-term functional recovery is only found in just over half of them. On the other
hand, most (two thirds) segments with perfusion de-
fects in ECO images do not achieve functional reco-
very. At the same time, these authors also performed
first pass gadolinium perfusion MRI followed by de-
layed myocardial enhancement (DME). This technique
is very reliable in detecting irreversible myocardial
ersis with results similar to those of ECO in MRI
fusion studies and a better correlation with func-
tional recovery. We have to remember that following
successful primary angioplasty only one third of myo-
cardial segments finally recover functionality. That is,
as we have commented earlier. Peteiro et al confirm
that maintaining an artery open following angioplasty
does not guarantee recovery of myocardial function,
and that post-angioplasty myocardial perfusion con-
trast ECO and first pass MRI perfusion studies, are
only moderate predictors of recovery, although their
predictive value improves if DME by MRI is used.

López Lereu et al analyze various options offered
by MRI in the study of perfusion and myocardial via-
bility in a group of patients similar to those in Peteiro
et al’s series. Impeccable research methods place
López Lereu et al on a par with current clinical re-
search in MRI. As in the previous study, results for
this series highlight the fact that functional recovery of
myocardial segments occurs in only one third of pa-
tients. The authors endorse gadolinium DME as an
outstanding predictor of long-term functional reco-
very, with positive and negative predictive values ap-
proaching 90%. Curiously, first pass gadolinium myo-
cardial perfusion shows conserved perfusion in almost
half of the patients, as does contrast ECO. However,
its predictive value here is only moderate.

One interpretation of these interesting results would
lead us to consider that analysis of myocardial perfu-
sion after reperused AMI with restored patency is of
limited value in the prognosis of recovery of myocar-
dial function. At least, this is the case of studies such
as these, in which perfusion is evaluated by contrast
ECO or resting first pass MRI, and qualitative assess-
ment of perfusion is visual only. Myocardial perfusion
constitutes a substantial challenge for intravenous con-
trast agent imaging techniques because of the reduced
volume of coronary flow and still limited spatial reso-
lution it entails. This is evident when these limitations
are countered by using techniques such as immediate
post-primary angioplasty intracoronary injection of
ECO contrast agents. Using this method, Bodí et al report good correlation between perfusion and global
long-term left ventricular systolic function. In truth,
we probably need to introduce MRI protocols that are
more complex than the analysis of baseline first pass
studies. These could take the form of post-pharmacolo-
logic stimulation studies, which have been shown to
increase the diagnostic value in detecting perfusion de-
fects secondary to obstructive coronary artery le-
sions. Or, we could await the definitive introduction

of the semiquantitative methods of MRI perfusion
analysis that have yet to be standardized but which
have given good results in this field. It is not a ques-
tion of undervaluing the knowledge of regional myo-
cardial perfusion as an indicator of the state of micro-
circulation after primary angioplasty but of improving
analytical method for ECO and MRI.

However, it is fortunate that MRI offers an alterna-
tive that has proven more valid in the prognosis of
myocardial segment functionality following revascular-
ization by primary angioplasty. The high reliability
of gadolinium DME to detect areas of irreversible myo-
cardial necrosis and delimit the scale of transmural
extension has, when combined with the study of ven-
tricular segment function in the same MRI sessions,
become standard practice in determining myocardial
viability, and identifying as potentially recoverable
hibernating or stunned myocardium, those segments
with contractile dysfunction, without DME, or limited
in extension to the subendocardium. Findings of the
two studies presented here confirm the value of this
technique, recognizing its high diagnostic value in de-
termining recovery of myocardial function.

The other great advantage of DME by MRI is its
relative simplicity and innocuousness. It requires up-
to-date magnetic resonance equipment—widely used
today—and technical care and precision in performing
the study. Despite this, DME by MRI has become an
essential part of basic protocols for any MRI study in
patients with ischemic heart disease.

Consequently, it is no great surprise that this tech-
nique should be favored by scientific society study
groups in their most recent recommendations. Nor is
it out of place to affirm that in the near future obtain-
ing a study of function, extension of necrosis and via-
bility may well become standard practice in attending
all AMI survivors, with or without primary revascu-
larization, given that it provides valuable information
for a full evaluation of each patient, with highly reliable
implications for prognosis, therapy and with reference
to follow-up. It is satisfying to be able to affirm that
the articles presented here make a decisive contribu-
tion to the process of incorporating this technique into
the arsenal of diagnostic imaging resources in cardi-
ology.

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