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Scientific letters

Noninvasive Treatment of Acute Myocardial Infarction. Clinical Profile and Predictors of Poor Prognosis

Tratamiento no invasivo del infarto agudo de miocardio. Perfil clínico de los pacientes y variables predictoras de mal pronóstico

To the Editor,

In current clinical practice, only a small percentage of patients with acute coronary syndrome are treated conservatively (receiving neither coronary angiography nor fibrinolysis). Evidence-based clinical practice guidelines[1] recommend that patients suffering an acute myocardial infarction (AMI) undergo invasive intervention, in addition to medical treatment of proven prognostic efficacy; this invasive treatment should take the form of emergent reperfusion therapy for ST segment elevation myocardial infarction (STEMI) and early coronary angiography for non-ST segment elevation myocardial infarction (NSTEMI). Certain clinical situations accompanying acute coronary syndrome exclude patients from this intensive management strategy. The typical clinical profile in such cases is that of a fragile elderly patient with anemia and renal failure or other important comorbidities that justify conservative management.

Here we present an analysis of in-hospital and long-term mortality among AMI patients in our population who were assigned to conservative treatment by the on-duty physician. The aim was to identify variables that predict poor prognosis in these patients.

We analyzed the records of 4408 patients consecutively admitted to our hospital between 2003 and 2012 with a diagnosis of AMI (1745 with STEMI and 2663 with NSTEMI). Of these patients, 460 received conservative medical treatment (127 [7.3%] with STEMI and 333 [12.5%] with NSTEMI); 84 STEMI patients presented > 24 hours after symptom onset. Among the total group of STEMI patients, 54 (3.1%) received fibrinolytic treatment and all were later examined by angiography. Patients assigned to conservative management tended to be older, and this group included a higher percentage of women and patients with diabetes mellitus, had a worse Killip class, and had lower hemoglobin and higher creatinine readings (Table). All of this, as is well known, implies a poor prognosis for patients receiving conservative medical treatment.[1]

Among patients receiving conservative treatment, we analyzed variables associated with a worse prognosis during in-hospital care and long-term follow-up; in-hospital and long-term mortality were analyzed independently in the two types of AMI by multivariate analysis (binary logistic regression for in-hospital mortality and Cox regression for long-term mortality), with adjustments for first-order interactions between covariates.

Among NSTEMI patients, univariate analysis indicated an association of high in-hospital mortality with diabetes mellitus (odds ratio [OR] = 1.79; 95% confidence interval [95%CI], 1.02-3.14; *P* = .042), Killip class ≥ II (OR = 6.81; 95%CI, 3.46-13.43; *P* < .001), hemoglobin (OR = 0.85; 95%CI, 0.73-0.98; *P* = .027), creatinine (OR = 1.49; 95%CI, 1.17-1.90; *P* = .001) and troponin (OR = 1.02; 95%CI, 1.01-1.04; *P* = .001). In-hospital mortality in these patients was also associated with nontreatment with beta-blockers (OR = 0.19; 95%CI, 0.09-0.39; *P* < .001), angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers (OR = 0.35; 95%CI, 0.19-0.63; *P* < .001), or statins (OR = 0.23; 95%CI, 0.16-0.32; *P* < .001). In the multivariate analysis, only Killip class ≥ II persisted as an independent predictor of in-hospital mortality (OR = 4.5; 95%CI, 2.13-9.53; *P* < .001).

