Heart rate during myocardial infarction: Relationship with one-year global mortality in men and women

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BACKGROUND: Elevated heart rate (HR) has been found to be related to an increased death rate in patients with acute myocardial infarction (AMI), but sex differences and optimal timing for HR measurement have not been sufficiently investigated.
OBJECTIVES: To verify the predictive value of HR for one-year mortality in a cohort of subjects hospitalized for AMI, with men and women considered separately.
PATIENTS AND METHODS: HR was measured in 424 patients (303 men and 121 women) with constant sinus HR, on the first, third and seventh days after hospital admission for AMI. Clinical and laboratory data were obtained on the same days. All patients were followed up for one year.
RESULTS: Among the men, the one-year mortality rate was 5% for the subjects with a seven-day HR of less than 80 beats/min, and the one-year mortality rate was 39% for patients with a seven-day HR of 80 beats/min or more (P<0.0001). Among the women, the differences in mortality related to HR were not significant. In a multivariate Cox regression analysis, the relative risks of mortality in men who had an HR of 80 beats/min or more were 3.1 (CI=1.4 to 7.0, P=0.003) on the first day, 4.1 (CI=1.8 to 9.8, P=0.001) on the third day and 8.6 (CI=2.9 to 27.0, P<0.0001) on the seventh day. In the 203 men in whom echocardiographic left ventricular ejection fraction was measured, an interactive effect of high HR with depressed ejection fraction on mortality was found. Beta-blocking therapy influenced HR during AMI but did not influence the HR-mortality association.
CONCLUSIONS: The results of the present prospective study show that HR measured during the first week after admission for AMI is an important predictor of mortality in men. The predictive power of HR increased from the first to the seventh day after AMI.

Key Words: *Autonomic nervous system; Heart rate; Mortality; Myocardial infarction; Sex*

Résumé à la page suivante

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Le rythme cardiaque pendant un infarctus du myocarde : Le lien avec le taux de mortalité global au bout d'un an chez les hommes et les femmes

HISTORIQUE : On a découvert qu'un rythme cardiaque (RC) élevé est relié à une augmentation du taux de décès chez les patients souffrant d'un infarctus myocardique aigu (IMA), mais les différences entre les sexes et le moment optimal pour mesurer le RC n'ont pas fait l'objet d'une exploration suffisante.

OBJECTIFS : Vérifier la valeur prédictive du RC relativement au taux de mortalité au bout d'un an, auprès d'une cohorte de sujets hospitalisés par suite d'un IMA, les hommes et les femmes étant évalués séparément.

PATIENTS ET MÉTHODOLOGIE : Le RC de 424 patients a été mesuré (303 hommes et 121 femmes), selon un RC sinusal constant, le premier, le troisième et le septième jour après une hospitalisation pour cause d'IMA. Les données cliniques et de laboratoire étaient obtenues le même jour. Tous les patients ont été suivis pendant un an.

RÉSULTATS : Chez les hommes, le taux de mortalité au bout d'un an s'élevait à 5 % chez les sujets dont le RC à sept jours était inférieur à 80 battements à la minute, tandis qu'il correspondait à 39 % chez ceux dont le RC à sept jours était équivalent ou supérieur à 80 battements à la minute ($P < 0,0001$). Chez les femmes, les différences de taux de mortalité relié au RC n'étaient pas significatives. Selon une analyse de régression de Cox, les risques relatifs de mortalité chez les hommes dont le RC était d'au moins 80 battements à la minute s'élevaient à 3,1 (IC=1,4 à 7,0, P=0,003) le premier jour, à 4,1 (IC=1,8 à 9,8, P=0,001) le troisième jour et à 8,6 (IC=2,9 à 27,0, P<0,0001) le septième jour. Pour les 203 hommes chez qui on a mesuré la fraction d'éjection du ventricule gauche par échocardiographie, une combinaison du RC élevé et de dépression de la fraction d'éjection était constatée au décès. Un traitement aux béta-bloquants influait sur le RC pendant l'IMA, mais non sur l'association entre le RC et le taux de mortalité.

