Original Article

Gender Influence on the Immediate and Medium-Term Progression after Primary Percutaneous Coronary Intervention and Analysis of Independent Risk Factors for Death or Events

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Objective

Determine gender-related differences and risk factors for death and events, both in-hospital and at six-month evolution, of patients admitted within the first twelve hours of ST-segment elevation acute myocardial infarction and who underwent primary percutaneous coronary intervention.

Methods

Between July 1998 and December 2000, 199 consecutive patients were enrolled in the study, with elevation myocardial infarction and without cardiogenic shock, outcome, in-hospital and six-month progression were studied.

Results

Clinical characteristics were similar in both groups, except that women were older than men (67.04 ± 11.53 x 59.70 ± 10.88, $p < 0.0001$). In-hospital mortality was higher among women (9.1% x 1.5%, $p = 0.0171$), as was the incidence of major events (12.1% x 3.0%, $p = 0.0026$). The difference in mortality rates remained the same at six months (12.1% x 1.5%, $p = 0.0026$). The multivariate analysis predicted death: female gender and an age over eighty years, and major events and/or stable angina multivessel: disease and severe ventricular dysfunction.

Conclusion

Female gender and an age over eighty years were independent predictors of mortality, six months of patients who had undergone primary percutaneous intervention.

Key words

Primary coronary angioplasty, acute myocardial infarction, gender, risk factors.

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On average, women present with first symptoms of coronary disease ten years after men do, and they are more likely to present with stable angina than acute infarction or sudden death, which are initial symptoms more likely to occur among men[1,2,3]. Between 45 and 64 years of age, annual mortality rates are higher (2.5 to 4.5 fold) among women[4] due to undetermined causes.

In acute myocardial infarction, in-hospital mortality is higher among women[5], they take longer to seek medical care and are treated more conservatively[2]. With fibrinolytics, the survival benefit is the same for men and women; however, the difference of the in-hospital mortality rates remains unchanged, although the prognosis seems to be similar for patients who undergo primary percutaneous coronary intervention[2]. In the long run, mortality rates are similar, but women are likely to progress with more angina and congestive heart failure[6].

Compared to disease management with fibrinolytic agents, primary percutaneous coronary intervention decreases mortality[7]. The use of stents[8,9] provides improvements in results, complications, and event-free survival. The use of glycoprotein IIb/IIIa inhibitors offers conflicting results[10,11]. The time of delay until recanalization with primary percutaneous coronary intervention is strongly associated with disease progression, mortality within thirty days[12], and left ventricle ejection fraction[13].

The goal of this study was to determine the risk factors for death and major events, for major events and/or stable angina, and the influence of gender on clinical progress in-hospital and at six months of 199 patients admitted within the first twelve hours of ST-segment elevation acute myocardial infarction, and treated with primary percutaneous coronary intervention.

Methods

Between July 1, 1998 and December 31, 2000, 199 consecutive patients diagnosed with ST-segment elevation acute myocardial infarction within the first twelve hours of symptom onset underwent primary percutaneous coronary intervention and were prospectively followed. Since with balloon angioplasty or conventional stenting restenosis takes place within three months and, at the latest, six months after hospital discharge, 90.8% of the male patients and 95.0% of the female patients were followed for clinical symptoms during six months after hospital discharge. The clinical follow-up ended on June 30, 2001; at three and six months, patients underwent clinical examinations or their clinical status was checked by telephone conversation.

Inclusion criteria were ST-segment elevation acute myocardial infarction of 1 mm minimum in at least two contiguous leads, that did not recede with acetylsalicylic acid or sublingual nitroglycerin administration within twenty minutes, and hospital admission within the twelve hours of symptoms onset. Exclusion criteria were cardiogenic shock, acute left coronary artery stem lesion, previous administration of fibrinolytics, and mechanical complications requiring immediate surgical treatment.

