

Follow-Up Findings one Year After Discharge From a Chest Pain Unit

Jesús Zarauza,^a María J. Rodríguez-Lera,^b Begoña Ceballos,^b Liébana Piedra,^b Trinidad Dierssen,^b and Josefina Pérez^a

^aServicio de Cardiología, Hospital Sierrallana, Torrelavega, Cantabria, Spain

^bServicio de Urgencias, Hospital Sierrallana, Torrelavega, Cantabria, Spain.

One hundred and twenty five consecutive patients discharged from a chest pain unit (group I, 32 with the diagnosis of probable ischemic heart disease and group II, 93 with the diagnosis of non-vascular pain) were prospectively followed up for one year. In group I (treadmill exercise testing were positive at a high workload in 15, negative in 9 and inconclusive in 4), one patient had non-ST elevation acute coronary event 15 days after discharge and two patients had unstable angina at 3 and 5 months. There were no events among the patients who had positive or inconclusive exercise testing. In group II (treadmill exercise testing were negative in 85 and inconclusive in 5) one patient had non-ST elevation acute coronary event at 7 months and one had unstable angina at 11 months. In conclusion, patients discharged from a chest pain unit, including those patients with positive treadmill exercise at a high workload, have a favorable mid-term outcome.

Key words: *Unstable angina. Diagnosis. Myocardial infarction.*

Full English text available at: www.revespcardiol.org

Seguimiento a un año de los pacientes dados de alta de una unidad de dolor torácico

Un total de 125 pacientes dados de alta de nuestra unidad de dolor torácico (grupo I: 32 con diagnóstico de cardiopatía isquémica probable y grupo II: 93 con dolor inespecífico, razonablemente no vascular) fueron seguidos durante 12 meses. En el grupo I (ergometría positiva a alta carga en 15, negativa en 9 y no concluyente en 4), un paciente presentó infarto agudo sin elevación del segmento ST a los 15 días y 2 pacientes angina inestable a los 3 y 5 meses. No hubo eventos entre los pacientes con ergometría positiva o no concluyente. En el grupo II (ergometría negativa en 85, no concluyente en 5), un paciente presentó infarto agudo sin elevación del segmento ST a los 9 meses y otro reingresó por angina inestable a los 12 meses. Concluimos que los pacientes dados de alta de una unidad de dolor torácico, incluidos aquellos con ergometría positiva de bajo riesgo, tienen un favorable pronóstico a medio plazo.

Palabras clave: *Angina inestable. Diagnóstico. Infarto de miocardio.*

INTRODUCTION

Management of chest pain patients in emergency departments is a constant challenge that can lead to unnecessary admissions and inappropriate discharges.¹ Consequently, chest pain units (CPU) have been established in an effort to manage patients more efficiently.² In Spain, few hospitals have units of this kind and little information is available about those that exist.^{3,4} The present study is based on a CPU that ope-

ned in June 1999 and reports on medium-term evolution of patients discharged from the unit.

PATIENTS AND METHOD

This is a prospective study of the first 125 patients consecutively discharged between June 1999 and May 2000, of 410 patients assigned to the CPU protocol.

CPU protocol

This is a functional CPU within an emergency department. Patients presenting with unexplained chest pain that is tentatively diagnosed as of cardiac etiology are assigned to a protocol (Figure 1).

Correspondence: Dr. J. Zarauza Navarro.
Servicio de Cardiología. Hospital Sierrallana.
Barrio de Ganzo, s/n. 39300 Torrelavega. Cantabria. España.
E-mail: jzarauza@scsalud.es

Received 13 March 2003.

Accepted for publication 6 August 2003.

ABBREVIATIONS

IHD: ischemic heart disease.
 NSTEMI: acute myocardial infarction with non-ST segment elevation.
 ET: exercise testing.
 CPU: chest pain unit.