CONCLUSIONS : Les résultats de la présente étude prospective révèlent que le RC mesuré dans la semaine suivant une hospitalisation consécutive à un IMA représente un prédicteur important de mortalité chez les hommes. La puissance prédictive du RC augmente entre le premier et le septième jour suivant un IMA.

In recent years, evidence has been accumulating that a high heart rate (HR) is an important risk factor for cardiovascular and all-cause mortality in the general population (1-4). The HR-mortality association has generally been found to be stronger among men than women (5,6). More recently, elevated HR has also been found to be related to an increased death rate in patients with acute myocardial infarction (AMI) (7-16). However, most studies have taken into account HR at hospital admission or at discharge (8-11), and the time course of HR during the acute phase of myocardial infarction was not related to subsequent mortality.

The purpose of the present study was to evaluate the prognostic significance of resting HR in patients with AMI independently of clinical or echocardiographic signs of left ventricular pump dysfunction, and to verify whether the time course of HR during the first week after AMI might add further prognostic information to the average HR value.

PATIENTS AND METHODS

Patients

Five-hundred two unselected patients consecutively admitted to three intensive care units – Adria General Hospital, Bassano del Grappa General Hospital and Conegliano General Hospital, Italy) for AMI were prospectively studied. Patients gave informed consent and were interviewed by a physician who completed a standard record form of the details of the patient's medical history. The study was approved by the ethics committees of the three hospitals. The criterion for AMI diagnosis was the fulfillment of at least two of the following: central chest pain lasting longer than 30 min, typical changes in serum enzyme levels (total creatine kinase [CK], CK isoform MB, aspartate aminotransferase and lactate dehydrogenase), typical electrocardiogram (ECG) changes with occurrence of pathological Q-waves and/or localized ST-T changes in at least two contiguous leads (17).

Blood pressure was measured using a mercury sphygmomanometer with a cuff of appropriate size. The mean of three recordings was used. The presence and degree of heart failure were assessed on the first, third and seventh days after admission after the Killip classification (18).

With the patient lying supine since awakening, HR was measured by palpation of the radial pulse over a 60 s period on the first, third and seventh days after admission, between 07:00 and 08:00. Furthermore, HR was taken from a standard ECG. Because the HR measured from the ECG provided similar results, only data related to HR measured from the radial pulse are shown.

To evaluate left ventricular ejection fraction (LVEF), a two-dimensional echocardiogram was performed in 346 patients between the third and seventh days after admission. Patients were examined lying in the left lateral position. Four- and two-chamber apical views were recorded on VHS cassettes and sent to the Conegliano Veneto Hospital, where they were examined by two physicians who had no knowledge of the patients' clinical data (19). The percentage LVEF was determined according to Simpson's method (20). Other details on patients' characteristics and methods of measurement were reported elsewhere (19). Thirty subjects were not analyzed because the echocardiographic images were technically unsatisfactory. Thus, LVEF was obtained for 316 patients.

Six patients with artificial pacemakers and 59 others with paroxysmal or chronic atrial fibrillation, or atrial flutter, were excluded. Of the subjects with constant sinus pacemaker during the seven days of the study, five were excluded because they had neoplastic disease and eight were excluded because of incomplete data collection. Thus, 424 subjects were analyzed. For 39 subjects, seventh-day data were not available because of early discharge or death.

TABLE 1
Clinical characteristics of the patients according to sex in a study of heart rate during myocardial infarction and the relationship with one-year global mortality in men and women

