# Clinical and Angiographic Profile in Coronary Artery Disease: Hospital Outcome with Emphasis on the Very Elderly

*Micheli Zanotti Galon[1], George César Ximenes Meireles[1], Sérgio Kreimer[1], Gilberto Guilherme Ajjar Marchiori[1], Desidério Favarato[2], João Aparecido Pimenta de Almeida[1], Lorena Squassante Capeline[1]*

*Hospital do Servidor Público Estadual[1]; Instituto do Coração - HC/FMUSP[2], São Paulo, SP - Brazil*

## Abstract

**Background: Knowing the risk factors and clinical manifestations of coronary artery disease (CAD) allows us to intervene more effectively with a particular population.**

**Objective: To identify clinical and angiographic profiles of patients undergoing cardiac catheterization, treated at a tertiary hospital and treated by percutaneous coronary interventions (PCI).**

**Methods: The study of 1,282 patients who underwent 1,410 cardiac catheterizations, selected from March/2007 to May/2008 from a database in a general hospital for diagnosis of coronary artery disease (CAD). Risk factors, indication for examination, technical details of PCI and in-hospital outcomes were prospectively collected.**

**Results: There were 688 (54.0%) males, mean age 65.4 ± 10.9 years and 20.0% above 75 years age. The most frequent clinical condition was acute coronary syndrome (ACS) without ST-segment elevation (STS) (38.7%). The multi artery CAD occurred in 46.4%, PCI was indicated in 464 patients, 547 target lesions were treated (type B2 or C, 86.0%), and of these, 14.0% treated with drug eluting stents. Among those with AMI with STS, primary PCI was performed in 19.0% of the patients, from these, 77.0% were transferred from the origin hospitals late (late PCI) and had not received prior thrombolytic, and 4.0% had PCI rescue. Angiographic success was achieved in 94.2% of PCIs. Death occurred in 5.6% of patients, with average age of 75.2 ± 10.2 years.**

**Conclusion: The prevalence of elderly (20.1% being ≥ 75 years) and male was observed. From the risk factors for CAD, the most common were systemic hypertension and dyslipidemia. There was a predominance of ACS. Age ≥ 75 years old, multiarterial CAD and chronic renal failure were predictors of in-hospital deaths. (Arq Bras Cardiol 2010; 95(4): 422-429)**

**Key words: Coronary artery disease; aged; heart catheterization; sickness impact profile; risk factors.**

## Introduction

The prevalence of coronary artery disease (CAD) has been progressively increasing worldwide as a result of increased life expectancy and survival to acute conditions. Facts that are also seen in Brazil[1].

Cardiovascular diseases have significant morbidity and mortality in the elderly. The World Health Organization (WHO) considers elderly in developing countries, those who are 60 years old or older and in developed countries, individuals aged 65 years old or older. In the U.S., the elderly constitute 13.0% of the population, which accounts for 65.0% of hospitalizations for heart disease. About 85.0% of deaths from AMI occur in the elderly population[2,3].

**Mailling address: Micheli Zanotti Galon •**
R. Francisco Leitão, N 205, Apto 42 - Pinheiros - 05414-020 - São Paulo, SP - Brazil
E-mail: micheligalon@yahoo.com.br
Manuscript received November 10, 2009; revised manuscript received March 25, 2010; accepted April 09, 2010.

In elderly patients, percutaneous coronary intervention (PCI) is a strategy of revascularization often used[4,5]. Observational data of the 90's suggested that elderly patients are a high-risk group for PCI[6,7], progressing to higher mortality rates when compared to younger individuals.

Elderly patients with acute coronary syndrome (ACS) often have different risk profile from non elderly: they have a higher prevalence of arterial hypertension, diabetes mellitus, myocardial infarctation, angina, peripheral vascular disease, cerebral vascular accident (CVA), multi artery disease and heart failure. On the other hand, they have lower cholesterol levels and a lower prevalence of smoking. Generally, the elderly search for medical care later, after the onset of symptoms. In the event of ACS, instead of pain, they frequently have the so-called "ischemic equivalents," such as dyspnea, malaise, confusion, syncope or pulmonary edema. Also in relation to non elderly, the elderly have lower elevation of cardiac enzymes and a higher incidence of ACS without STS[8]. In the patients over 75 years old, the best therapy with betablocker, ASA, anticoagulant and hypolipemiant is the least used, as well as fibrinolytic and revascularization by angioplasty or surgery[9,10].