Patients who do not suffer angina, electrocardiographic changes or elevation of necrosis markers during the observation period undergo exercise treadmill testing (Bruce). Exercise testing (ET) is provided on weekdays between 8:00 and 15:00. If ET cannot be performed (because the patient is judged unable to walk on the treadmill or the electrocardiogram provides inconclusive information), cardiac stress imaging is performed (^{99m}Tc radiotracer). At the discretion of the attending physician the patient is hospitalized or stress imaging is performed during an outpatient clinic visit. Exercise testing is classified as positive, negative or nondiagnostic in line with published criteria.⁵ A low-risk positive ET is defined by the presence of angina or ischemia above the submaximal heart rate when angina is neither limiting nor severe and ST-segment changes are neither extensive nor ≥ 2mm. A test is defined as negative by the absence of angina or ischemia at a heart rate below the age-predicted maximum. A test is defined as nondiagnostic when it is ne-

gative but the aforementioned heart rate level is not reached. If ET results indicate medium or high risk, the patient is hospitalized; if ET results are negative the patient is discharged; if ET results indicate low risk or are nondiagnostic, the decision over admission or discharge is taken at the discretion of the attending physician. Based on risk factor history, previous vascular illness, characteristics of the pain and ET results, patients are diagnosed with probable ischemic heart disease (IHD) (Group I) or chest pain of a probably non-vascular etiology (Group II).

Follow-up

During 12-month follow-up we recorded data on adverse events: death, AMI, readmission for unstable angina and revascularization. These were classified as «early» if they occurred in the first month after discharge and «late» if the took place after that.

Statistics

Qualitative variables were analyzed with the chi-squared test, and Student’s *t* test was used for comparisons of 2 means.

Results

Of 410 patients assigned to the protocol, 263 (64.1%) were admitted for elevated markers, new-onset angina or electrocardiographic changes during the observation period, and 147 completed evaluation. Of

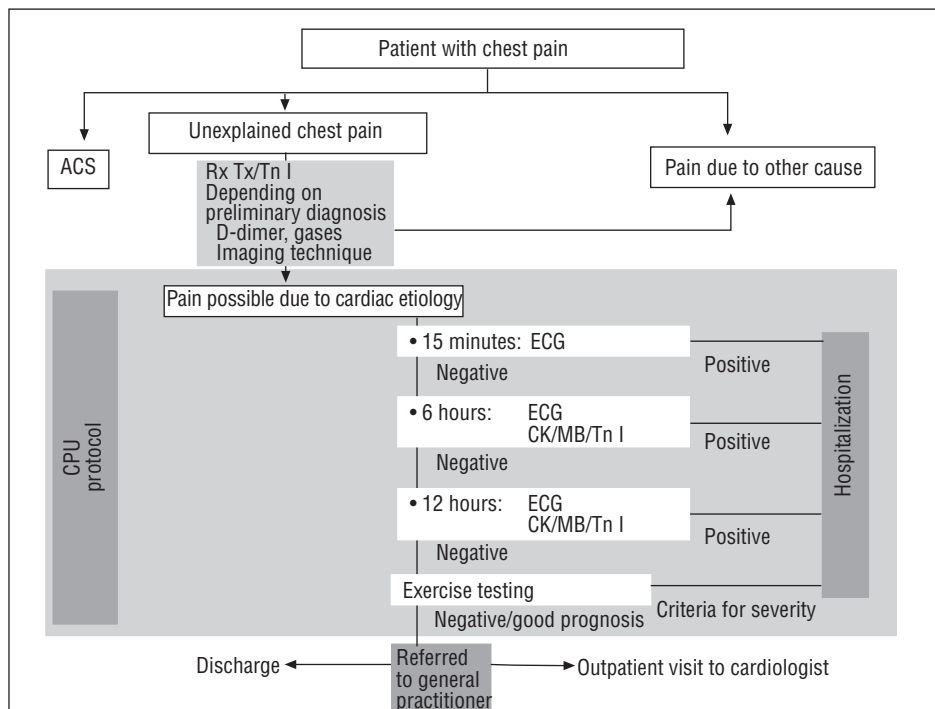


Fig. 1. CPU protocol. ECG indicates electrocardiogram; RxTx, chest x-ray; ACS, acute coronary syndrome; Tn, troponin I.

TABLE 1. Patient characteristics

	Total	Group I	Group II	P (between groups)
Number	125	32	93	
Age, mean±SD	62.3±11.5	67.9±7.2	60.4±12.1	.001
Men, %	58.4	62.5	57.0	.585
Risk factor				
Smoking, %	24.0	12.5	28.0	.077
Hypertension, %	42.4	46.9	40.9	.553
Diabetes mellitus, %	19.2	34.4	14.0	.012
Dyslipidemia, %	36.0	34.4	36.6	.824
FH, %	11.2	12.5	10.7	.787
History of cardiovascular events				
Angina/AMI/revascularization, %	24.0	34.1	20.4	.118
Artery disease LL/S, %	10.4	9.3	10.7	.826
Exercise testing, n (%)	118 (94.4)	28 (87.5)	90 (96.8)	
Positive low risk, n (%)	15 (12.7)	15 (53.5)	0	
Negative, n (%)	94 (79.9)	9 (32.1)	85 (94.4)	
Nondiagnostic, n (%)	9 (7.6)	4 (14.2)	5 (5.6)	
Cardiac stress imaging, n (%)	11 (8.8)	5 (15.6)	6 (6.4)	
Positive, n (%)	4 (36.4)	4 (80)	0	
Negative, n (%)	7 (63.6)	1 (20)	6 (100)	