Long-term mortality in NSTEMI patients (4.2 ± 2.8 years) was positively associated with the following variables: age (hazard ratio [HR] = 1.06; 95%CI, 1.04-1.08; *P* < .001), peripheral artery disease (HR = 1.70; 95%CI, 1.18-2.46; *P* = .005), previous AMI (HR = 1.46; 95%CI, 1.06-2.02; *P* = .022), Killip class ≥ II (HR = 2.43, 95%CI, 1.79-3.28; *P* < .001), hemoglobin (HR = 0.88; 95%CI, 0.81-0.95; *P* = .001), creatinine (HR = 1.27; 95%CI, 1.13-1.44; *P* < .001), and troponin (HR = 1.01; 95%CI, 1.01-1.02; *P* < .001). Indicators of good prognosis were treatments with beta-blockers (HR = 0.50; 95%CI, 0.37-0.68; *P* < .001) and statins (HR = 0.55; 95%CI, 0.47-0.66; *P* < .001). After the multivariate analysis, the following persisted as independent predictors of mortality: age (HR = 1.06; 95%CI, 1.03-1.09; *P* < .001), peripheral artery disease (HR = 1.71; 95%CI, 1.06-2.76; *P* = .028), previous AMI (HR = 1.76; 95%CI, 1.15-2.71; *P* = .009), Killip class ≥ II (HR = 1.59; 95%CI, 1.05-2.41; *P* = .028), hemoglobin (HR = 0.87; 95%CI, 0.77-0.98; *P* = .020), creatinine (HR = 1.38; 95%CI, 1.07-1.77; *P* = .013), and nontreatment with statins (HR = 0.79; 95%CI, 0.62-0.99; *P* = .042).

Among patients with STEMI, univariate analysis showed association of high in-hospital mortality with Killip class ≥ II (OR = 8.00; 95%CI, 3.02-21.17; *P* < .001), creatinine (OR = 1.72; 95%CI, 0.97-3.05; p = .062), and troponin (OR = 1.01; 95%CI, 0.99-1.02; *P* = .079). Indicators of good prognosis were treatments with beta-blockers (OR = .21; 95%CI, 0.08-0.56; *P* = .002), angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers OR = 0.19; 95%CI, 0.08-0.48; *P* < .001), and statins (OR = 0.15; 95%CI, 0.06-0.36; *P* < .001). In the multivariable analysis, the only independent predictors of in-hospital mortality were Killip class ≥ II (OR = 5.22; 95%CI, 1.44-18.86; *P* = .012) and treatment with statins (OR = 0.79; 95%CI, 0.06-0.63; *P* = .006).

Long-term mortality of STEMI patients was associated with age (HR = 1.09; 95%CI, 1.04-1.15; *P* = .001), hemoglobin (HR = 0.86; 95%CI, 0.76-0.97; *P* = .015), and creatinine (HR = 1.72; 95%CI, 1.18-2.49; *P* = .004). After multivariate analysis, only age persisted as an independent mortality predictor (HR = 1.09; 95%CI, 1.04-1.15; p = .001).

For in-hospital mortality, we conducted a sensitivity analysis, eliminating patients who died during the first 48 hours (68 with STEMI and 18 with NSTEMI, out of 307 in-hosptial deaths). Killip class ≥ II remained as an independent mortality predictor in both the NSTEMI group (OR = 7.41; 95%CI, 4.82-11.39; *P* < .001) and the STEMI group (OR = 10.58; 95%CI, 6,26-17,89; *P* < .001), and statins treatment persisted as a predictor of good prognosis in the STEMI group (OR = 0.19; 95%CI, 0.12-0.32; p < .001).

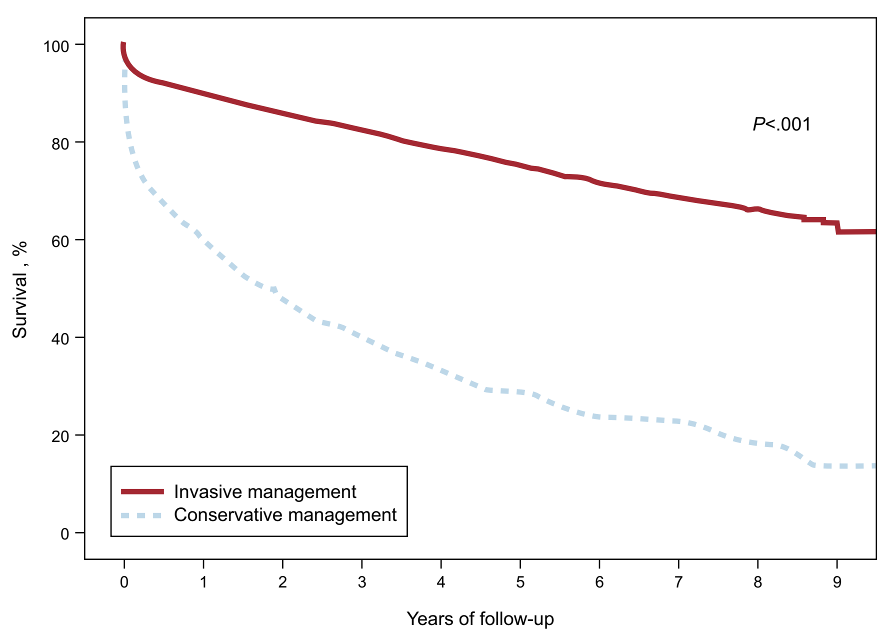
Our results clearly show that patients under conservative management have a higher basal risk than those treated invasively, which could justify invasive therapy. Of the variables analyzed, the only independent predictor of in-hospital mortality in the 2 infarction groups is Killip class ≥ II, an indicator of major clinical and hemodynamic instability. Notably, age is not a predictor of in-hospital mortality in either of the AMI groups, but is a predictor of mortality risk during follow-up. The influence of age on the treatment of acute coronary syndrome was analyzed in the MINAP registry, which showed that the use of invasive treatment was