The aim of this study was to evaluate patients with suspected CAD who underwent cardiac catheterization and PCI with special focus on the population aged 75 years old or more, their baseline clinical characteristics at admission, medical treatment and outcome in hospital.

## Methods

### Sample selection

Hospital do Servidor Público serves patients from a service network covering the city of São Paulo and 18 Medical Centers of Ambulatory Care (CEAMAS), located in the inner cities of São Paulo state. Currently, *Instituto de Assistência Médica ao Servidor Público Estadual* (IAMSPE) includes 1,239,287 aggregated people, involving contributors and beneficiaries, and HSPE is reference to highly complex procedures such as cardiac catheterization. Patients over 70 years old were responsible for about 30.0% of admissions in the last seven years. 1,410 cardiac catheterizations were performed in 1,282 patients for clarifying diagnosis of CAD and included consecutively in a database prospectively from March/2007-May/2008, by completing a clinical record used to record information about the baseline clinical characteristics, symptoms at admission, electrocardiographic changes, laboratory tests, medical treatment and in-hospital evolution of patients. To avoid selection bias, exclusion criteria were not applied and all patients who underwent cardiac catheterization for clarification of CAD in this period were included. The study was approved by the Ethics Committee in Research of the Office of Medical Assistance for Public Servants of the State in accordance with the Declaration of Helsinki.

### Analyzed characteristics

As per clinical presentation modalities of CAD, patients were characterized as stable angina (SA), ACS without ST-segment elevation (STS), ACS with STS or ischemic equivalent (atypical manifestations of ACS as dyspnea, malaise, confusion, syncope or pulmonary edema). Risk factors for CAD and its comorbidities were documented at the time of catheterization, by completing a questionnaire: diabetes mellitus (if present, the therapeutic regimen in use is specified: Insulin, oral hypoglycemic agents, diet), smoking, history of CAD in the family, cerebrovascular accident (CVA) /transient ischemic attack (TIA), chronic kidney failure (if present, treatment regimen of dialysis or conservative treatment), dyslipidemia, coronary history (if prior AMI, myocardium revascularization or PCI).

The angiographic characteristics such as extent of CAD (characterized by the number of vessels with angiographic lesion over 50.0% - one, two or three-arteries), TIMI flow before PCI (TIMI 0/1, or when there is absence or discrete flow distal to target lesion; TIMI 2, when there is flow distal to target lesion of the entire coronary, delayed, though; TIMI 3, when there is flow distal to target lesion of the entire coronary compatible with normality) and the treated vessel (if native coronary, venous/arterial or vessel graft with restenosis) were documented and analyzed.

### Cardiac catheterization and percutaneous coronary intervention

PCIs were performed according to standard methods and guidelines orientations in force[11-13].

Angiographic and procedure success[11] was defined as: 1) angiographic: reduction of target stenosis to a stenosis diameter of < 30.0%, with maintenance or restoration of TIMI 3 flow, as assessed by quantitative coronary angiography; 2) procedure: achievement of angiographic success and absence of major clinical complications (death, AMI with STS and emergency myocardial revascularization surgery). The definition of AMI after a procedure takes into account the development of new Q waves and/or elevation of CK-MB (> three times its baseline), with or without associated precordialgia.

The coronary lesions were divided into A, B1, B2 and C[11], according to the classification of the American College of Cardiology and American Heart Association. The characteristics of high risk (type C) were: lesion length > 20 mm, massive calcification, excessive tortuosity of proximal segment, target segment with extreme angulation (> 90 degrees), chronic occlusion in blunt tip, inability to protect significant lateral (≥ 2.5 mm) and stenotic (> 50%) branch, degenerated vein grafts.

