

## Early Myocardial Perfusion Gated-SPECT in Patients With Chest Pain and Non-Diagnostic ECG in the Emergency Department

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**Objective.** To analyze the value of early rest myocardial perfusion gated-SPECT in patients with chest pain and non-diagnostic ECG in the emergency department.

**Patients and method.** Two hundred and twenty two patients (mean age 61 [13] years, 49% women) with atypical chest pain and non-diagnostic ECG were randomized into 2 groups. Group A patients (n=111) underwent early rest myocardial perfusion gated-SPECT <6 h after the cessation of chest pain. Their CK-MB and troponin I levels were also determined at 0, 4, and 8 h. Group B patients (n=111) underwent conventional management in the emergency department without gated-SPECT.

**Results.** The early rest myocardial perfusion gated-SPECT results were positive for all 8 patients with increased CK-MB and troponin I levels. For the diagnosis of acute myocardial infarction, this corresponded to a sensitivity and a negative predictive power of 100%. When doubtful results were considered as negative, specificity was 84% and the positive predictive power 33%. Fewer Group A patients were admitted and their time in the emergency department was shorter (18.4% compared to 32.7% for group B patients,  $P < .027$ ; 13 [6] h compared to 15.9 [8.6] h for group B patients,  $P < .009$ ).

**Conclusions.** In patients with atypical chest pain and non-diagnostic ECG in the emergency department, early rest myocardial perfusion gated-SPECT was highly sensitive and showed good negative predictive power in the diagnosis of acute myocardial infarction; its positive predictive value, however, was low. This technique may reduce the number of patients hospitalized as well as their length of stay in the emergency department.

**Key words:** *Scintigraphy. Myocardial infarction. Coronary disease. Radioisotopes. Imaging. Nuclear medicine.*

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### Gated-SPECT precoz de perfusión miocárdica en los pacientes con dolor torácico y electrocardiograma no diagnóstico en urgencias

**Objetivo.** Analizar la utilidad de la *gated*-SPECT precoz de perfusión miocárdica de reposo en los pacientes con dolor torácico y electrocardiograma no diagnóstico en urgencias.

**Pacientes y método.** Se estudió a 222 pacientes (el 49% de mujeres, edad de  $61 \pm 13$  años) con dolor torácico y electrocardiograma no diagnóstico que fueron distribuidos aleatoriamente en 2 grupos: grupo A, con 111 pacientes a los que se practicó una *gated*-SPECT antes de las 6 h de la finalización del dolor además del manejo estándar (determinaciones de la fracción MB de la creatinina-masa y troponina I a las 0, 4 y 8 h), y grupo B, con 111 pacientes que sólo recibieron el manejo estándar en urgencias.

**Resultados.** En los 8 pacientes del grupo A con criterios bioquímicos de infarto agudo de miocardio, la SPECT precoz de reposo fue positiva: sensibilidad y valor predictivo negativo del 100%. La especificidad fue del 84% y el valor predictivo positivo del 33% cuando los resultados dudosos fueron considerados como negativos. El número de pacientes ingresados (el 18,4 frente al 32,7%;  $p < 0,027$ ) y el tiempo de estancia en urgencias ( $13 \pm 6$  frente a  $15,9 \pm 8,6$  h;  $p < 0,009$ ) fueron significativamente inferiores en el grupo A.

**Conclusiones.** En los pacientes con dolor torácico y electrocardiograma no diagnóstico en urgencias, la sensibilidad y el valor predictivo negativo de la SPECT precoz de reposo son muy elevados para el diagnóstico de infarto agudo de miocardio, pero el valor predictivo positivo es bajo. La práctica de esta exploración permite reducir el número de pacientes ingresados y el tiempo de estancia en urgencias.

**Palabras clave:** *Gammagrafía. Infarto de miocardio. Enfermedad coronaria. Isótopos radiactivos. Imagen. Medicina nuclear.*

## ABBREVIATIONS

CK-MB: creatine kinase MB fraction.  
 AMI: acute myocardial infarction.  
 ROC: receiver operating characteristic curves.  
 SPECT: single photon emission computed tomography.