Table

Basal Characteristics of Patients Hospitalized for STEMI and NSTEMI, Stratified According to Treatment Received Cconservative vs Invasive Management)

	STEMI			NSTEMI		
	Conservative management (n = 127)	Invasive management (n = 1618)	*P*	Conservative management (n = 333)	Invasive management (n = 2330)	*P*
Age, mean (SD), years	83.3 (9.4)	65.2 (13.6)	< .001	80.1 (10.5)	67.9 (12.1)	< .001
Sex (women), %	51.2	24.6	< .001	45.3	27.3	< .001
Diabetes mellitus, %	31.5	22.2	.016	39.9	30.6	.001
Arterial hypertension, %	54.3	46.2	.078	67.9	59.3	.003
Dyslipidemia, %	26.0	38.3	.006	42.3	47.0	.115
Peripheral artery disease, %	8.7	7.5	.627	17.1	11.2	.002
Previous myocardial infarction, %	7.1	5.3	.378	24.4	13.6	< .001
Previous stroke, %	15.0	5.2	< .001	15.0	6.8	< .001
Previous neoplasia, %	8.7	5.9	.314	13.2	7.5	< .001
Killip class ≥ II, %	51.2	22.4	< .001	44.7	17.5	< .001
Hemoglobin, mean (SD), g/dL	13.2 (1.9)	14.2 (1.8)	< .001	12.6 (1.9)	13.9 (1.8)	< .001
Creatine, mean (SD), g/dL	1.3 (0.6)	1.1 (0.5)	< .001	1.4 (1.0)	1.1 (0.7)	< .001
Troponin I, mean (SD), ng/L	44.0 (63.9)	79.6 (96.8)	< .001	11.1 (17.7)	10.6 (28.1)	.666
ASA, %	89.8	94.4	.031	88.3	93.3	.001
Clopidogrel, %	43.3	89.2	< .001	58.3	82.1	< .001
Beta-blockers, %	39.4	64.4	< .001	47.1	64.7	< .001
ACEI/ARB, %	48.8	59.1	.024	52.6	55.5	.313
Statin, %	56.7	80.1	< .001	62.2	79.2	< .001
In-hospital death, %	28.3	7.5	< .001	18.0	3.8	< .001
Postdischarge death, %	48.0	15.1	< .001	53.5	22.1	< .001

ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; ASA, acetylsalicylic acid; NSTEMI: non-ST segment elevation myocardial infarction; STEMI: ST segment elevation myocardial infarction.



Years of follow-up		0	1	2	3	4	5	6	7	8	9
Patients at risk	Invasive management	3948	3380	2638	2187	1958	1759	1323	941	503	79
	Conservative management	460	278	192	146	113	95	68	45	24	5

Figure. Kaplan-Meier curves for patients in our population with acute myocardial infarction, grouped according to treatment regimen (conservative management with no coronary angiography vs invasive management).

less frequent in older patients, despite demonstrated mortality reductions with this approach in all age groups.[2]

In conclusion, in daily clinical practice it is common to encounter patients with AMI who are treated conservatively, without coronary angiography (approximately 1 in 10). These patients have a poor cardiovascular risk profile and a dismal prognosis (Figure), with mortality exceeding 20% during hospital care and approaching 50% during postdischarge follow-up. Killip class is the only predictor of mortality during hospitalization, and age is the variable most strongly associated with mortality during follow-up.