All patients were given acetylsalicylic acid combined with ticlopidine or clopidogrel. During the coronary intervention, heparinization was performed according to TCA. The administration of glycoprotein IIb/IIIa inhibitors at the beginning of the procedure was left to operator's discretion. In case of a slow flow/no-reflow phenomenon[14,15] adenosine was administered. Judkins[16] technique was the preferred choice for the procedure. Stenting was used whenever technical conditions allowed, and stent size was determined by quantitative coronary angiography analysis. An ECG and CPK & CKMB measurements were obtained at admission, six and twelve hours after the procedure, and the following morning.

Major in-hospital events were defined as: subacute occlusion, reinfarction, emergency surgery, stroke, and cardiac or global death. The medium-term clinical follow-up took place at three and six months (patients underwent clinical examinations or their clinical status was checked by telephone conversation). Coronary symptomatology, major disease progression events (reinfarction, new revascularization and cardiac and global mortality) were evaluated, as well as event-free survival, including stable coronary disease (major events in disease progression and/or stable angina). Patients with unstable angina or evidence of severe ischemia, detected by means of non-invasive tests, were referred to new coronariographic studies.

Success was defined as: a residual lesion smaller than 20% after stent implantation or smaller than 50% after ballooning only, with TIMI grade 3 distal flow; angiographic restenosis, a narrowing of the vessel lumen greater than 50% at the lesion site[17], and clinical restenosis; reincidence of angina symptoms, their equivalents and other ischemic events.

Quantitative angiography data were obtained on-line by the Emitron DGM IV system and all of the following aspects were analyzed: pre-procedural stenosis, vessel reference diameter, and residual stenosis, defined as the ratio between the minimum luminal diameter at the dilated stenosis site and the reference diameter.

The continuous variables of demographic data, procedure technique and results, symptomatology, and in-hospital events during disease progression, and the totals from both periods were studied by Student's t test; the categorical variables were analyzed by the chi-square test, Yates-corrected chi-square test or Fisher's exact test.

Logistic regression, multiple logistic regression, Cox univariate and multivariate analyses, and/or Kaplan-Meier curves were used to analyze the following categorical variables: diabetes, extent of disease (one-vessel and multivessel), extent of disease (one-vessel, two-vessel and three-vessel) the last one for Kaplan-Meier curves only, left ventricular function (normal, mild and moderate dysfunction versus severe dysfunction), previous myocardial infarction, gender, tobacco use, and use of stent. The following continuous variables were categorized: time elapsed between symptom onset and reperfusion (≤ 6 hours and > 6 and ≤ 12 hours), and reference vessel diameter of the target lesion (< 3 mm and ≥ 3 mm).

Age was categorized as non-octogenarian and octogenarian in the first model of multiple logistic regression and Cox regression; and as non-aged and aged (< 65 years and ≥ 65 years) in the second model of multiple logistic regression and Cox regression. Therefore, the models mentioned were age-corrected. On the other hand, Kaplan-Meier's age curves were analyzed as: 1- non-aged (< 65 years) and aged (≥ 65 years); 2- non-octogenarian and octogenarian; and 3- non-aged, non-octogenarian aged (≥ 65 years and < 80 years) and octogenarian. Kaplan-Meier curves (Log Rank) were also prepared for the significant variables in the multivariate analysis as previously published[18].

For in-hospital deaths, the following variables were considered in the multiple logistic regression analysis: diabetes, extent of the disease, left ventricular function, use of stent, diameter of the target vessel, tobacco use, gender, time elapsed between symptom onset and reperfusion, and age.

Variables with a statistical significance of ≤ 0.10 in one or more situations (death, major events and major events and/or stable angina) in the univariate analysis were selected for the Cox multivariate analysis (fitted by forward conditional stepwise selection). The following factors were considered for death analysis: extent of the disease, left ventricular function, gender, time elapsed between symptom onset and reperfusion, and age; and for the major events and major events and/or stable angina analysis: extent of the disease, left ventricular function, gender and age.

