

Effect of Combined Beta-Blocker and Angiotensin-Converting Enzyme Inhibitor Treatment on 1-Year Survival After Acute Myocardial Infarction: Findings of the PRIAMHO-II Registry

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Introduction and objectives. Clinical trials have shown that combining beta-blockers and angiotensin-converting enzyme (ACE) inhibitors has an additive effect in reducing mortality in patients with left ventricular dysfunction following acute myocardial infarction. Whether this additive effect also occurs in unselected post-myocardial infarction patients is unknown.

Methods. In total, 5397 patients who were discharged from hospital after suffering an acute myocardial infarction were followed for 1 year. The primary endpoint was all-cause mortality. The effects of the medications on 1-year survival were analyzed using a Cox regression model, which included propensity scores for beta-blocker and ACE inhibitor use to take account of any potential imbalance in drug prescription rates.

Results. At hospital discharge, 55.9% of patients were receiving beta-blockers and 45.1%, ACE inhibitors. The 1-year mortality rate was 5.5%. Overall, combination of the two medications significantly reduced the 1-year mortality rate (hazard ratio [HR]=0.51; 95% confidence interval [IC], 0.32-0.82); $P < .005$) to a greater extent than ACE inhibitors alone (HR=0.78; 95% CI, 0.54-1.12; $P = .2$) or beta-blockers alone (HR=0.67; 95% CI, 0.43-1.05; $P = .08$). The same trend was also observed in low-risk patients without acute heart failure who had an ejection fraction $\geq 40\%$.

Conclusions. In unselected post-myocardial infarction patients, combined prescription of beta-blockers and ACE inhibitors had an additive effect on the 1-year survival rate.

Key words: Beta-blockers. Angiotensin-converting enzyme inhibitors. Survival. Myocardial infarction.

Efecto de la asociación de bloqueadores beta e inhibidores de la enzima de conversión en la supervivencia al año tras un infarto agudo de miocardio. Resultados del registro PRIAMHO II

Introducción y objetivos. La combinación de bloqueadores beta e inhibidores de la enzima de conversión de la angiotensina (IECA) ha demostrado reducir la mortalidad en pacientes con infarto de miocardio y disfunción sistólica. Sin embargo, no sabemos si esta asociación presenta efectos aditivos sobre la supervivencia al año en una población no seleccionada de pacientes con infarto agudo de miocardio con y sin elevación del segmento ST.

Métodos. Se realizó un seguimiento durante un año a 5.397 pacientes dados de alta tras un infarto agudo de miocardio. El criterio de valoración fue la mortalidad por cualquier causa. Para analizar el efecto de la medicación se utilizó el modelo de regresión logística de Cox, en el que se incluyó el *propensity score* para compensar las posibles desviaciones en la prescripción de los 2 grupos de fármacos.

Resultados. En el momento del alta, el 55,9% de los pacientes recibió bloqueadores beta y el 45,1%, IECA. La mortalidad al año fue del 5,5%. En el grupo total, la combinación se asoció con una reducción significativa de la mortalidad (*hazard ratio* [HR] = 0,51; intervalo de confianza [IC] del 95%, 0,32-0,82); $p < 0,005$) superior a la de los IECA solos (HR = 0,78; IC del 95%, 0,54-1,12; $p = 0,2$) y los bloqueadores beta solos (HR = 0,67; IC del 95%, 0,43-1,05; $p = 0,08$). Esta misma tendencia se observó en los

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This study was carried out with a research grant from Boehringer Ingelheim.

The researchers and hospitals participating in the PRIAMHO II study are listed in the Appendix.

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Received June 30, 2005.

Accepted for publication January 12, 2006.

ABBREVIATIONS

BB: beta-blockers.
 EF: ejection fraction.
 HR: hazard ratio.
 AMI: acute myocardial infarction.
 CHF: congestive heart failure.
 ACE inhibitors: angiotensin-converting enzyme inhibitors.

pacientes de bajo riesgo, sin insuficiencia cardiaca en fase aguda y con fracción de eyección $\geq 40\%$.