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Low Recurrence Rate After Nodal Reentrant Tachycardia Cryoablation With an 8-mm Tip Catheter and Prolonged Applications

Reducción de las recurrencias tras crioablación de taquicardia reentrante nodal con catéter de 8 mm mediante crioaplicaciones prolongadas

To the Editor,

Comparative studies of radiofrequency catheter ablation and cryoablation for nodal reentrant tachycardia report similar short-term outcomes, with success rates above 95%.[1,2] Of note is the fact that radiofrequency ablation is associated with a risk of atrioventricular block of 0.75%,[1] whereas no cases of permanent atrioventricular block have been reported with cryoablation. In contrast, a higher recurrence rate has been reported after cryoablation with 4- and 6-mm catheters, although this problem can be overcome by increasing the lesion size with 8-mm catheters.

Our objective was to assess the efficacy and safety of cryoablation of nodal reentrant tachycardia with an 8-mm catheter immediately after the procedure and after a 1-year follow-up and to analyze the possible factors associated with long-term success.

We retrospectively reviewed our experience of consecutive patients with this type of arrhythmia who were treated with an 8-mm cyroablation catheter (Freezor® MAX, Medtronic; Minneapolis, Minnesota, United States) between May 2008 and January 2013 and who were in clinical follow-up for at least 1 year.

The cyroapplications were performed at –80 °C, preferably at the lower third of the Koch triangle, with the aim of abolishing or modifying conduction in the slow pathway and suppressing the inducibility of tachycardia. During these ablations, the patients underwent electrophysiological assessment, and application was interrupted in the event of lack of efficacy.

At the beginning of the study period, the duration of cryoapplications after initial success was 4 minutes (23 patients), whereas in the last 18 months, the duration was 8 minutes (39 patients). Neither freeze-thaw-freeze cycles nor safety applications were used.

After the procedure, all antiarrhythmic drugs were discontinued and the patients entered clinical and electrocardiographic follow-up for 12 months or until clinical recurrence. Recurrence was defined as persistence of symptoms with electrocardiographic documentation of the arrhythmia.

The demographic characteristics of the patients and the main findings are summarized in Table. An initial successful outcome was achieved in 61 of the 62 patients (98%). In 8 patients (12.9%), transient atrioventricular block was documented during the cryoapplications (PR prolongation). In all patients, this event completely resolved within seconds of interrupting the application. There were no other complications.

After a mean follow-up of 10.7 months (95% CI, 9.8-11.5 months), 8 patients (12.9%) with successful initial outcomes experienced recurrence, in all cases within 6 months of cryoablation (Figure).

Significant differences were found in the recurrence rate in patients who received 4-minute cryoapplications (7 of 23, 30%) vs those who received 8-minute cryoapplications (1 of 39, 3%; $P = .003$).

There were no significant differences in the recurrence rate according to the initial outcome of cryoablation when the the

Table
Clinical Characteristics of the Patients and Outcomes

Age, mean (SD), y	43.5 (16.1)
Sex, female/male	16/46 (74% women)
Structural heart disease, yes/no	3/59 (92% without heart disease)
First procedure, yes/no	57/5 (92% first procedure)
Common NRT, yes/no	55/7 (89% common NRT)
Initial success, yes/no (%)	61/1 (98.4%)
Number of cryoapplications/patient, mean (SD)	4.9 (3)
Recurrences, yes/no (recurrence rate, %)	8/62 (12.9%)
Recurrences, yes/no (recurrence rate, %) according to application time:	
4 min	7/23, 30%[a]
8 min	1/39, 3%[a]
Recurrences, yes/no (recurrence rate, %) by complete abolition or not of slow pathway	
Complete abolition	2/21 (9.5%)[b]
Residual single echo	6/41 (14.6%)[b]
Transient prolongation of PR interval, yes/no (%)	8/62 (12.9%)
Complete atrioventricular block, yes/no	0/62

NRT, nodal reentrant tachycardia; SD, standard deviation.
[a] $P = .003$.
[b] $P = .4$.