EPI-INFO (6.0 version, Centers for Disease Control and Prevention, Atlanta) and SPSS *for Windows* (10.0 version, SPSS Inc. Chicago, Illinois) software were used to perform the statistical analysis; the first one was used also as a database.

Results

Table 1 displays data for mean age, delay between symptom onset and recanalization of the target vessel, previous myocardial infarction, acute infarction site, previous revascularization, risk factors for coronary atherosclerotic disease, and technical characteristics of the procedure.

In the groups of male and female patients, respectively: 73 (54.9%) and 42 (63.3%) patients had multivessel coronary disease involvement (p = 0.2393); 28 (21.1%) and 18 (27.3%) had severe left ventricular dysfunction (p = 0.3271), and 54 (40.6%) and 27 (40.9%) had suffered previous acute anterior wall infarction (p = 0.9668). The infarct-related artery (IRA) was occluded in 101 (75.9%) men and 46 (69.7%) women (p = 0.3453), and the initial TIMI flow was grade 2 or 3 in 32

Table 1 – Clinical variables, risk factors and procedure techniques

Variable	Men N = 133	Women N = 66	P
Age (years)	59.7 ± 11.5	67.0 ± 10.9	< 0.0001
Onset-reperfusion (hours)	3.6 ± 2.0	3.4 ± 2.2	0.9216
Previous AMI (n, %)	18 (13.5)	7 (10.6)	0.5574
Previous revascularization (n, %)	8 (6.0)	2 (3.0)	0.1225
Systemic arterial hypertension (n, %)	78 (58.6)	46 (69.7)	0.1299
Diabetes mellitus (n, %)	32 (24.1)	18 (27.3)	0.6227
Tobacco use (n, %)	51 (38.4)	17 (25.8)	0.0779
Dyslipidemy (n, %)	71 (53.4)	37 (56.1)	0.7200
Family history (n, %)	72 (54.1)	32 (48.5)	0.4524
Previous acute infarction (n, %)	54 (40.6)	27 (40.9)	0.9668
Stenting (n, %)	104 (78.2)	44 (66.7)	0.0794
Direct stenting (n, %)	10 (7.5)	6 (9.1)	0.7009
Predilation (atmospheres)	7.87 ± 2.35	8.30 ± 3.42	0.9143
Stent delivery (atmospheres)	12.15 ± 2.05	11.15 ± 1.85	0.0072
Stent postdilation (n, %)	39 (29.3)	23 (34.8)	0.3426
Postdilation (atmospheres)	13.20 ± 2.02	13.34 ± 1.58	0.8036
Success (n, %)	122 (91.7%)	58 (87.9%)	0.3842

Previous AMI = previous acute myocardial infarction; onset-reperfusion = time elapsed between symptom onset and reperfusion of the infarct-related artery; revascularization = previous percutaneous surgical revascularization; stenting = procedures with stents; success = reperfusion with TIMI grade 3 flow

Table 2 – Major in-hospital and global events, and symptomatology and events during progression of the disease in six months (except in-hospital events)

Variable	Men N = 133	Women N = 66	P
In-hospital subacute occlusion (n, %)	2 (1.5)	1 (1.5)*	0.9951
In-hospital reinfarction (n, %)	0 (0.0)	2 (3.0)	0.1088
Major in-hospital events (n, %)	4 (3.0)	8 (12.1)	0.0152
In-hospital deaths (n, %)	2 (1.5)**	6 (9.1)	0.0171
Stable angina during progression (n, %)	5 (4.2)	2 (3.5)	0.5928
Unstable angina during progression (n, %)	12 (10.1)	5 (8.8)***	0.7827
Angiographic restenosis during progression (n, %)	12 (10.1)	4 (7.0)	0.5078
New PCI or revascularization during progression (n, %)	12 (10.1)	5 (8.8)	0.7827
Previous acute infarction during progression (n, %)	1 (0.8)	0 (0.0)	0.6761
Cardiac deaths during progression (n, %)	0 (0.0)	1 (1.7)	0.3266
Noncardiac deaths during progression (n, %)	0 (0.0)	1 (1.7)****	0.3266
Total number of major events (n, %)	23 (17.3)	19 (28.8)	0.0613
Total number of major events and/or stable angina (n, %)	27 (20.3)	20 (30.3)	0.1178
Total number of deaths (n, %)	2 (1.5)	8 (12.1)	0.0026
Total number of cardiac deaths (n, %)	0 (0.0)	7 (10.6)	0.0003