Conclusiones. En una población no seleccionada de pacientes con infarto agudo de miocardio, la prescripción conjunta de bloqueadores beta e IECA en el momento del alta hospitalaria muestra efectos aditivos sobre la supervivencia al año.

Palabras clave: *Bloqueadores beta. Inhibidores de la enzima de conversión de la angiotensina. Supervivencia. Infarto agudo de miocardio.*

INTRODUCTION

In addition to reperfusion therapy, which is the basic treatment in acute coronary syndrome, aspirin, beta-blockers (BB), and angiotensin-converting enzyme inhibitors (ACE inhibitors) reduce short- and long-term morbidity and mortality in patients with recent acute myocardial infarction (AMI).¹⁻⁴ These drugs and the statins form the basic pharmacological core of secondary prevention and, in the absence of contraindications, should be prescribed to all AMI patients, with or without ST-segment elevation, according to clinical practice guidelines.⁵⁻⁸ However, the level of evidence is lower regarding early indications for ACE inhibitors in patients without congestive heart failure (CHF) or systolic dysfunction,^{8,9} and regarding the prescription of BB at discharge in low-risk patients (non-complicated AMI, with preserved systolic function and negative exercise stress test).⁸

These refinements have been implemented in quality-of-care improvement programs within AMI. Whereas the four types of drugs cited are sometimes globally prescribed in the absence of contraindications,¹⁰ restrictions are also accepted regarding using ACE inhibitors,¹¹⁻¹³ although no clinical trial has demonstrated that the combination of aspirin, BB, ACE inhibitors, and statins is better than just one or several of them.

The combination of BB and ACE inhibitors reduces mortality in patients with recent AMI and an ejection fraction (EF) $\leq 40\%$ with or without clinical heart failure in the acute phase previously treated with ACE inhibitors.¹⁴ However, there are few studies demonstrating whether this beneficial effect applies to the entire population of AMI patients, including those at low risk, without acute CHF or systolic dysfunction.

The aim of this study was to investigate whether BB combined with ACE inhibitors improves survival compared to each drug alone in an unselected patient population, with or without ST-segment elevation AMI, 1 year after the acute episode and who had been discharged to their homes.

METHODS

The PRIAMHO II study (Proyecto de Registro de Infarto Agudo de Miocardio HOspitalario) was designed by the Ischemic Heart Disease and Coronary Care Units Section of the Spanish Society of Cardiology with the collaboration of the SEMYCIUC Cardiology Intensive Care Working Group. This consists of a registry of patients with AMI admitted to coronary care units. The methodology has been previously published.¹⁵ In brief, 81 of the 165 public hospitals with coronary units were randomly selected and invited to participate. All centers had to meet the following requirements: *a*) register at least 70% of AMI patients admitted to the hospital (coverage rate); *b*) register more than 75% of the AMI patients admitted to coronary intensive care unit (CICU) (ascertainment rate); *c*) have a kappa index of 70% between the registered data and that obtained by an external auditor in a random sample of 20% of the patients included in each center (concordance rate); and *d*) $>90\%$ follow-up rate in registered patients at 1 year.

The study was developed between 15 May and 16 December 2000. At the end of this period, 58 of the 81 invited hospitals met all the requirements.

The diagnosis of infarction was based on the presence of at least 2 of the following criteria: ischemic symptoms of over 20 min duration, presence of pathological Q-waves, and an increase in serial enzyme markers of myocardial necrosis more than double the normal value and showing an enzyme kinetics curve.

Demographic data, clinical background, and complications during hospitalization were recorded, as well as the diagnostic and therapeutic procedures used during hospital stay. All the variables had been previously defined and their collection standardized.

Patients were followed up for a minimum of 1 year. All deaths that occurred within the first 28 days after the AMI were considered to be related to this event. After this period, the assessment criterion was mortality from any cause.

Statistical Analysis

Continuous variables are presented as mean \pm SD. Discrete variables appear as percentages. Univariate analysis was carried out with the Student *t* test for continuous variables with normal distribution and the Fisher test for dichotomous variables, or the χ^2 test.