S indicates stroke; FH, family history; AMI, acute myocardial infarction; LL, lower limbs.

TABLE 2. Adverse events during follow-up

No. (%) [95% CI]	Total patients		Group I		Group II	
	Early	Late	Early	Late	Early	Late
Death	0 [0.00-2.90]	0 [0.00-2.90]	0 [0.00-10.89]	0 [0.00-10.89]	0 [0.00-3.89]	0 [0.00-3.89]
AMI	1 (0.8) [0.02-4.37]	1 (0.8) [0.02-4.37]	1 (3.1) [0.08-16.22]	0 [0.00-10.89]	0 [0.00-3.89]	1 (1.0) [0.03-5.84]
Readmission for UA	0 [0.00-2.90]	3 (2.5) [0.50-6.85]	0 [0.00-10.89]	2 (6.2) [0.02-4.38]	0 [0.00-3.89]	1 (1.0) [0.03-5.84]
Revascularization	1 (0.8) ^a [0.02-4.37]	2 (1.6) ^b [0.19-5.66]	1 (3.1) ^a [0.08-16.22]	2 (6.2) ^b [0.02-4.38]	0 [0.00-3.89]	0 [0.00-3.89]

^aAortocoronary bypass. ^bPercutaneous revascularization. Revascularized patients were those who suffered AMI (aortocoronary bypass due to disease in three vessels and common arterial trunk) or UA (in both cases involving angioplasty and stenting in one vessel). UA indicates unstable angina; AMI, acute myocardial infarction.

these, 22 were hospitalized, 21 with positive ET and 1 with nondiagnostic ET. The remaining 125 patients (85%) were discharged. Probable IHD was diagnosed in 32 of these patients (group I) and non-specific pain with probable nonvascular etiology in 93 (group II) (Table 1).

In group I, 28 patients (87.5%) underwent ET. Results were positive at high workload in 15 patients, negative in 9 and nondiagnostic in 4. Cardiac stress imaging was performed on 5 patients (4 of whom could not undergo ET and 1 who had a nondiagnostic ET) and these showed uptake defects in 1 territory in 4 patients.

In group II, 90 patients (96.8%) underwent ET. Results were nondiagnostic in 5 and negative in the rest. Cardiac stress imaging was performed on 6 pa-

tients (3 of whom could not undergo ET and 3 who had nondiagnostic ET results): all were negative.

Follow-up

None of the patients died during follow-up (Table 2). In group I, 1 patient presented NSTEMI at 15 days. Exercise test results had been negative and coronary angiography showed disease in 3 vessels and the left main coronary artery. The patient was recommended for surgery. 2 patients were rehospitalized for unstable angina at 3 and 5 months respectively and underwent percutaneous revascularization procedures. Both patients ET results had been negative. No events were recorded for patients with low risk positive or nondiagnostic ET results.

TABLE 3. Results of other studies

	CPU patients	Discharged	Events first month	Events \pm first year
Gibler et al ⁷	1010	82%	0.53%	—
ROMIO ⁸	50	82%	0%	—
CHEER9	212	46%	0.5%	2.8%
Amsterdam et al ¹⁰	1000	64%	0.17%	—

No early events were recorded in group II. One patient presented NSTEMI at 9 months and another was rehospitalized for unstable angina at 12 months.

DISCUSSION

Several studies have demonstrated a low incidence of complications among patients discharged from a CPU (Table 3).⁶⁻⁹ However, there are few operational CPUs in Spain and little data is available as to their performance. Sanchis et al³ have recently confirmed the value of immediate ET in the CPU protocol in a study in which no patient with negative ET results presented complications during the first month of follow-up. Similarly, Pastor et al⁴ analyzed the results of a CPU in Seville (Spain). Exercise testing was performed on 179 patients with negative results in 79% of cases. At 1 year follow-up, 89% of the patients in this group were event-free. The results of the present study are similar: 85% of patients were discharged after ET and the incidence of adverse events during 1 year was 4%. None of the patients died.