Variable	Men (n=303)	Women (n=121)	P
Age, years (mean ± SD)	63±11	72±11	<0.0001
Prior AMI, n (%)	68 (22)	25 (21)	NS
Prior angina, n (%)	58 (19)	30 (25)	NS
Current smokers, n (%)	146 (48)	26 (21)	<0.0001
Diabetic patients, n (%)	62 (20)	41 (34)	0.004
Hypertensive patients, n (%)	115 (38)	77 (64)	<0.0001
SBP (mmHg)	123±18	122±18	NS
DBP (mmHg)	75±11	72±12	0.03
Total cholesterol levels (mmol/L)	210±53	221±48	0.04
HDL cholesterol levels (mmol/L)	44±11	46±12	NS
Triglyceride levels (mmol/L)	154±114	153±92	NS
Creatine kinase isoform MB peak levels (U/L)	173±137	155±170	NS
Non-Q wave AMI, n (%)	77 (25)	38 (32)	NS
Heart failure (first week), n (%)	85 (28)	59 (49)	<0.0001
LVEF (%)	51±12	52±13	NS
Arrhythmias (%)	98 (32)	35 (29)	NS
Thrombolysis (%)	136 (45)	38 (31)	0.01
Beta-blockers (%)	144 (47)	38 (31)	0.002
NDP ca-antagonists (%)	54 (18)	24 (20)	NS

AMI Acute myocardial infarction; DBP Diastolic blood pressure; HDL High density lipoprotein; LVEF Left ventricular ejection fraction; n Number; NDP ca-antagonists Nondihydropyridine calcium antagonists; NS Not significant; SBP Systolic blood pressure

Follow-up

One year after being recruited, patients were called for a clinical check-up. For those who had died in hospital, the date and cause of death were obtained from hospital records (including postmortem report, when available). Mortality data after discharge were obtained from clinical records or the patient's physician. No patient was lost to follow-up.

Statistical analysis

Statistical analysis was carried out with the Systat 7.0 for Windows package (SPSS Inc, USA) and JMP 3.1.4 for Windows (SAS Institute Inc, USA). HR cut-off values were determined by using the MedCalc version 4.16H for Windows receiver operating characteristic curve analysis (MedCalc, USA). Differences in mean values were tested with unpaired Student's *t* tests. Proportions were compared with Pearson χ^2 and Fisher's exact tests (two-tail) where indicated. Variables significantly associated in correlation analysis with HR were entered as independent variables in a forward, step-wise multiple regression analysis, with HR as the dependent variable (minimum tolerance for entry into model 0.01; alpha to enter and alpha to remove 0.15). All analyses were sex-specific.

The associations between HR and time until death were analyzed separately for the two sexes using the Kaplan Meier life table procedure. The associations between HR and time to mortality, with other variables controlled, were then assessed using the Cox proportional hazards regression model (21). Analyses were performed using a significance level of alpha=0.05 (two-sided). The categorical variables were grouped into classes such that having diabetes or being a current smoker etc, scored 1, and the opposite class scored 0. Killip class was considered to be a four-class variable. HR was entered into the Cox model as a continuous variable, while for the relative risk estimate, HR was considered to be categorical. The risk factors considered in the model were entered into a first model. This model was reduced by removing the variable causing the least change in significance. This procedure was continued until no further variables could be removed without producing a significant change in the model (21). A final model was developed in which HR was entered as the first variable and was then adjusted for all variables that were found to be significant in the previous backward elimination model. Relative odds and corresponding two-sided

TABLE 2
Heart rate (HR) classified by sex on the first, third and seventh days after admission of patients who survived and those who did not in a study of HR during myocardial infarction and the relationship with one-year global mortality

	First day HR (beats/min)	Third day HR (beats/min)	Seventh day HR (beats/min)
Men			
Total (n=303)	71±13	69±13	67±11
Alive (n=270)	70±12	68±11	66±9
Dead (n=33)	80±16	81±17	79±17
P*	<0.0001	<0.0001	<0.0001
Women			
Total (n=121)	80±17	77±14	72±11
Alive (n=88)	78±16	76±14	71±10
Dead (n=33)	87±18	81±15	74±13
P*	0.02	NS	NS

**Comparisons between patients who remained alive and those who died. Data adjusted for age and beta-blocking therapy and are expressed as mean ± SD*

95% CIs were derived from the regression coefficients in the Cox model.

The significance of the effects of HR and LVEF on total mortality in men was assessed from F-ratios with a two-way ANCOVA (tertiles of heart rate × tertiles of ejection fraction) after adjusting for age and CK isoform MB peak levels (continuous variables), and sex, presence of diabetes, history of hypertension, smoking status, history of angina, Killip class, thrombolysis and beta-blocking therapy (categorical variables).