In order to control for the differences in baseline clinical characteristics between the treated and untreated

patients, a logistic regression analysis was done for each treatment (ACE inhibitors and BB) and, thus, the propensity score¹⁶ of receiving a given treatment could be calculated. All the clinical variables were included in these analyses. Between-factor interactions were also evaluated. The capacity of the model to discriminate between patients discharged under treatment was measured through the C-statistic.

Cox regression was used to determine the variables associated with 1-year survival and to estimate the hazard ratio (HR) with a 95% confidence interval (CI) of dying between hospital discharge and 1-year follow-up. The clinical variables that showed significant differences in the univariate analysis were included in the different models, as well as the propensity score of receiving ACE inhibitors and/or BB. The interactions were also assessed between treatment at the time of discharge (none, ACE inhibitors only, BB only, or both) and the remaining factors. A statistically significant interaction was found between treatment and the variable "high risk" (Killip class I or ejection [EF] <0.40%). For this reason, the results are presented separately depending on whether high-risk was present or not. Statistical significance was set at $P<.05$.

RESULTS

Baseline Characteristics

Between 15 May and 15 December 2000, 6221 patients were enrolled with a 93% 1-year follow-up rate. Table 1 shows the patients' baseline data, as well as mortality in different phases of the study. Initial ST-segment elevation was found in 66.3% of the patients, whereas Q-wave AMI was much more frequent than non-Q-wave AMI (65.6 vs 34.4%). Post-hospital discharge mortality was 5.5%, 28-day mortality, 11.4%, and 1-year mortality, 16.5%.

Treatment at of Discharge and 1-Year Mortality

Some 5397 patients survived the acute phase. At the time of hospital discharge, 91% received antiplatelet agents; 55.9%, BB; 45%, ACE inhibitors; and 45%, statins. Table 2 shows the distribution of BB and ACE inhibitors by group. Angiotensin-converting enzyme inhibitors were most frequently prescribed in women and in patients with diabetes, hypertension, previous infarction, and heart failure during hospitalization, and with EF<40%. Patients treated with BB at the time of discharge were younger, smoked more, and had received reperfusion treatment more often.

One-year mortality was 9.6% in patients treated with ACE inhibitors vs 2.5% and 3.6% in those treated with BB only or in combination, respectively ($P<.001$) (Table 2). Table 3 shows the factors related to 1-year survival

TABLE 1. Clinical Characteristics and Background of Patients Included in PRIAMHO II. Mortality at Different Times During the Study*

	Total Group (n=6221)
Age, mean±SD, y	65.4±12.8
Female	25.3%
Background	
Diabetes	29.4%
Smoking	44.1%
Hypertension	46.1%
Dyslipidemia	40.3%
Previous infarction	15.7%
Previous revascularization	8.5%
ECG at admission	
ST-segment elevation/LBBB	69.4%
ECG at discharge	
Q-wave infarction	65.6%
Mortality	
CICU mortality	9.6%
Mortality following discharge	5.5%
28-day mortality	11.4%
1-year mortality	16.5%

*LBBB indicates left bundle branch block; SD, standard deviation; ECG, electrocardiogram; CICU, cardiac intensive care unit, coronary unit.

from the time of hospital discharge. Independent predictors of mortality after discharge were: age, female sex, non-Q-wave infarction, the presence of CHF during the acute phase (Killip class I), or significant systolic dysfunction (EF<40%). On the other hand, primary reperfusion led to an important reduction in mortality.

The patients who received BB only or BB with ACE inhibitors at discharge had a higher probability of being alive at 1 year, as well as those treated with aspirin or hypolipidemic agents. However, the opposite was the case with ACE inhibitors, nitrates, and calcium antagonists (Table 3).

The C-statistic (area under the receiver operating characteristic curve) was 0.81 for ACE inhibitors and 0.85 for BB in the analysis that included all the variables listed in Table 2, together with CICU treatment, demonstrating that the models have a good level of discrimination between patients receiving each treatment.