## INTRODUCTION

With the incorporation of technetium compounds and synchronization with the electrocardiogram (ECG), myocardial perfusion “gated single photon emission computed tomography” (gated-SPECT) now allows simultaneous assessment of the perfusion and function of the left ventricle. Recently, some centers have begun to use it in patients with chest pain and non-diagnostic ECG.<sup>1,2</sup> Given the pharmacokinetic and physical characteristics of technetium agents, images can be obtained that reflect the myocardial perfusion at the time of injection at any moment during the following 6 hours. The majority of studies that have investigated the use of early rest myocardial perfusion gated-SPECT in this context report it to have a sensitivity and a negative predictive power of close to 100% for the diagnosis of acute myocardial infarction (AMI), especially if the radioisotope is injected when pain is being experienced or at some time in the 6 hours after it has ceased.<sup>3-10</sup> The specificity of this technique is lower (around 75%), but in the majority of papers the significance of positive patterns in the absence of AMI is not clear.

This study examines the value of early rest myocardial perfusion gated-SPECT in patients with atypical chest pain and non-diagnostic ECG in terms of its efficacy in helping to diagnose AMI and its influence on patient management in the emergency department.

## PATIENTS AND METHODS

### Study Population and Protocol

The study subjects were 222 patients (mean age, 61±13 years, 49% women) who presented at the emergency department with chest pain that did not meet the criteria for typical angina (according to a previously established questionnaire),<sup>11</sup> and with a non-diagnostic ECG (no ST segment elevation or depression of ≥0.5 mm). Consecutive patients who met the above criteria (2 per day during the scintigraphic detection hours of the Nuclear Medicine Department) were randomly assigned to either: Group A – 111 patients who underwent early rest myocardial perfusion gated-SPECT

with <sup>99m</sup>Tc methoxy-isobutyl-isonitril [MIBI], the tracer being injected either while the patient was experiencing pain or <6 h after its cessation, plus standard emergency room management [ECG plus serial determinations of biochemical markers of myocardial damage at 0, 4, and 8 h after presentation]; or Group B – 111 patients who received standard emergency room management but who did not undergo early rest myocardial perfusion gated-SPECT. The attending physician had knowledge of the gated-SPECT results. Ninety six patients with negative biochemical markers agreed to undergo symptom-limited stress SPECT before 48 h had elapsed since undergoing early rest myocardial perfusion gated-SPECT (patients released were tested as outpatients).

This prospective study received the approval of our hospital’s ethics committee. All patients gave their informed consent to be included.

### Biochemical Markers of Myocardial Damage

The MB fraction of creatine kinase (CK-MB) and troponin I levels were determined 3 times on arrival at the emergency room and again at 4 and 8 h. A diagnosis of AMI was made when values were greater than 5 and 0.5 µg/L respectively.

### Early Rest Myocardial Perfusion Gated-SPECT

All Group A patients received an intravenous injection of 900 MBq (around 25 mCi) of <sup>99m</sup>Tc-MIBI either during the time they were experiencing pain or at some point during the 6 hours after it had ceased. Detection was performed between 1 and 3 h later when patients were suffering no pain and were clinically stable.

Tomographic images were taken using a Siemens ECAM 90° double headed gamma camera, equipped with high resolution collimators. A semi-circular orbit of 180° was made, beginning at the 45° right anterior oblique position. Images were taken at intervals of 3° (25 s per interval). The process was synchronized with the R wave of the ECG. All images were reconstructed using a 5th order Butterworth filter. The cut-off frequency was 0.5 (0.45 for gated-SPECT images). Short axis, long horizontal axis and long vertical axis images were obtained, according to current recommendations.<sup>12</sup>

Thirteen segments were evaluated per patient: anterobasal, anteromedial, anteroapical, basoseptal, medio-septal, apicoseptal, inferobasal, inferomedial, inferoapical, laterobasal, lateromedial, lateroapical, and apical. Each segment was assessed by 3 experts who did not know the patients’ biochemical marker values. A value of 1 was given for normal results, 2 for mild defects, 3 for moderate defects and 4 for severe defects (or similar to background) when seen in two projections.

In myocardial perfusion gated-SPECT examinations, the ventricular volumes and the left ventricular ejection fraction were assessed according to Germano et al.<sup>13</sup> In each of the left ventricular segments, contractility and thickening were evaluated according to the following scale: 1 = normal, 2 = mild alteration, 3 = moderate alteration, and 4 = severe alteration. For both SPECT and gated-SPECT, scores of 1 were considered negative, 2 as doubtful, and 3 and 4 as positive.