** presented enzyme elevation and is also included in the line below as in-hospital reinfarction; ** both non-cardiac; *** 4 due to restenosis and 2 due to disease progression; **** gastric neoplasm. PCI = percutaneous coronary intervention; revascularization = surgical revascularization during progression*

(24.1%) men and 20 (30.3%) women (p = 0.3453).

For 128 male patients (96.2%) and 65 female patients (98.5%) the target vessel was the native vessel, and for five men (3.8%) and one woman (1.5%) (p = 0.3845) the target vessel was the heart bypass graft. Recanalization of the target vessel was performed for 133 (100%) men and 64 (96.9%) women (p = 0.1088); the procedure was successful in 122 (91.7%) men and 58 (87.9%) women (p = 0.3841), since by the end of the procedure, 11 (8.3%) male patients and six (9.1%) female patients (p = 0.8454) had a TIMI grade 2 flow distal to the lesion that measured 2.7 ± 8.5 and 6.7 ± 19.0 % (p = 0.1402), respectively.

The reference diameter of the target vessel was 3.41 ± 0.52 (2.17 to 5.23) mm in the male group and 3.11 ± 0.49 (2.29 to 4.89) mm in the female group (p < 0.0001); the diameters of the stents used were 3.45 ± 0.50 and 3.15 ± 0.50 mm (p < 0.0001), respectively. Glycoprotein IIb/IIIa inhibitors were used in 82 (61.7%) male patients and in 43 (65.2%) female patients (p = 0.6307), respectively: tirofiban in 55 (41.4%) and 35 (53.0%) patients (p = 0.1191) and abciximab in 27 (20.3%) and 8 (12.2%) patients (p = 0.1536).

Two men (1.5%) and one woman (1.5%) experienced subacute occlusions and were treated with new coronary interventions. Only the female patient presented a new enzymatic elevation and was, therefore, the last one to be included as reinfarction in the group of two (3.0%) women who progressed to in-hospital reinfarction. This patient was included only once in major in-hospital events. There were no cases of emergency surgery, major bleeding or stroke due to encephalic occlusion in this study.

Table 2 shows cases of in-hospital deaths and major events. The logistic regression analysis revealed that the female group had an increased risk of death of 6.550 (p = 0.024; OR = 6.550; CI 95% = 1.284-33.403). The multiple logistic regression analysis showed that in the first model (age categorized as octogenarians and non-octogenarians), the female group had an increased risk of death of 6.605 (P = 0.042; OR = 6.605; CI 95% = 1.071-40.745); patients with severe left ventricular dysfunction (p = 0.062) and octogenarians (p= 0.079) tended toward significance for increased risk of death. In the second model (aged and non-aged patients), there was only tendency toward significance for increased risk of death in: severe left ventricular dysfunction (p = 0.050) and female gender (p = 0.052) factors.

Medium-term follow-up was carried out for 119 (90.8%) men and 57 (95.0%) women. Table 2 displays findings on stable and unstable coronary disease, acute myocardial infarction and death within the six-month progression period. The twelve (10.1%) patients from the male group and the five patients (8.8%) from the female group who progressed to unstable angina during the follow-up period underwent new coronariographies. All of the twelve (10.1%) men and four (7.0%) of the women experienced angiographic restenosis (p = 0.5078). The other female patient (1.8%) progressed to coronary disease in another location. All patients who progressed to unstable angina required new revascularizations.