A significant interaction ($P=.044$) was found between treatment and high-risk (Killip class I or EF<0.40%). Thus, different analyses are shown in Table 4: for all patients (no interaction), low-risk patients (Killip class I and EF≥40%, 3.1% 1-year mortality rate following discharge) and high-risk patients (Killip class >I or EF<40%, 12.8% 1-year mortality rate following discharge).

If we adjust the model for possible confounding variables detected in the univariate analysis, the data presented in Table 4 show an additional positive effect of ACE inhibitors combined with BB. Thus, in the

TABLE 2. Characteristics, Clinical Complications, Treatment, and Mortality Among Survivors From the Time of Hospital Discharge According to the Treatment Prescribed at This Time*

	None	ACE Inhibitors Only	BB Only	Both	P
Patients, n	1196	1143	1833	1225	
Age, mean±SD, y	65.5±12.79	69.8±11.41	60.6±12.30	63.5±12.13	<.001
Female, %	22.0	28.6	19.4	24.1	<.001
Diabetes, %	27.3	34.8	22.3	29.4	<.001
Smoking, %	44.8	36.8	51.2	48.4	<.001
Hypertension, %	38.2	54.3	40.9	50.9	<.001
Previous infarction, %	13.6	21.3	12.4	15.3	<.001
Previous revascularization, %	5.4	7.1	7.6	9.0	.008
ST-segment elevation/LBBB, %	65.3	69.8	66.4	74.2	<.001
Anterior location, %	32.9	48.0	35.0	55.3	<.001
Non-Q-wave AMI, %	38.6	35.1	34.7	30.1	<.001
Complications					
Killip class III-IV at the time of admission, %	6.0	11.6	2.1	5.6	<.001
Killip class II during admission, %	24.6	43.4	12.0	25.4	<.001
Repeat AMI, %	2.6	2.5	1.6	2.2	.198
Post-AMI angina, %	17.0	13.3	14.4	14.1	.064
VF/VT, %	5.6	6.7	4.4	6.5	.029
Advanced AV block, %	8.2	6.2	2.7	2.9	<.001
Flutter/AF, %	7.8	11.9	4.0	6.8	<.001
Mechanical complication, %	0.8	0.3	0.1	0.2	.003
EF<40%, %	11.7	24.8	5.7	15.0	<.001
Killip class >I or EF<40%, %	24.7	43.5	12.0	25.4	<.001
CICU treatment					
Primary reperfusion, %	40.0	41.7	50.1	52.3	<.001
Fibrinolysis, %	33.4	36.5	45.3	47.9	<.001
PTCA balloon/stent, %	6.6	5.2	4.8	4.4	.080
Treatment at the time of discharge					
Aspirin, %	77.9	81.3	89.1	86.1	<.001
Lipid-lowering agents, %	38.6	35.0	55.5	49.9	<.001
Nitrates, %	42.1	44.8	33.7	32.7	<.001
Calcium antagonists, %	32.8	20.3	9.1	5.5	<.001
Mortality per year, %	7.7	9.6	2.5	3.6	<.001

*PTCA indicates percutaneous transluminal coronary angioplasty; AV, atrioventricular; BB, beta-blockers; LBBB, left bundle branch block; SD, standard deviation; AF, atrial fibrillation; EF, ejection fraction; VF, ventricular fibrillation; AMI, acute myocardial infarction; CICU, cardiac intensive care unit, coronary unit.

group that includes all the patients, treatment with ACE inhibitors and BB was independently related to a significant reduction in mortality (HR=0.51; 95% CI, 0.32-0.82; $P=.005$), whereas the reduction found with ACE inhibitors only or BB only did not reach statistical significance. The same trend was observed in the low-risk group, since the lower probability of dying was obtained with the combination of drugs (HR=0.49 with ACE inhibitors-BB; HR=1.39 with ACE inhibitors only; HR=1.00 with BB only). The 3 treatments analyzed significantly reduced mortality in the high-risk group (Table 4).