### Stress Test

Ninety six patients from Group A with negative myocardial damage markers agreed to undergo stress-rest myocardial perfusion SPECT between 24 and 48 h after undergoing early rest myocardial perfusion gated-SPECT. A symptom-limited stress test was performed on a treadmill (using the Bruce protocol) until the appearance of angina, dyspnea, muscular exhaustion, or until there was a depression of more than 2 mm in the ST segment compared to baseline at 0.08 s from the J point. At the time of this test, 6 patients were undergoing treatment with beta-blockers and 2 with calcium antagonists. Six patients were administered dipyridamole (0.16 µg/kg/min over 4 min) during stress since the level of exercise reached was insufficient (maximum cardiac frequency <80%, 5 MET not reached in absence of symptoms and with positive ST segment).<sup>14,15</sup>

### Stress-Rest SPECT

This was performed using a 2 day protocol. On the first day, between 30 s and 60 s after the end of the stress test, 900 MBq (25 mCi) of <sup>99m</sup>Tc-MIBI were injected intravenously and tomography performed approximately 1 h later. The acquisition and processing procedures followed were identical to those used in the post-pain resting study. On the second day, a rest study was performed. Again, 900 MBq (25 mCi) of <sup>99m</sup>Tc-MIBI were intravenously injected, and the same detection, acquisition and processing procedures performed 1 h later. Mild, moderate or severe defects that corrected themselves with rest were considered positive results.

### Statistics

Receiver operating characteristic curves (ROC) were used to identify the criteria for scoring the early rest myocardial perfusion gated-SPECT results that would allow the best compromise between sensitivity and specificity in the diagnosis of AMI. Sensitivity was calculated as the percentage of patients with abnormal test results who had suffered an AMI (true positives/true positives plus false negatives). Specificity

was calculated as the percentage of patients with normal test results who had not suffered an AMI (true negatives/true negatives plus false positives). Positive predictive power was determined as the percentage of patients with abnormal results who had suffered an AMI (true positives/true positives plus false positives). Negative predictive power was determined as the percentage of patients with normal results who had not suffered an AMI (true negatives/true negatives plus false negatives). The 95% confidence interval ( $\alpha=0.05$ ) for these values were calculated. Increased CK-MB and troponin levels were taken as a reference for the diagnosis of AMI (according to the values mentioned above). The Kappa index was calculated to evaluate the degree of agreement between the 3 observers who assessed the early rest myocardial perfusion gated-SPECT results (0-0.20= very low agreement, 0.21-0.40= low agreement, 0.41-0.60= moderate agreement, 0.61-0.80= good agreement, and 0.81-1.00= very good agreement).<sup>16</sup> The chi-square test was used to determine the differences between the categorical variables of Group A and B patients. The Student *t* test was used for continuous variables. Significance was set at  $P=.05$ .

### RESULTS

No significant differences were seen in either the clinical or electrocardiographic variables of Group A and B patients (Table 1). Eight Group A patients and 6 Group B patients met the criteria for AMI according to biochemical markers.

### Early Rest Myocardial Perfusion Gated-SPECT

Twenty four Group A patients had positive early rest myocardial perfusion gated-SPECT results (score, 3-4; 17 inferolateral, 7 anterior; Figure 1), 57 had negative results (score, 1), and 30 had doubtful results (score, 2). The Kappa agreement index for the three observers who assessed these results was good (0.632). Forty eight patients (43%) received the radiotracer while they were suffering pain, and a positive result was obtained for 11 (23%) of them. This was not significantly different to the result obtained for those patients who received the radiotracer after their pain had subsided (13/63=21%). Eleven of the 48 patients (23%) injected during the pain period, and 19 (30%) of the 63 who received it afterwards, gave doubtful results. The sites associated with these doubtful results were inferolateral (16 patients [12 men]) and anterior (14 [9 women]).