Data are presented as mean ± SD. P values are two-tailed. Statistical significance was established at $P<0.05$.

RESULTS

The main clinical characteristics of the patients according to sex (303 males and 121 females) are reported in Table 1. The women were older than the men, were more frequently diabetic and hypertensive, and were less often treated with thrombolytic and beta-blocking therapy. Clinical signs of heart failure were more common in the women, while LVEF did not differ between the sexes.

HR was higher in the women over the first week of hospitalization (the P value was adjusted for age and beta-blocking therapy, and was $P<0.0001$ on the first and the third days, and $P=0.005$ on the seventh day) (Table 2).

HR decreased from the first to the seventh day in the men who survived, while it remained unchanged in the men who died during the year of follow-up (Table 2). No such difference was observed between women who died and those who survived.

In a multiple regression analysis, Killip class and LVEF independently correlated with HR throughout the week of the study in the men ($P<0.0001$ for all days for both Killip class and LVEF). Thrombolysis and beta-blocking therapy were also related to HR (in a negative fashion, $P<0.05$) on the third and seventh days, as were CK isoform MB peak levels ($P<0.01$ on both days). Blood pressure was associated with HR on the first day ($P<0.001$ for both systolic and diastolic blood pressure) but not on the third and seventh days. Variables that were not associated with HR in men included age, diabetes mellitus and nondihydropyridine calcium antagonist therapy. In the women, Killip class, LVEF and beta-blocking therapy had similar relationships to HR as those for the men, while among the other variables, only diabetes mellitus was significantly related to HR ($P<0.001$ on the first and third days).

One-year mortality

Thirty-three (11%) men and 33 (27%) women died within one year of enrolment in the study. The causes of death were heart failure and/or cardiogenic shock in 20 patients (seven men, 13 women), reinfarction in eight (six men, two women), ventricular septum or free wall rupture in seven (five men, two women), stroke in five (two men, three women) and sudden death in 18 (10 men, eight women). Eight patients died due to other cardiac causes (one man, one woman) or noncardiac causes (two men, four women).

In Table 2, the mean HRs in the men and the women who died are compared with those of the survivors. HR was higher in the men who died than in those who survived throughout the first week of hospitalization, while among the women, the difference in HR was significant only on the first day.

The receiver operating characteristic curve analysis showed that, for both sexes, the HR cut-off value that best discriminated between the patients prone to death and those who survived was approximately 80 beats/min for all days. Therefore, the men and women were grouped according to whether they had an HR of less than 80 beats/min or an HR of 80 beats/min or more. Among the men, mortality

TABLE 3
One-year mortality rate in men and women according to heart rate (HR) on the first, third and seventh days after admission to hospital in a study of HR during myocardial infarction and the relationship with one-year global mortality in men and women

	Men (n=303)		Women (n=121)	
	HR<80 beats/min	HR≥80 beats/min	HR<80 beats/min	HR≥80 beats/min
First day				
Alive (%)	201 (94)	69 (77)	44 (80)	44 (67)
Dead (%)	12 (6)	21 (23)	11 (20)	22 (33)
	χ^2:20.4, P<0.0001		NS	
Third day				
Alive (%)	229 (95)	41 (67)	52 (78)	36 (67)
Dead (%)	13 (5)	20 (33)	15 (22)	18 (33)
	χ^2:37.7, P<0.0001		NS	
Seventh day				
Alive (%)	228 (95)	23 (61)	66 (79)	18 (62)
Dead (%)	11 (5)	15 (39)	18 (21)	9 (37)
	χ^2:46.9, P<0.0001		NS	

NS Not significant

TABLE 4
Results of Cox survival analysis for heart rate in the men (entered as a continuous variable) recorded on the first, third and seventh days after admission to hospital, in a study of heart rate during myocardial infarction and the relationship with one-year global mortality

	First-day-heart rate		Third-day heart rate		Seventh-day heart rate	
Model	χ^2	P	χ^2	P	χ^2	P
Univariate	16.0	<0.0001	32.7	<0.0001	30.3	<0.0001
Age adjusted	13.0	0.0003	28.2	<0.0001	29.2	<0.0001
Multivariable	4.5	0.03	9.9	0.001	11.6	0.0007

rate was higher in the group with an HR of 80 beats/min or more than in the rest of the cohort on the three days of the study. Similar trends were observed among the women, but the differences were not significant (Table 3).