### In-hospital outcomes

Patients were followed up during hospitalization, with the intent to highlight complications associated with both diagnostic and therapeutic procedures, the latter being more frequent. The complications were categorized as major were death, myocardial infarctation, emergency MR and CVA (loss of neurological function of vascular cause that lasts longer than 24 hours). Minor complications were: access site complications, renal failure secondary to contrast-induced nephropathy (relative increase of 25 to 50.0% or absolute of 0.5 mg/dl of baseline creatinine after contrast exposure), adverse reactions to radiological contrast, TIA (focal neurological deficit of sudden onset lasting less than 24 hours, presumably of vascular origin and confined to one area of the brain, or eye, irrigated by a specific artery)[14].

The medications used during hospitalization were prescribed by the physician in charge, being documented by completing the medical record, emphasizing: fractionated and low molecular weight heparin, tirofiban, ASA, clopidogrel, ticlopidine, nitrate, betablockers, calcium channel blocker, angiotensin converting enzyme inhibitor, nitrate, insulin, oral hypoglycemic agents[15].

### 2.5. Statistical analysis

A total of 1,282 patients who underwent 1,410 cardiac catheterizations were evaluated for diagnosis clarification of CAD, and therapeutic clarification for treatment of coronary stenosis, according to inclusion and exclusion criteria.

Quantitative variables were presented as means and standard deviations and the absolute and relative frequencies for qualitative variables were calculated.

To compare the associations between clinical and angiographic variables and the occurrence of death, chi-square

test or Fisher's exact test were used. The ages were divided into three age groups (< 60 years old, 60-74 years old and ≥ 75 years old).

To compare the distributions of creatinine clearance among patients younger than 75 years old or 75 years old or more nonparametric ANOVA Kruskal-Wallis was used.

To study the clinical and angiographic correlations and death, in a multivariate way, logistic regression model with stepwise variable selection process was used.

The significance level used was 5.0%.

## Results

### Overview of the study population

In the study period, 1,410 cardiac catheterizations were performed in 1,282 patients for CAD diagnostic clarification. Table 1 outlines the main baseline clinical characteristics of this population. 688 (54.0%) males, mean age of 65.4 years old (± 10.9) and 20.1% above 75 years old. Among the classic risk factors for CAD, the most common were systemic arterial hypertension and dyslipidemia. Diabetes mellitus was present in 31.6% of patients.

The confirmed clinic condition that triggered the most catheterization was ACS without STS (38.7%). Among AMI with STS, primary PCI was performed in only 19.0%; 77.0% were transferred from origin hospitals late (late PCI) and had not received prior thrombolytic, 4.0% underwent rescue PCI (Chart 1). Among patients who were not referred for primary PCI, only 12.0% of patients received thrombolytic treatment.

Multiartery coronary artery disease occurred in 46.4% of coronariographies, PCI was indicated in 464 patients and 547 treated target lesions (type B2 or C in 86.6%), located mostly in native vessels (94.7%) and treated with stents, 14.6% with drug-eluting stent (Table 2).

Procedural success was achieved in 94.2% of PCIs. When analyzed by clinical situation, ACS patients without STS and those with STS undergoing angioplasty within the first 12 hours were successful in 97.1%, while patients with ACS with STS treated late (> 24 hours) and who kept clinical evidence of ischemia, such as post-infarctation angina, acute pulmonary edema attributed to ischemia, among other presentations considered by the clinician of the patient as a result of ischemia, were successful in 90.4%. Among patients with stable angina and atypical manifestations of CAD, the procedural success was achieved in 97.2% and 100.0% respectively.

AMI after PCI was observed in 2.8% of patients, among these, one patient with acute thrombosis (first 24 hours after PCI) of eluting stents (Supralimus 2.5 x 39 mm), possibly due to the stent hypoexpansion in a portion of the lesion with severe calcification of the artery. There was no need for emergency MR (Table 3).