The left ventricular ejection fraction (66.1±9.7%), end-diastolic volume (71±25.6 ml) and end-systolic volume (25.7±14.2 ml) were calculated by gated-SPECT and were normal for all patients. Early gated-SPECT (to test for contractility and thickening) only

**TABLE 1. Clinical Characteristics of Patients in Groups A and B\***

	Group A (n=111)	Group B (n=111)	P
Age, years	60.4±2.4	62.1±13.5	.324
Women	51 (46%)	58 (52%)	.347
Diabetes	19 (17%)	18 (16%)	.857
Hypertension	55 (49.5%)	61 (55%)	.420
Smokers	52 (47%)	41 (37%)	.274
Hypercholesterolemia	40 (36%)	30 (27%)	.113
Risk factors			
0	14 (12.6%)	16 (14.4%)	.695
1	42 (37.8%)	47 (42.3%)	.494
2	41 (36.9%)	40 (36%)	.889
3	14 (12.6%)	8 (7.2%)	.252
HR at admission, beats/min	78±15	78±18	.774
BP at admission, mm Hg	143±21	137±33	.128
Pain			
Duration, h	6.1±12	7±23	.724
Retrosternal	101 (91%)	102 (92%)	.810
Radiating	76 (68%)	84 (75%)	.231
Enhanced autonomic symptoms	34 (31%)	46 (41%)	.093
Exacerbated with stress	21 (19%)	19 (17%)	.727
Feeling of dyspnea	48 (43%)	36 (32%)	.097
ECG			
Normal	73 (66%)	68 (61%)	.123
Atrial fibrillation	5 (4.5%)	8 (7.2%)	.422
Negative T waves	13 (11.7%)	14 (12.7%)	.837
Flat T waves	2 (1.8%)	2 (1.8%)	1.000
ST segment rectified	9 (8.1%)	13 (11.7%)	.501
Left anterior hemi-block	11 (9.9%)	14 (12.6%)	.678
Right bundle branch block	2 (1.8%)	3 (2.7%)	1

\*HR indicates heart rate; BP, blood pressure; ECG, electrocardiogram.

showed abnormalities (Figure 2) in 13 of the 24 patients (54%) with positive perfusion SPECT results. No patient with negative or doubtful early rest myocardial perfusion SPECT results showed alterations in contractility or thickening in gated-SPECT.

The 8 patients meeting the biochemical criteria for AMI (3 injected with the radiotracer during the pain period) all had positive early rest myocardial perfusion SPECT results (7 inferolateral and 1 anterior). Therefore, the sensitivity and negative predictive power of rest gated-SPECT was close to 100%. The best ROC curves (Figure 3) were obtained when the doubtful results (score 2) were considered to be negative (specificity 84%, positive predictive power 33%). When taken as positive, specificity was only 47% and the positive predictive power only 13% (Table 2).

**Stress-Rest SPECT**

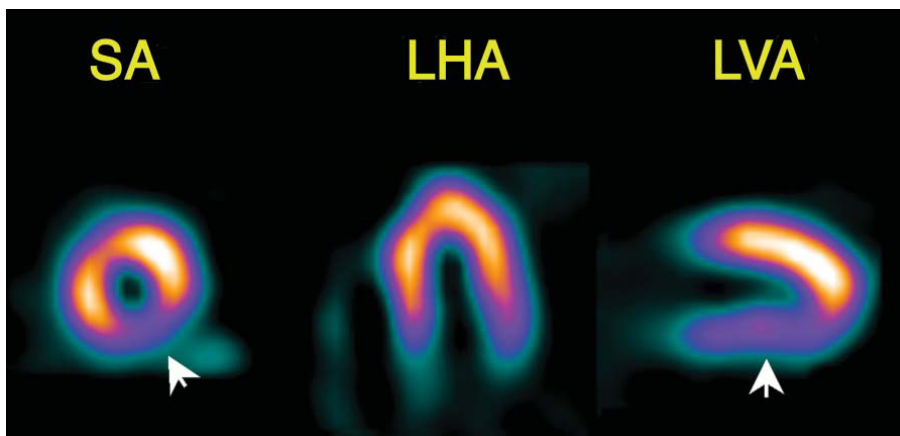
Table 3 shows the stress results for Group A patients with no biochemical indication of acute necrosis. Ten patients had clinically or electrocardiographically positive results. Five patients had angina and a depressed ST segment (≥1 mm) during the test, 4 showed a depressed ST segment only, and 1 had only angina. Of the 10 patients with positive ECG exercise results, 8 showed a positive stress SPECT result (5 inferolateral and 3 anterior) and 2 had negative CT results.