Survival analysis

At univariate Cox regression analysis, HR (as a continuous variable) was a significant predictor of mortality in the men (P<0.0001 for all days) (Table 4). The HR-mortality association remained highly significant after adjustment for age. Unadjusted relative risks of mortality for the men with an HR of 80 beats/min or more are reported in Table 5. A tendency of increased risk was observed from the first to the seventh day of hospitalization. The predictive power of HR remained virtually unchanged after adjustment for age. Figure 1 shows the Kaplan Meier survival curves related to seventh-day data in the men. Among the women, HR was not a significant predictor of outcome.

HR was an independent predictor of one-year mortality in the men in a multivariate Cox proportional hazards regression analysis that included HR, difference in HR from the first to the seventh day, age, sex and CK isoform MB peak levels as continuous variables, and the presence of diabetes, history of hypertension, smoking status, history of angina, Killip class, thrombolysis and beta-blocking therapy as categorical variables (Table 4). Again, the relative risk of mortality progressively increased from the first to the seventh day (Table 5). Other independent predictors of death in the seventh-day model were HR decline from first to seventh day (in a negative fashion, P=0.006), age (P=0.04), CK isoform MB peak levels (P=0.005), thrombolysis (in a negative fashion, P=0.02) and diabetes (P=0.01). The inclusion of systolic and diastolic blood pressures in the model did not change the results of the Cox analysis.

The predictive power of HR improved when the average of the three day measurements of the study were used

TABLE 5
Relative risks (RR) for one-year mortality in the men with a heart rate of 80 beats/min or more on the first, third and seventh days after admission to hospital in a study of heart rate during myocardial infarction and the relationship with one-year global mortality

	First-day heart rate		Third-day heart rate		Seventh-day heart rate	
Model	RR (95% CI)	P	RR (95% CI)	P	RR	RR (95% CI)
Univariate	4.6 (2.3-9.6)	0.0004	7.3 (3.6-15.0)	<0.0001	10.7 (4.9-23.9)	<0.0001
Age adjusted	4.3 (2.1-9.0)	0.0003	6.8 (3.4-14.1)	<0.0001	8.9 (4.0-20.4)	<0.0001
Multivariable	3.1 (1.4-7.0)	0.003	4.1 (1.8-9.8)	0.001	8.6 (2.9-27.0)	<0.0001

CL Confidence limit

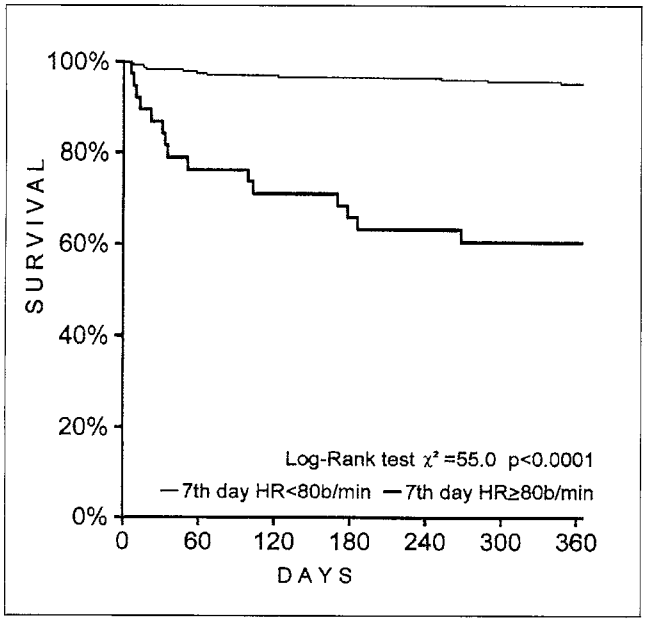

Figure 1) *Kaplan Meier survival curves for one-year total mortality in 303 men stratified by seventh-day heart rate (HR) in a study of HR during myocardial infarction and the relationship with one-year global mortality in men and women. b/min Beats/min*