Of the twelve patients in the male group, nine underwent a new percutaneous coronary intervention and three had myocardial revascularization surgery. Of the five patients in the female group, four underwent new percutaneous coronary intervention and one had myocardial revascularization surgery.

Table 2 shows data on in-hospital mortality, cardiac and non-cardiac deaths during disease progression, and cardiac and global deaths, as well as the total number of major events and major events and/or stable angina after the six-month follow-up period.

Figures 1 and 2 show the Kaplan-Meier survival curves prepared according to age (non-aged, non-octogenarian aged and octogenarians) ($p = 0.0003$) and gender ($p = 0.0014$).

At the end of the clinical follow-up period, the multivariate analysis showed that the risk factors related to death were**:** female gender ($p = 0.008$; HR = 8.207; CI 95% = 1.743-38.658) and age (octogenarians), ($p = 0.001$; HR = 8.496; CI 95% = 2.396-30.120); age (aged) showed a marked tendency towards statistical significance ($p = 0.053$; HR = 3.801; CI 95% = 0.983-14.706). The following factors were associated with major events: multivessel coronary disease ($p = 0.005$; HR = 3.290; CI 95% = 1.433-7.558), severe left ventricular dysfunction ($p = 0.028$; HR = 2.351; CI 95% = 1.097-5.038), and age (octogenarians) showed a tendency towards significance ($p = 0.069$); and the same factors were related to major events and/or stable angina at six months: extent of multivessel coronary disease ($p = 0.002$; HR = 3.323; CI 95% = 1.527-7.231) and severe left ventricular dysfunction ($p = 0.024$; HR = 2.292; CI 95% = 1.116-4.71).

The univariate categorical variables that met criteria to be included in the multivariate analysis ($p \leq 0.10$) in one or more situations (death, major events, and major events and/or stable angina) were**:** extent of the coronary disease, left ventricular function and gender (which were included in both models of multivariate analyses), age (non-octogenarian and octogenarian) which was included only in the first model of multivariate analysis, and age (non-aged and aged) which was included only in the second model of multivariate analysis, as well as the time elapsed between symptom onset and reperfusion with $p = 0.101$.

At the end of the six-month period, these were independent risk factors for death in the multivariate analysis**:** female gender and octogenarians (Table 3) in the first model, and female gender alone (Table 4) in the second model (where age was classified as non-aged and aged). The independent risk factors for major events and major events and/or stable angina were**:** multivessel coronary disease and severe left ventricular dysfunction (Tables 3 and 4) regardless of how age was categorized.

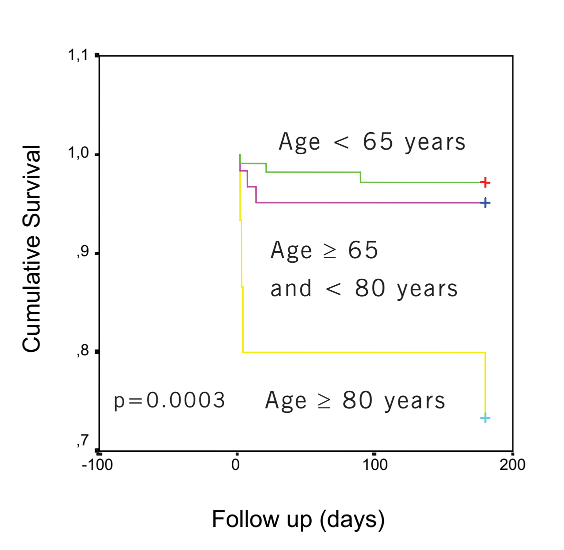

Fig. 1 *– Survival curve (Kaplan-Meier). Group with ages < 65 years with lower mortality, group with age ≥ 65 and < 80 years with intermediate mortality rates and group with higher mortality rates with ages ≥ 80 years (Log Rank, p = 0.0003)*