Of the 96 patients who had not suffered an AMI and who underwent stress-rest SPECT, 35 had positive results (sites: 23 inferolateral, 12 anterior). Thirteen

**TABLE 2. Diagnostic Accuracy of Rest Gated-SPECT for Acute Myocardial Infarction When Taking Doubtful Results as Positive or Negative\***

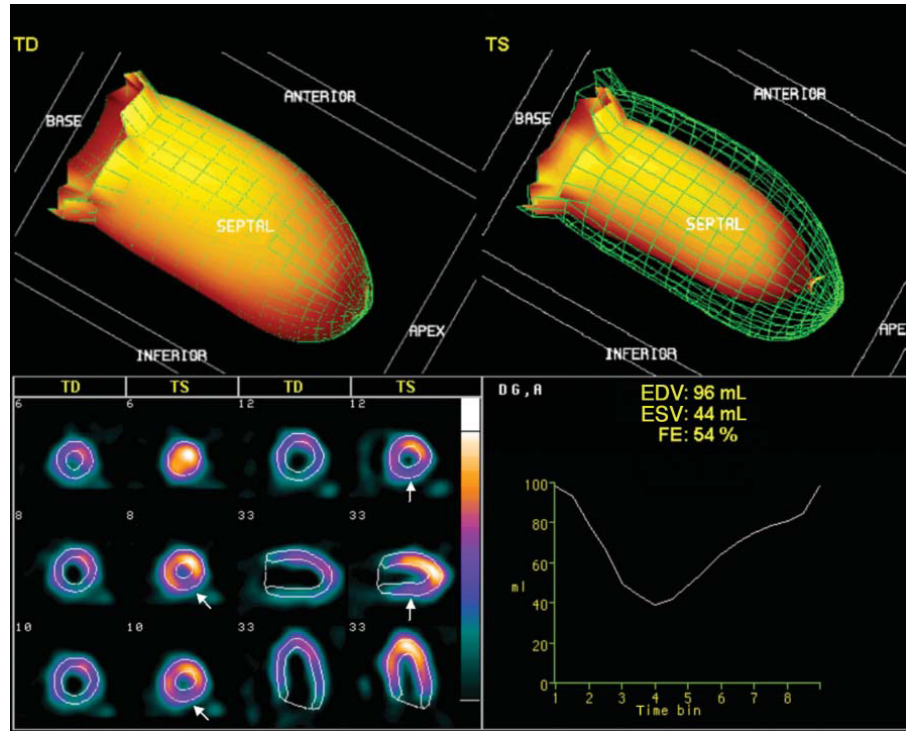
	TP	TN	FP	FN	S	Sp	PPP	NPP
Doubtful (score 2) = negative	8	87	16	0	100% (63-100)	84% (76-91)	33% (16-55)	100% (96-100)
Doubtful (score 2) = positive	8	48	55	0	100% (63-100)	47% (37-57)	13% (6-23)	100% (93-100)

\*Sp indicates specificity; FN, false negatives; FP, false positives; S, sensitivity; TN, true negatives; TP, true positives; NPP, negative predictive power; PPP, positive predictive power. Figures in brackets are 95% CI values.



**Figure 1.** Early rest myocardial perfusion SPECT: results when the radiotracer was administered three hours after cessation of pain in a patient with chest pain, non-diagnostic ECG, and no increase in biochemical markers of myocardial damage. A moderate defect can be seen in the perfusion of the inferolateral region (arrows). SA indicates short axis; LHA, horizontal long axis; LVA, long vertical axis.





**Figure 2.** Gated-SPECT results of the same patient as in Figure 1. The ejection fraction (EF), the end-diastolic volume (EDV), end-systolic volume (ESV) and overall contractility are normal, although a slight reduction in thickening can be seen in the inferolateral region (arrows).

(81%) of the 16 patients with positive early rest gated-SPECT results but who had suffered no AMI had a positive stress-rest SPECT test, compared to 22 (27%) of the 80 patients with negative early rest SPECT results ( $P<.0001$ ). The sites of the reversible defects always coincided (Figure 4).