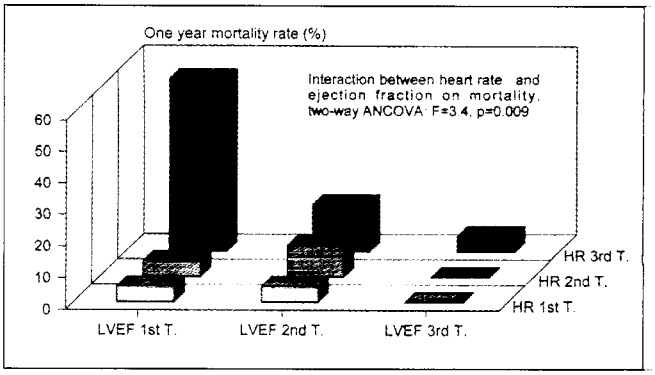

Figure 2) *Mortality rate in 203 men stratified according to tertiles (T) of echocardiographic left ventricular ejection fraction (LVEF) and Ts of resting heart rate (HR) measured on the seventh day after admission to hospital in a study of HR during myocardial infarction and the relationship with one-year global mortality in men and women*

in the multivariable Cox model (χ^2=21.6, P<0.0001). When the highest HR value recorded during the first week after admission was used, the strength of the association with mortality was not greater than that for seventh-day data. When the subjects who died from heart failure were excluded from the analysis, HR remained a strong predictor of mortality in the men (data not shown).

In the subset of men with echocardiographic LVEF, HR maintained its predictive power for one-year mortality on the three days of the study (P=0.02, P<0.0001 and P<0.0001 on the first, third and seventh days, respectively). Two-way ANCOVA revealed that both HR and LVEF (P=0.005 and P=0.04, respectively, on the seventh day) had a significant effect on mortality (Figure 2). Furthermore, a significant interaction was found between high HR and depressed ejection fraction on mortality (P=0.009 on the seventh day); this mortality was 55% in the subjects who had an HR greater than 72 beats/min and an ejection fraction of less than 47%, and was 0% in the subjects who had an HR less than 62 beats/min and an ejection fraction greater than 58% (Figure 2). A similar trend was found for third-day data.

Influence of beta-blocking therapy

One-hundred eighty-two patients (144 men and 38 women) received beta-blocking therapy. Atenolol was used in 82% of the patients (the dose ranged from 2.5 to 15 mg/day for intravenous administration and ranged from 50 to 200 mg/day for oral administration). Other beta-blockers used were propranolol, metoprolol and sotalol. Patients receiving beta-blockers were younger than those not receiving beta-blockers (61±12 versus 69±11 years, P<0.0001) had fewer clinical signs of heart failure (21% versus 44%, P<0.0001), and had a slightly greater percentage LVEF (53±10% versus 50±13%, P=0.06). The HR in the patients stratified by beta-blocking therapy and sex is reported in Table 6. Generally, there was a 5 beats/min

TABLE 6
Heart rate (HR) of men and women, and in subjects with an HR greater than 80 beats/min according to beta-blocking therapy on the first, third and seventh days after admission in a study of HR during myocardial infarction and the relationship with one-year global mortality

	Mean HR			Subjects with HR >80 beats/min (%)		
	Beta-blockers	No beta-blockers	P	Beta-blockers	No beta-blockers	P
Men						
First-day HR	68±11	72±14	0.001	20	35	0.006
Third-day HR	65±11	71±13	<0.0001	8	27	<0.0001
Seventh-day HR	65±8	68±12	0.007	7	17	0.02
Women						
First-day-HR	75±15	82±17	0.065	35	59	0.03
Third-day-HR	75±15	79±14	NS	33	48	NS
Seventh-day-HR	66±9	72±10	0.005	9	26	NS

Data are mean ± SD and percentage

difference between men and women taking beta-blockers compared with those not taking these drugs.