DISCUSSION

The results of our study demonstrate that ACE inhibitors combined with BB yield a greater reduction in mortality than each drug group separately after 1-year follow-up in an unselected group of patients with AMI,

with or without ST-segment elevation, who survive the acute phase. This finding acquires importance given the scarcity of data on the additive effect of combined ACE inhibitors and BB begun during hospitalization, although the results of a registry cannot be considered definitive.

In recent years various drugs and therapies have demonstrated their efficacy in treating acute coronary syndrome. ACE inhibitors form one of the groups for which indications have possibly increased. In the 1996 treatment guidelines for AMI¹⁷ the prescription of ACE inhibitors was a class I recommendation in patients with previous AMI or with clinical acute CHF, as well as in patients with EF<40%. There was no clear recommendation regarding the use of long-term ACE inhibitors. In the guidelines for ST-segment elevation AMI published in 2004,⁸ the type I indications during hospitalization were not changed, although prescribing ACE inhibitors is accepted for all patients with AMI in the first 24 h, in the absence of contraindications (a class

TABLE 3. Characteristics, Clinical Complications, and Treatment at the Time of Hospital Discharge According to Vital Status per Year Among the Survivors*

	Alive per Year	Deaths per Year	P
Patients, n	5105	292	
Age, average±SD, y	63.8±12.6	73.7±9.9	<.001
Women, %	22.7	28.8	.017
Diabetes, %	26.9	41.1	<.001
Smoking habit, %	47.0	29.1	<.001
Hypertension, %	44.7	58.2	<.001
Previous infarction, %	14.5	28.1	<.001
Previous revascularization, %	7.5	6.2	.408
ST-segment elevation/LBBB, %	69.0	61.3	.006
Anterior location, %	41.7	45.5	.196
Non-Q-wave AMI, %	33.8	49.3	<.001
Complications			
Killip class III-IV at the time of admission, %	5.0	18.9	<.001
Killip class II during admission, %	22.6	57.4	<.001
Repeat-AMI, %	2.0%	3.4	.112
Post-AMI angina, %	14.6	17.1	.235
VF/VT, %	5.6	5.5	.905
Advanced AV block, %	4.6	5.8	.355
Flutter/AF, %	6.6	17.1	<.001
Mechanical complication, %	0.2	1.7	<.001
Treatment in CICU			
Primary reperfusion, %	47.8	26.4	<.001
Fibrinolysis, %	42.5	21.9	<.001
PTCA balloon/stent, %	5.3	4.5	.546
EF<40%, %	12.3	27.4	
Killip class >I or EF<40%, %	22.7	57.4	<.001
Treatment at time of discharge			
Nitrates, %	37.1	49.7	<.001
Calcium antagonists, %	15.7	20.2	.042
Aspirin, %	84.6	78.4	.005
Lipid-lowering agents, %	47.1	30.5	<.001
BB, %	58.1	30.8	<.001
ACE inhibitors, %	43.3	52.7	.002
BB and ACE inhibitors, %	23.0	15.1	.002

*PTCA indicates percutaneous transluminal coronary angioplasty; AV, atrioventricular; BB, beta-blockers; LBBB, left branch bundle block; SD, standard deviation; AF, atrial fibrillation, EF, ejection fraction; VF, ventricular fibrillation; AMI, acute myocardial infarction; CICU, cardiac intensive care unit, coronary unit.

IIA recommendation). ACE inhibitors are recommended at the time of discharge for all patients in the absence of contraindications (class I).