**TABLE 3. Results of Stress Test for Group A Patients\***

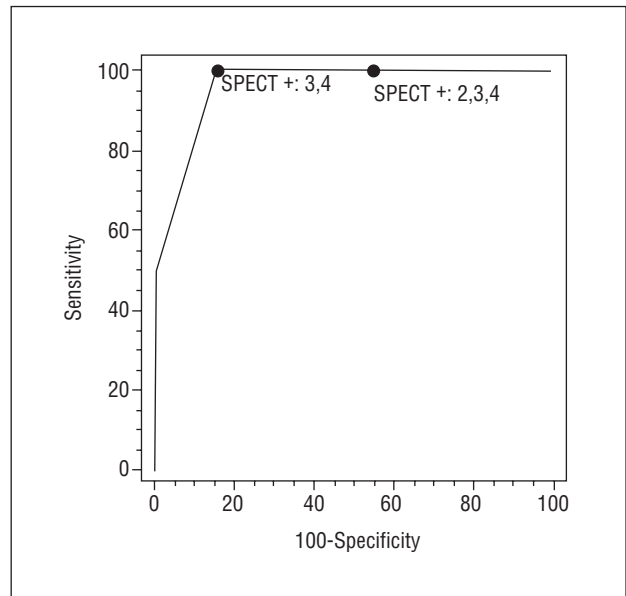
MET	9.3±3.08 (3.3-15)
Maximum HR, beats/min	141.7±23.4 (83-196)
Theoretically maximum HR, %	87.8±12.5 (53-131)
Maximum SBP, mm Hg	185.6±23.1 (90-240)
Depressed ST+angina	5
Depressed ST (≥1 mm) alone	4
Angina alone	1
ST depression of 0.5 mm	5

\*HR indicates heart rate; SBP, systolic blood pressure.

**TABLE 4. Clinical Course of Group A and B Patients Excluding Those Who Suffered Acute Myocardial Infarction (n=208)\***

	Group A (n=103)	Group B (n=105)	P
Hours in emergency department	13±6	16±8.6	.004
Number of patients admitted	14 (13.6%)	29 (27.6%)	.013
Days in hospital	8.57±7	7.3±5.1	.175
Catheterized	6 (5.8%)	8 (7.6%)	.606
PTCA-stent	1 (1%)	4 (3.8%)	.174
Coronary surgery	0	1	.321

\*PTCA indicates percutaneous transluminal coronary angioplasty.



**Figure 3.** Receiver operating characteristic curve of early rest myocardial perfusion SPECT for the diagnosis of acute myocardial infarction. The best compromise between (100%) and specificity (84%) was obtained when doubtful results (score 2) were understood as negative.

**Clinical Course**

The attending physicians (who knew the SPECT results) admitted significantly fewer Group A patients than Group B patients. The time spent in the emergency department by Group A patients was also significantly shorter (Table 4). Tables 4 and 5 show the

**TABLE 5. Results for Admitted Patients in Group A Who Did Not Suffer Acute Myocardial Infarction (n=14)\***

N	Resting SPECT	Stress SPECT	Exercise Test	Coronary Angiography	CAD	Revascularization
13	-	-	-		-	
17	+ (ant)	+ (ant)	-	Normal	-	
18	-	-	-		-	
25	-	-	-	Normal	-	
26	-	-	-	Normal	-	
29	-	+ (inf-lat)	Insuf		+	
30	-	+ (inf-lat)	Insuf	Normal	-	
37	+ (ant)	-	-		-	
40	+ (inf-lat)	+ (inf-lat)	+		+	
47	+ (inf-lat)	+ (inf-lat)	Insuf	RC 50%	+	
52	+ (inf-lat)	+ (inf-lat)	-		+	
67	+ (inf-lat)	+ (inf-lat)	Insuf	LAD 65%, RC 100%	+	PTCA + LAD stent
70	+ (inf-lat)	+ (inf-lat)	+		+	
106	+ (inf-lat)	+ (inf-lat)	+		+	

\*SPECT indicates single photon emission computed tomography; CAD, coronary artery disease; PTCA, percutaneous transluminal coronary angioplasty; ant, anterior; inf-lat, inferolateral; LAD, left anterior descending coronary artery; RC, right coronary artery; Insuf, insufficient; +, positive; -, negative.