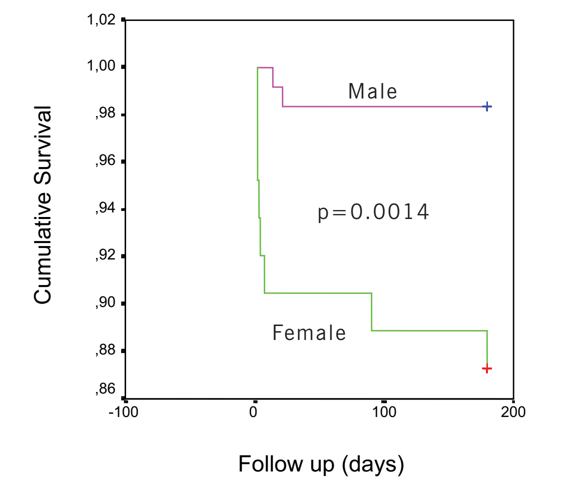

Fig. 2 *- Survival curve (Kaplan-Meier). Group of male patients with smaller mortality rate and group of female patients with higher mortality rate (Log Rank, p = 0.0014)*

Discussion

Most of the studies published before the advent of primary percutaneous coronary interventions showed higher early and late mortality rates in women than in men[19,20]. In those studies, women were older, had a greater number of risk factors and comorbidities; however, when such differences are considered all together, gender has a less significant influence on the prognosis[20].

In this study, female patients showed higher in-hospital mortality, leading to a higher rate of cardiac and global mortality at the end of the follow-up period despite the statistical adjustments made.

The predominance of men, especially of a younger age,

Table 3 - Independent risk factors for death, major events and major events and/or stable angina in the multivariate analysis: First model with age classified as non-octogenarian and octogenarian

Variable	Event	Meaning P	HR exp (B)	Confidence Interval (95%)	
				Lower	Upper
Female	Death	0.010	7.680	1.624	36.313
Octogenarian	Death	0.002	7.246	2.032	25.641
Multivessel	Events	0.007	3.175	1.379	7.299
Severe LV dysfunction	Events	0.045	2.179	1.016	4.673
Multivessel	Events and/or SA**	0.003	3.226	1.479	7.042
Severe LV dysfunction	Events and/or SA**	0.038	2.174	1.044	4.405

*The following variables were included in the multivariate model: * extent of the disease, left ventricular function, age, gender and time elapsed between symptom onset and reperfusion; ** extent of the disease, left ventricular function, age and gender. SA = stable angina; Events = major events; Multivessel = obstruction ≥ 50% in 2 or 3 systems; Octogenarian = age ≥ 80 years; LV = left ventricle*

Table 4 – Independent risk factors for death, major events and major events and/or stable angina in the multivariate analysis. Second model with age classified as non-aged and aged

Variable	Event	Meaning P	HR exp (B)	Confidence Interval (95%)	
				Lower	Upper
Female	Death	0.008	8.208	1.743	38.657
Multivessel	Events	0.007	3.175	1.379	7.299
Serious LV Dysfunction	Events	0.045	2.179	1.016	4.673
Multivessel	Events and/or SA**	0.003	3.226	1.479	7.042
Serious LV Dysfunction	Events and/or SA**	0.038	2.174	1.044	4.405