The new indication for the long-term administration of ACE inhibitors in patients without heart failure or EF<40% is supported by the results of the HOPE¹⁸ and EUROPA¹⁹ studies, although these are non-clinical trials started in the acute or subacute phase of AMI. The HOPE¹⁸ study included 9297 patients diagnosed with vascular disease or diabetes associated with another risk factor. Of these, 52.6% had an old myocardial infarction, and only 8.1% presented

EF<40% in an echocardiographic substudy (patients with CHF were excluded from the study). Treatment with 10 mg/day ramipril over a mean follow-up of 5 years reduced cardiovascular mortality from 17.8 to 6.1% ($P<.001$). At baseline 39% of the patients received BB. In the EUROPA¹⁹ study, 12 218 patients with chronic ischemic cardiopathy (64% with previous infarction) and without evidence of CHF, were randomized to receive 8 mg of perindopril or placebo. After an average follow-up of 4.2 years, mortality in the placebo group was 4.1%, versus 3.5% in the treatment group ($P=.10$), although the combined assessment criterion showed a significant reduction with the drug (10% vs 8%; $P=.0003$). Some 62% of the patients received BB.

However, in a later clinical trial, the PEACE study,²⁰ which was carried out with trandolopril in patients with chronic ischemic cardiopathy and EF>40%, no benefit was found after a 4.8 year follow-up in a population similar to that of the EUROPA study (55% with a previous infarction and 60% with BB). A recently published case-control study²¹ did not demonstrate a greater reduction in mortality in patients with ischemic cardiopathy, already treated with aspirin, statins, and BB, by the addition of ACE inhibitors. Thus, it is understandable that some clinical practice guidelines have questioned the general prescription of ACE inhibitors in patients with AMI,⁹ including non-ST-segment elevation AMI.²²

However, a recent metaanalysis of the HOPE, EUROPA, and PEACE studies²³ found a significant reduction in mortality. This outcome was only achieved in the high-risk subgroup in our registry, although our patients began treatment in the acute phase rather than in the chronic, as in the trials cited. Furthermore, follow-up was only for 1 year, which was insufficient time to show a beneficial effect in these studies.

We verified the additive effect of combined BB and ACE inhibitors in a non-selected patient population with recent AMI, which included 75% of patients without CHF or EF<40%, showing that the combination of BB and ACE inhibitors yielded a reduction in mortality not achieved by these drugs separately. These data agree with the current trends in treatment for post-infarction patients. Although we are unaware of any study with a design similar to ours, there is increasing evidence that better compliance to clinical practice guidelines leads to better prognosis in patients with AMI.^{12,24}

The combination of ACE inhibitors plus BB yielded the greatest reduction in mortality in the low-risk subgroup, but without reaching statistical significance. On the other hand, in the high-risk subgroup, BB only, ACE inhibitors only, and their combination significantly reduced mortality. The additive effect of the combination on high-risk patients has been reported in a post-infarction registry of patients >65 years old with systolic dysfunction.²⁵ This was confirmed in the CAPRICORN

TABLE 4. Effect of Angiotensin-Converting Enzyme Inhibitors and Beta-Blockers Administered at the Time of Discharge on 1-Year Mortality Among Survivors From the Time of Discharge*