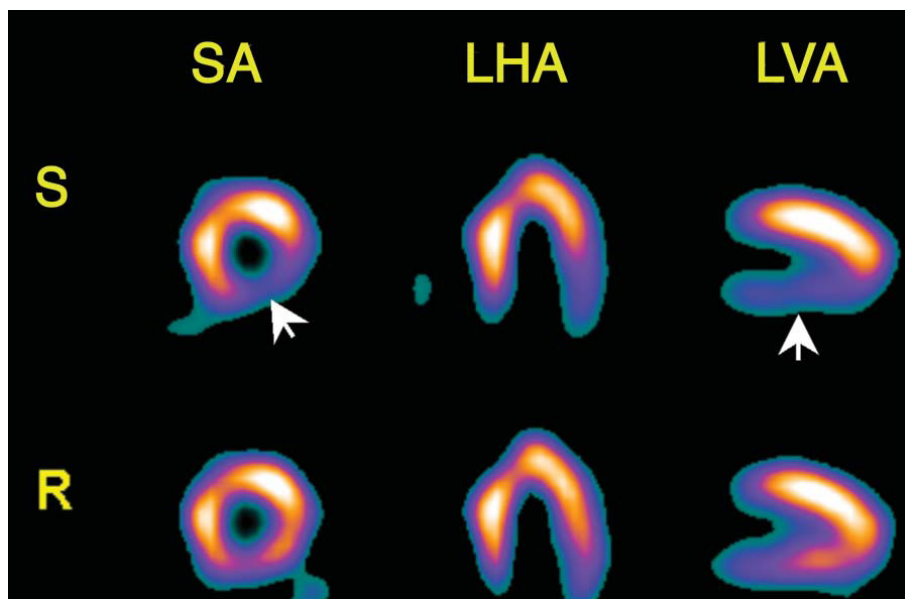
examinations undergone by the Group A and B patients who were admitted. Six Group A patients were admitted with negative gated-SPECT results; only 1 was diagnosed with ischemic heart disease who had a positive stress-rest SPECT result (although criteria for severity were not met and revascularization was not performed). In the remaining eight of these 14 Group A patients, a diagnosis of ischemic heart disease was established depending on coronary angiography results, or, when not performed, on the results of the stress-rest SPECT test. In agreement with these criteria, 7 of these 14 patients (50%) were diagnosed with ischemic heart disease.

Of the 29 Group B patients admitted, 14 underwent myocardial perfusion stress-rest SPECT at the request of the attending physician (Table 6). In this group, a

diagnosis of ischemic heart disease was established according to the patient's coronary angiography or stress-rest SPECT results, or on the results of a conventional stress test when neither of these examinations was performed. Eleven of the 29 patients (38%) were diagnosed with ischemic heart disease.

**DISCUSSION**

The use of myocardial perfusion images using radioisotopes for the assessment of patients with AMI was first proposed at the end of the 1970s. Myocardial perfusion planar scintigraphy with thallium-201 showed a sensitivity of over 90% in the diagnosis of AMI when there was no perfusion in the necrotic area.<sup>17</sup> With the advent of tomographic techniques and tech-



**Figure 4.** Stress-rest SPECT for the same patient as in Figures 1 and 2, 36 h after pain had ceased. A moderate perfusion defect can be seen in the inferolateral region during stress (S) (arrows) which is totally corrected at rest (R). The resting images are normal here, unlike those obtained in early rest SPECT (Figure 1).

TABLE 6. Admitted Patients in Group A Who Did Not Suffer Acute Myocardial Infarction (n=29)\*

N	Stress SPECT	Exercise	Test Coronary	Angiography CAD	Revascularization
01		+	CT 75%, RC 30%	+	3 aortocoronary grafts
03		-		-	
07	+ (inf-lat)	Insuf		+	
10	+ (inf-lat & ant)	-		+	
19	-	Dipy		-	
22		-		-	
24	-			-	
27	+			+	
29		-		-	
30	-	+		-	
34		-		-	
37	+			+	
42		-		-	
46		-		-	
47		+	LAD 90%	+	PTCA+stent in the LAD
51			LAD 85%	+	PTCA+stent in the LAD
53		-		-	
63	-	-		-	
68			Normal	-	
82	-			-	
84	-			-	
88			LAD 50%, CX 85%	+	ACTP+CX stent
89	-			-	
90	-			-	
98	-			-	
102			RC 95%	+	PTCA+RC stent
103			Normal	-	
104			Normal	-	
105	+ (inf)			+	