*The following variables were included in the multivariate model: * extent of the disease, left ventricular function, age, gender and time elapsed between symptom onset and reperfusion; ** extent of the disease, left ventricular function, age and gender. SA = stable angina; Events = major in-hospital events and major events during progression; Aged = age ≥ 65 years; multivessel = obstruction ≥ 50% in 2 or 3 systems; LV = left ventricle*

and the greater reference diameter of their vessels have been reproduced in several studies on the subject[21,22]. Diabetes is related to the worst progression and, generally speaking, has a higher incidence in women [22,23,24]. In our study, diabetes incidence is similar in both groups, but the incidence in the male group (24.1%) is well above that reported by other authors[20,22,23,24]. Women tend to take longer to seek medical care[1], delaying the introduction of reperfusion strategies [23,24]. After hospital admission, gender is an independent factor of delay for primary percutaneous coronary intervention[25]. Antoniucci et al.[22] report a delay with no significant difference between the groups and values similar to ours which were 3.4 ± 2.2 hours in women and 3.6±2.0 hours in men (p = 0.9216), with approximately 50% of the patients treated within the first two hours of onset, which could be beneficial to the disease progression.

Our success in the procedure was similar in both groups: 91.7% in the male group and 87.8% in the female group (p = 0.3841), rates apparently lower than those published by Vacek et al.[26] (91% and 95%; p = 0.08) and Antoniucci et al.[22] (97% and 98%; p = 0.93); however, these authors considered a TIMI grade 2 or 3 flow distal from the treated lesion as a successful outcome, whereas in our institution, only a TIMI grade 3 flow was considered as satisfactory. Had we considered a TIMI grade 2 or 3 flow as satisfactory, our success rate would have been 100% and 96.9%, respectively.

The percentages of stents and glycoprotein IIb/IIIa inhibitors used in men and women are approximately the same as those of other studies with patient enrollment periods similar to ours. Azar et al[21] report a higher incidence of bleeding complications that required blood transfusions during the use of IIb/IIIa in women (24% x 1.7%; p < 0.001), an event that did not occur in our study.

This difference may be due to the fact that our protocol does not foresee the concomitant infusion of heparin and glycoprotein IIb/IIIa inhibitor or the early withdrawal of the sheaths still in the procedure room, after heparin neutralization with protamine sulfate. The ample utilization of stents and glycoprotein IIb/IIIa inhibitors is due to the fact that the patient inclusion period coincided with the publication of medical studies about the benefits of such agents in primary percutaneous coronary intervention[10,27].

On the other hand, the CADILLAC trial[11] showed that in primary percutaneous coronary intervention, stenting is the main distinguishing factor in the treatment of lesions and only in regard to the need of new revascularization procedures of the target lesion, since mortality in-hospital and at six months was similar in all four groups, regardless of the use of stents and glycoprotein IIb/IIIa inhibitors.

Recent trials aimed at analyzing the role of gender in the progression of myocardial infarction treated by means of primary percutaneous coronary intervention include patients with cardiogenic shock[21,22]; a significantly greater number of women were admitted with cardiogenic shock during enrollment in such studies [21,22,24]. In our study, cardiogenic shock was an exclusion criterion, since Killip class IV patients have a clinical progression much worse than those in class I, II or III [28], and also because we expected a greater number of women with such severe conditions enrolled in the study.

In our study, even after the multivariate analysis was performed, female gender remains an independent risk factor for mortality. Some studies do not show any difference in mortality among the groups after primary percutaneous coronary intervention, suggesting that this treatment would equate the progression of the disease between genders[9,23].

In other studies, mortality among women was significantly higher; however, after adjusting the clinical characteristics of the groups, namely age, gender was no longer an independent risk factor for mortality[21,22,26]. Nevertheless, there are differences between these studies and our own, especially the longer period between symptom onset and reperfusion and the inclusion of patients in cardiogenic shock[21,22]. In a study with a large number of patients, Vaccarino et al[29] show that, regardless of the type of treatment, in-hospital mortality among women is higher, especially for younger women who show double the incidence when under 50 years of age, whereas in patients over 74 years of age, there is no gender difference in mortality.