To exclude the possible influence of beta-blocker use on the results, multivariable Cox analysis was repeated after eliminating the men who were taking beta-blocking therapy (n=144). In the patients not taking beta-blockers (n=159), the HR predictive power was similar to that for the entire group.

In the multivariable Cox model, beta-blocking therapy did not predict survival in either men or women.

The mortality rate in the patients with an HR of less than 80 beats/min had a tendency to be slightly higher among those not receiving beta-blocking therapy than among those who did; however, after controlling for age and sex, the difference was no longer significant (P=0.9).

DISCUSSION

Mounting evidence indicates that a fast HR is associated with an increased risk of cardiovascular morbidity and mortality in the general population (1-4). This relationship has been found at all ages (3) and also among people with hypertension (22). In postmyocardial infarction patients, HR has received comparatively less attention as a risk factor for mortality, because in these subjects, high HR was generally thought merely to reflect depressed left ventricular function (7). Yet, evidence that HR is related to the development of life-threatening ventricular arrhythmias, and that tachycardia rather than bradycardia is associated with increased mortality in patients with AMI, was provided long ago (23).

The present results indicate that HR is a potent predictor of mortality in post-AMI men irrespective of clinical signs of heart failure and echocardiographic assessment of left ventricular pump dysfunction. Several studies have demonstrated the predictive value of HR in AMI, but not independently of other factors, such as Killip class or LVEF (7,8,24). In the present report, HR showed the greatest predictive power in the patients with pump dysfunction: among the men with a LVEF of less than 47%, one-year total mortality was 55% in those with an HR greater than 72 beats/min, and was 5% in the men with a HR less than 62 beats/min (Figure 2).

A trend of increasing mortality with higher HR was also found among the women but the results did not attain the level of statistical significance, possibly due to the smaller number of women enrolled in the present study. On the other hand, a weaker predictive power of HR for cardiovascular mortality in women has been reported in several clinical conditions (3,5,6,22), including AMI (10). A high HR has been considered to be a marker of heightened sympathetic activity and low vagal tone, which is a condition that favours the occurrence of life-threatening ventricular arrhythmias (25). As shown by results obtained in general populations (3,6), this mechanism operates mostly in men.

One might wonder whether the better prognosis of the subjects with lower HR in the present study was at least partially due to a protective effect of beta-blockers or because of the clinical characteristics of the subjects taking these drugs. In the present population, subjects who received beta-blockers were younger and had fewer signs of congestive heart failure than subjects not taking beta-blockers, and these subjects had an HR that was 5 beats/min lower. However, in agreement with the results found by others (7), the HR variable, but not beta-blocker use, entered the multivariable analysis of mortality. Moreover, the predictive value of HR for mortality held true in the group of men not taking beta-blockers.

Timing for measurement

Another aspect that needs to be clarified is the optimal timing for HR to be measured after AMI. Our results show that HR is predictive of mortality in men starting

from the first day after hospital admission and that its predictive value reaches its peak on the seventh day. The mean of the three measurements had a greater predictive power than each of the single measurements. Not only the absolute value of HR, but also the change in HR from the first to the seventh day of hospital admission, was predictive of mortality in men – the smaller the decline in HR the worse the prognosis. This issue has been neglected by previous investigators. In the Global Utilization of Streptokinase and TPA for Occluded Coronary Arteries (GUSTO-I) and Secondary Prevention Reinfarction Israeli Nifedipine Trial (SPRINT-2) studies (8,10), only HR at entry was related to subsequent mortality, while in the Gruppo Italiano per lo Studio della Streptochinasi nell'Infarto miocardico (GISSI-2) study (9), only predischarge HR was assessed as a predictor of six-month mortality. Both admission and predischarge HRs were found to be significant predictors of mortality in the study by Hjalmarson et al (7), but the predictive power of the two values was not compared, and the difference in HR between admission and discharge was not taken into account.

CONCLUSIONS

The results of this prospective study in patients with AMI who had constant sinus HR over the first week of hospitalization show that HR measured from the first to the seventh day after admission is an important predictor of mortality in men, irrespective of clinical and echocardiographic signs of left ventricular dysfunction.

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