\*SPECT indicates single photon emission computed tomography; CAD, coronary artery disease; PTCA, percutaneous transluminal coronary angioplasty; inf-lat, inferolateral; LAD, left anterior descending coronary artery; RC, right coronary artery; Insuf, insufficient; +, positive; -, negative; Dipy, dipyridamole; CX, circumflex artery; CT, common trunk.

netium compounds, however, some centers began to use early rest myocardial perfusion gated-SPECT in patients with chest pain and non-diagnostic ECG.

In the present group of patients (all of whom suffered chest pain not typical of angina and whose ECG showed no elevation or depression [ $\geq 0.5$  mm] of the ST segment in the emergency room), the sensitivity and negative predictive power of early myocardial perfusion gated-SPECT (performed <6 h after pain had ceased) was 100%. These results agree with the majority reported in the literature (negative predictive power for the diagnosis of AMI between 99% and 100%).<sup>1,2,5-7,18</sup> No significant differences were seen between the percentages of positive, negative or doubtful patterns for the 48 patients who received the radiotracer during the time they were suffering pain and those of the 63 who received it less than 6 h after pain had ceased. These values support the idea that patients with strictly negative images can be released early without concern for their safety.<sup>19</sup>

In this study, the specificity of the technique for the diagnosis of AMI was sub-optimal, although it improved when doubtful patterns were considered to be ne-

gative (this increases the number of true negatives and considerably reduces the number of false positives). Therefore, in practice, it is recommended that doubtful gated-SPECT results *not* be interpreted as positive for AMI. In a review of 6 studies that included 2214 patients examined with early gated-SPECT, specificities for the diagnosis of AMI of 60%-100% were obtained.<sup>20</sup> It should be remembered, however, that the number of false positives provided for AMI is high, and the positive predictive power is therefore very low—whether doubtful patterns are taken as being positive or negative. The correction of attenuation (not performed for the present patients) might reduce the number of doubtful results.<sup>21</sup>

Though rest gated-SPECT patterns showing moderate or severe defects are not always synonymous with acute myocardial necrosis, ischemic heart disease is very probable. In 4 out of every 5 patients in the present study with this scintigraphic pattern and no increased biochemical markers of myocardial necrosis, stress-rest SPECT showed signs of ischemia in the same region as the defects seen at rest. Conti et al<sup>22</sup> compared the diagnostic sensitivity of rest myocardial

perfusion gated-SPECT with that of stress-rest SPECT in 231 patients with no background of ischemic heart disease. Those who had begun to suffer pain no less than 3 hours before arrival at the emergency room (n=80) underwent rest myocardial perfusion gated-SPECT, whereas the remainder (n=151) underwent stress-rest SPECT within 24 h. No significant differences were seen between the 2 techniques with respect to the diagnosis of coronary heart disease or the prediction of ischemic complications during follow-up. Therefore, the diagnostic accuracy of stress-rest SPECT in patients with chest pain who arrive at the emergency room having suffered pain for more than 3 hours is comparable to that of gated-SPECT performed at the onset of symptoms. A number of studies show that it is safe for this type of patient, in whom acute necrosis has been excluded, to undergo a stress test.<sup>23-25</sup>

Finally, early rest myocardial perfusion gated-SPECT allows the number of admissions to be significantly reduced, as well as the time that patients need to remain in the emergency department. In agreement with other studies,<sup>26-28</sup> this could substantially reduce hospital costs.

## CONCLUSIONS

The sensitivity and the negative predictive power of early rest gated-SPECT (performed <6 h after the cessation of pain) in the diagnosis of AMI is very high in patients with chest pain and non-diagnostic ECG in the emergency department. Four out of every 5 patients with an early rest gated-SPECT pattern showing perfusion defects had a positive stress-rest SPECT test.

The number of hospital admissions and the time spent in the emergency department are significantly reduced in patients who, apart from receiving standard management, also undergo early rest myocardial perfusion gated-SPECT.

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