	All Patients (n=5,397)		Low-Risk Patients (Killip Class =I and EF≥40%) (n=4080)		High-Risk Patients (Killip Class I or EF<40%) (n=1317)	
	HR (95% CI)	P	HR (95% CI)	P	HR (95% CI)	P
PS for BB at the time of discharge	0.93 (0.47-1.85)	.831	1.11 (0.39-3.20)	.845	0.82 (0.33-2.05)	.671
PS for ACE inhibitors at the time of discharge	1.51 (0.77-2.97)	.234	1.06 (0.36-3.10)	.921	1.89 (0.77-4.65)	.167
Age	1.06 (1.04-1.07)	.001	1.06 (1.03-1.08)	.001	1.05 (1.03-1.08)	.001
Female	0.68 (0.49-0.96)	.027	0.68 (0.39-1.19)	.177	0.67 (0.43-1.03)	.070
Diabetes	1.27 (0.95-1.68)	.102	1.25 (0.79-1.98)	.332	1.25 (0.87-1.80)	.224
Smoking habit	0.97 (0.70-1.35)	.867	0.96 (0.59-1.57)	.879	0.96 (0.61-1.51)	.866
Hypertension	1.30 (0.97-1.74)	.082	1.47 (0.93-2.31)	.098	1.22 (0.82-1.80)	.321
Anterior infarction	1.28 (0.92-1.77)	.147	1.80 (1.11-2.93)	.018	0.99 (0.63-1.55)	.971
ST-segment elevation/LBBB	1.43 (1.00-2.03)	.048	1.20 (0.70-2.07)	.504	1.57 (0.98-2.53)	.063
Non-Q-wave AMI	1.50 (1.06-2.10)	.020	1.52 (0.90-2.57)	.113	1.51 (0.95-2.39)	.079
VF/VT in CICU	1.07 (0.59-1.95)	.820	-	-	1.44 (0.77-2.67)	.251
Flutter/AF	1.35 (0.93-1.97)	.113	1.11 (0.45-2.77)	.822	1.34 (0.88-2.04)	.172
Mechanical complication	2.83 (0.86-9.23)	.085	-	-	3.47 (1.02-11.81)	.047
Killip class >I or EF<40%	2.64 (1.91-3.65)	.001	-	-	-	-
Treatment in CICU						
Primary reperfusion	0.47 (0.33-0.68)	.001	0.46 (0.26-0.84)	.011	0.50 (0.31-0.79)	.003
Treatment at the time of discharge						
Nitrates	1.05 (0.80-1.39)	.718	0.82 (0.53-1.27)	.373	1.27 (0.88-1.84)	.204
Calcium antagonists	0.99 (0.67-1.46)	.953	1.61 (0.92-2.83)	.095	0.60 (0.33-1.09)	.094
Aspirin	1.08 (0.76-1.53)	.668	0.83 (0.48-1.43)	.493	1.21 (0.77-1.91)	.408
Lipid-lowering agents	0.85 (0.63-1.15)	.292	0.91 (0.58-1.43)	.696	0.80 (0.53-1.21)	.294
ACE inhibitors only	0.78 (0.54-1.12)	.178	1.39 (0.75-2.59)	.293	0.58 (0.37-0.90)	.015
BB only	0.67 (0.43-1.05)	.083	1.00 (0.52-1.93)	.989	0.42 (0.20-0.86)	.018
ACE inhibitors+BB	0.51 (0.32-0.82)	.005	0.49 (0.21-1.15)	.100	0.54 (0.31-0.96)	.034

*PTCA indicates percutaneous transluminal coronary angioplasty; BB, beta-blockers; LBBB, left bundle branch block; AF, atrial fibrillation; EF, ejection fraction; VF, ventricular fibrillation; AMI, acute myocardial infarction; PS, propensity score; CICU, cardiac intensive care unit, coronary unit.

clinical trial with carvedilol in patients with AMI, with or without CHF, and EF≤40% treated with ACE inhibitors and aspirin.¹⁴ The reduced effect in our study can be attributed to the difference between the populations analyzed. In the study by Shilapka et al²⁵ mortality due to acute events from the time of discharge to 1 year was 30% versus 12.8% in our high-risk patients. It cannot be ruled out that the BB used may not be the most effective means for treating patients with CHF or depressed EF, now that we know that there are differences between them.²⁶

Study Limitations

Our results are based on the PRIAMHO II registry which included patients with AMI admitted to the CICU. Thus, the patients were not randomly distributed. The different treatments prescribed were based on the criteria of the acting physician and we do not have data on contraindications or adverse drug effects. Neither do we know the specific active ingredients or dose. Furthermore, we lack information on whether changes were introduced regarding treatment during the follow-up year.

The new definition of AMI was published in September 2000²⁷ and coincided with the final part of our study. Thus, it could not be included in patient selection criteria.

CONCLUSIONS

In an unselected patient population with AMI, with or without ST-segment elevation, the prescription of BB and ACE inhibitors at the time of hospital discharge demonstrates additive effects on 1-year survival, which supports their prescription to all the post-infarction patients without contraindications, although their effect is more pronounced in the high-risk subgroup.

APPENDIX. RESEARCHERS PARTICIPATING IN PRIAMHO II (PROYECTO DE REGISTRO DE INFARTO AGUDO DE MIOCARDIO HOSPITALARIO)

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