

COMMENTARY

Reinjection of thallium for detection of viable myocardium: why not do it immediately?

Patients with undiagnosed chest pain referred for myocardial thallium-201 stress perfusion scintigraphy can largely be divided into two groups—those with suspected coronary artery disease and those with known coronary artery disease. Those with known coronary artery disease can be subdivided into those with coronary artery disease identified by coronary arteriography and those with documented myocardial infarction. For each of the three subgroups there is a different clinical question. In patients with suspected coronary artery disease the major question is the absence or presence of myocardial ischaemia. In patients without prior myocardial infarction but with angiographically confirmed coronary artery disease, the predominant question is—apart from whether or not ischaemia is present—the site of myocardial ischaemia. In patients with myocardial infarction, the distinction between reversible ischaemia and scar tissue is important. The isolated question of myocardial viability is only relevant when residual viability is suspected in severe dysfunctional myocardial regions—that is, where there is stunning or hibernation. Revascularisation procedures are warranted only if viability is demonstrated.

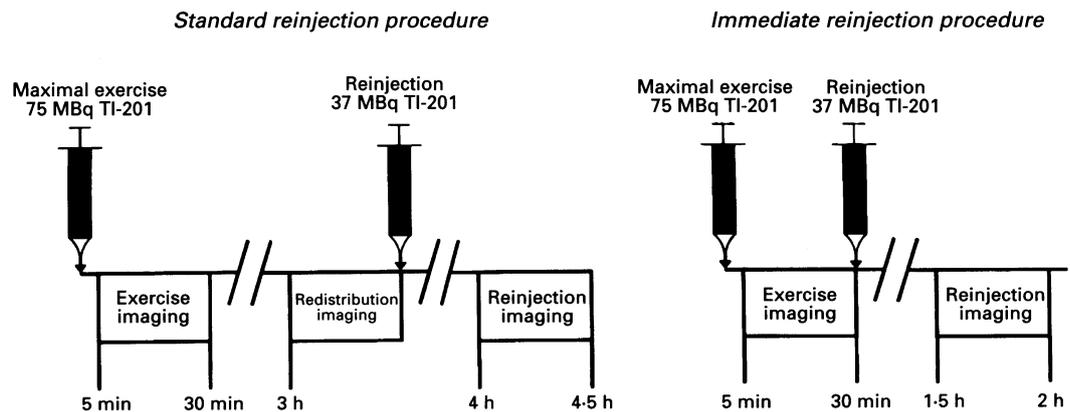
In scintigraphic terms, myocardial viability is determined by the absolute amount of tracer uptake in the dysfunctional region or by defect reversibility after stress.¹ The additional information on ischaemia is clinically useful and therefore stress protocols should be used if possible.² Reinjection of thallium-201 after conventional stress 3–4 h redistribution imaging has become a standard procedure in many hospitals (figure). With this approach myocardial viability is detected in about 50% of segments showing persistent defects at redistribution imaging and these results resemble those of positron emission tomography.^{3–8} Because scintigraphy is cheaper⁹ various protocols using thallium-201 should be tested before proceeding to more complicated and or sophisticated procedures such as positron emission tomography.^{10–12} In a study from our department using the standard approach to thallium-201 reinjection, reinjection of thal-

lium after 3–4 hours' redistribution showed defect reversibility (and thus viability) in 46% of segments initially classified as persistent (scar tissue).¹³ The requirement for an additional set of images after redistribution is a major drawback of the standard protocol. It prolongs the imaging time by about an hour. In a subsequent study from our institution, immediate reinjection of thallium-201 after acquisition of the stress images followed by imaging 60 minutes later yielded promising results in the detection of myocardial viability,¹⁴ and reduced the total investigation time to a maximum of 2.5 hours (figure). We compared our results in these two studies.^{13,14} The standard reinjection approach showed total defect reversibility in a similar proportion of segments as the immediate reinjection approach (70% v 69%), and moreover, myocardial viability was observed in a similar percentage of patients (88% v 91%, respectively).

Two recent studies on immediate reinjection imaging support our findings.^{15,16} Wackers *et al* compared the results of the standard approach and the immediate reinjection approach in the same group of 45 patients: agreement for defect reversibility was excellent (36% v 34%, respectively). Galli and Marcassa showed that immediate thallium-201 reinjection was a good method for assessing myocardial viability in 120 patients with left ventricular dysfunction.

Underwood and Pennell have commented on the practical implications of the standard reinjection approach—the uncertainty about whether an additional dose of thallium is needed and the extra imaging time required. Is reinjection necessary when 3–4 hour redistribution imaging might answer some of the clinical questions? Their comments certainly apply to the standard reinjection approach. None the less, withholding thallium reinjection in patients who have reversible defects at 3–4 hour redistribution imaging requires an accurate on-line analysis (visual and quantitative) immediately after acquisition of the redistribution images, and when the defect persists the patient will need a subsequent injec-

Protocols for thallium-201 stress/redistribution/reinjection and for thallium-201 stress/immediate reinjection.



tion and extension of the imaging procedure, which may interfere with a busy clinical schedule. Though it is true that if the patient only shows reversible defects at redistribution it may save the second injection of thallium, the remaining allocated camera time will probably be unused. This is not cost-effective. Even if the redistribution images without reinjection provide sufficient information, the total imaging procedure still takes at least 4 hours. Immediate reinjection avoids the uncertainty about an additional dose (because all patients are reinjected) and considerably reduces total imaging time (2.5 hours). Underwood and Pennell also referred to the problem of the unnecessary high radiation burden. However, the issue of a relatively high radiation dose is inherent in the choice of thallium as the radionuclide. If reduction of radiation dose is the goal, the use of technetium-labelled imaging agents should be considered, especially in patients in whom the detection of coronary artery disease itself is the primary clinical issue rather than the assessment of viability in dysfunctional myocardial regions.

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