However, these results must be put into perspective. Most protocols recommend discharge only if ET is negative, and patients are hospitalized if it is nondiagnostic or positive. In our protocol, if ET is nondiagnostic or positive at a high workload the decision is left to the discretion of the clinician. Of 125 patients discharged, ET results were positive in 2.7% and nondiagnostic in 7.6%. No cardiac events occurred in this subgroup of 24 patients and, although the number of patients is insufficient to reach any conclusions, these findings do agree with Amsterdam et al.⁹ In this study, 25% of 235 patients with nondiagnostic ET results reached 80% of the age-predicted heart rate and presented no cardiac events at 30 days. This suggests that the absence of ischemia at $\geq 80\%$ of age-predicted heart rate may serve to identify a low risk subgroup. Two factors probably determine this favorable evolution. The use of troponins in diagnosis and prognostic stratification of chest pain is well-known and Hamm et al¹⁰ defend the safety of discharging patients with negative troponin I tests reporting only 0.3% risk of early events. In current

CPU protocols, negative troponin level is a criterion for performing ET, in which case the patient is already considered to be at low risk. A second factor is the low prevalence of coronary artery disease in the group of patients who undergo ET, and consequently, the likelihood of a substantial number of false-positive results. Gibler et al⁶ found that only 33.9% of patients admitted with positive ET results had an underlying IHD condition.

We conclude that patients discharged from a CPU have an excellent medium-term prognosis with minimal incidence of complications. This good prognosis also seems to apply for low-risk, positive ET patients.

REFERENCES

- McCarty BD, Beshansky JR, D'Agostino RB, Selker HP. Missed diagnosis of acute myocardial infarction in the emergency department: result from a multicenter study. *Ann Emerg Med* 1993;22: 579-82.
- Zalenski RJ, Selker HP, Cannon CP, Farin HM, Gibler WB, Goldberg RJ, et al. National heart attack alert program position paper: chest pain centers and programs for the evaluation of acute cardiac ischemia. *Ann Emerg Med* 2000;35:462-71.
- Sanchis J, Bodí V, Llácer A, Núñez J, Ferrero JA, Chorro FJ. Valor de la prueba de esfuerzo precoz en un protocolo de unidad de dolor torácico. *Rev Esp Cardiol* 2002;55:1089-92.
- Pastor Torres LF, Pavón-Jiménez R, Reina Sánchez M, Caparrós Valderrama J, Mora Pardo JA. Unidad de dolor torácico: seguimiento a un año. *Rev Esp Cardiol* 2002;55:1021-7.
- Arós F, Boraita A, Alegría E, Alonso AM, Bardají A, Lamiel R, et al. Guías de práctica clínica de la Sociedad Española de Cardiología en pruebas de esfuerzo. *Rev Esp Cardiol* 2000;53:1063-94.
- Gibler WB, Runyon JP, Levy RC, Sayre MR, Kacich R, Hattemer CR, et al. A rapid diagnostic and treatment center for patients with chest pain in the emergency department. *Ann Emerg Med* 1995;25:1-8.
- Gómez MA, Anderson JL, Karagounis LA, Muhstein JB, Mooers FB, for the ROMIO Study Group. An emergency department-based protocol for rapidly ruling out myocardial ischemia reduces hospital time and expense: results of a randomised study (ROMIO). *J Am Coll Cardiol* 1996;28:25-33.
- Farkouh MF, Smars PA, Reeder GS, Zinsmeister AR, Evans RW, Meloy TD, et al. A clinical trial of chest-pain observation unit for patients with unstable angina. Chest Pain Evaluation in the Emergency Room (CHEER) investigators. *N Engl J Med* 1998;339: 1882-8.
- Amsterdam EA, Kirk JD, Diercks DB, Lewis WR, Turnipseed SD. Immediate exercise testing to evaluate low-risk patients presenting to the emergency department with chest pain. *J Am Coll Cardiol* 2002;40:251-6.
- Hamm CW, Goldmann BU, Heeschen C, Kreyman G, Berger J, Meinertz T. Emergency room triage of patients with acute chest pain by means of rapid testing for cardiac troponin T or troponin I. *N Engl J Med* 1997;337:1648-53.