In contrast to virtually all reports in medical literature, Mehilli et al.[30] found similar mortality rates for both genders and, when values were age-adjusted, they found a smaller mortality rate among women. But this study differs from ours in many aspects. Mehilli et al[30] study the period of inclusion was long (6 years). The study that began in 1995 when stents were not often used and IIb/IIIa blockers were not used at all; only 65% of patients presented with ST-segment elevation infarction; only 86% of the population underwent primary angioplasty; it included those with cardiogenic shock, and patients being treated with thrombolytics, and even patients who had not been treated with any type of reperfusion therapy. Moreover, the time between symptom onset and hospital admission was double the time elapsed between symptom onset and reperfusion of the infarct-related artery in our study.

In our study, in both models of multivariate analysis used for age-adjustment, mortality among women remained significantly higher by the end of the six-month follow-up period. The higher mortality among women takes place during hospitalization, and becomes similar to that observed among men after hospital discharge; these findings are comparable to those of other trials in which global mortality among women was higher during in-hospital progression and during clinical follow-up; however, after hospital discharge, mortality was similar in both groups[21,22]; and during the clinical follow-up with the adjustment made by multivariate analysis, gender was no longer an independent risk factor for mortality[21,22,26].

In the multivariate analysis of our study, age was significant concerning mortality of patients who were 80 or more years of age, which also differs from other studies presented about the subject that evaluated such a characteristic[21,23].

There was no difference between survival free of major events or stable disease at the end of six months. For separate events no difference was observed as to: the presence of unstable angina, acute myocardial infarction, target lesion revascularization and non-cardiac death. Exceptions occurred in relation to global mortality and cardiac mortality, which were higher in the female group. Azar et al.[21] also reported higher mortality rates at the end of six months of follow-up in the female group (15%) against 4.4% in the male group ($p < 0.05$), as well as for major events (40% x 15%; $p < 0.01$) due to higher mortality and higher target lesion revascularization rates.

In the study conducted by Antoniucci et al.[22], we found no difference among the groups for major events (death, reinfarction and target lesion revascularization) during the six-month follow-up after adjustments were made, with similar levels of angiographic restenosis and need for target lesion revascularization. In our study, after the multivariate analysis, the factors related to a higher incidence of major events at six months were severe left ventricular dysfunction and multivessel involvement of coronary disease; the same was true for survival free of major events and/or stable angina. In our study, as well as in the studies conducted by Antoniucci et al.[22] and Vacek et al.[26], no difference was found as to the incidence of complications among the groups after the procedure, even knowing that body surface is inversely related to the development of such complications being therefore more common among women[31,32].

In the three studies, there was no difference in the clinical follow-up as to clinical[26] or angiographic[22] restenosis and target lesion revascularization[21,26], even though the studies on restenosis showed an inverse relation between artery reference diameter and incidence of restenosis[32,33]. In our study, as well as in that conducted by Antonioucci et al.[22], despite the significantly smaller reference diameter of the infarct-related artery in the female group, in both groups it was on average greater than 3.0 mm (in Antoniucci's study it was 3.11 ± 0.49 and 3.02 ± 0.41 mm, respectively), and, perhaps for this reason, the levels of clinical restenosis were similar in both groups.

In conclusion, within the first 12 hours of symptom onset of acute ST-segment elevation myocardial infarction in patients treated by means of primary percutaneous coronary intervention, these were the independent risk factors for death**:** female gender and eighty or more years of age. For major events and major events and/or stable angina, multivessel coronary disease and severe left ventricular dysfunction proved to be primary risk factors. Cardiac and global deaths were higher within the in-hospital period for the female group; the differences continued during the six-month clinical follow-up and, after discharge, the incidence values were similar.

Major in-hospital events (acute occlusion, acute myocardial infarction, urgency of myocardial revascularization surgery, and mortality) were significantly higher in women due to higher cardiac mortality, with a similar incidence of the other events analyzed. After hospital discharge, the incidence of major events was similar in both groups; this meant that, after six months of follow-up, the significant difference observed in major events during hospitalization had disappeared, despite the tendency that these events were more likely to affect women. The rates of survival free of major events and/or stable angina were similar in both groups during the follow-up period.

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