Among patients undergoing coronary angiography, renal failure secondary to contrast-induced nephropathy occurred in 20 patients (1.6%), of which one quarter required dialysis as therapy. Bleeding from the arterial access way occurred in one patient (femoral), requiring blood transfusion. It was not observed pseudoaneurysm at the puncture site and was not observed inferior or superior limb ischemia (in the case of the radial procedure), ischemic or hemorrhagic CVA.

Death after PCI occurred in 5.2%, mean age of 75.2 ± 10.2 years old. The number of vessels affected by severe lesions was associated with in-hospital mortality: one, two, three vessels or left trunk coronary had a mortality rate of 0.54%, 3.33% and 3.41% respectively (p = 0.0005).

The most used drugs by the patients at the time of catheterization (Table 4) were ASA (65.7%) and statin (52.3%). Overall, patients undergoing PCI received dual antiplatelet therapy (ASA and clopidogrel) after the angioplasty (97.3%).

**Table 1 - Clinical characteristics of patients who underwent cardiac catheterization from March/2007-May/2008**

| Patients total | n = 1,282 | 100% |
|---|---|---|
| Age in years | | |
| < 40 | 12 | 0.9% |
| ≥ 40 < 50 | 95 | 7.4% |
| ≥ 50 < 60 | 295 | 23.0% |
| ≥ 60 < 75 | 622 | 48.5% |
| ≥ 75 < 80 | 153 | 11.9% |
| ≥ 80 | 105 | 8.2% |
| Male | 688 | 53.7% |
| Diabetes mellitus | 405 | 31.6% |
| Diet | 38 | 3.0% |
| DM * with insulin | 80 | 6.2% |
| DM with oral hypoglycemiant | 282 | 22.0% |
| Without treatment | 5 | 0.4% |
| Systemic arterial hypertension | 1.020 | 79.6% |
| Current smoking | 224 | 17.5% |
| Family history | 385 | 30.0% |
| Dislypidemia | 556 | 43.4% |
| Previous cerebral vascular accident | 64 | 5.0% |
| Previous chronic renal failure | 169 | 13.2% |
| Dyalitic | 21 | 1.6% |
| Non dyalitic | 148 | 11.5% |
| Previous coronary arterial disease | 207 | 16.1% |
| Previous PCI† | 73 | 5.7% |
| RM ‡ previous surgery | 115 | 9.0% |
| Previous cardiac failure | 42 | 3.3% |
| Clinical condition | | |
| Stable angina | 456 | 32.3% |
| AMI with STS § | 159 | 11.3% |
| ACS without STS// | 545 | 38.7% |
| Ischemic equivalent | 250 | 17.7% |

**DM - diabetes mellitus; †PCI - percutaneous coronary intervention; ‡ MR - myocardial revascularization. § AMI with STS - acute myocardial infarctation with ST-segment elevation; // ACS without STS - acute myocardial infarctation without ST-segment elevation.*

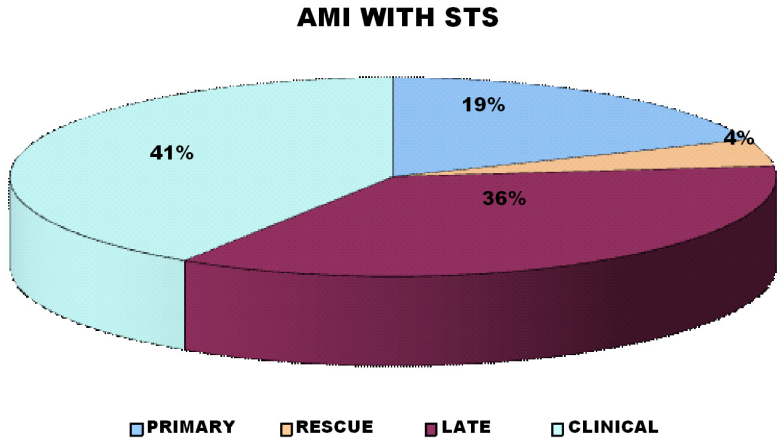


*Chart 1 - Percutaneous coronary intervention modalities used in the ACS with STS* treatment; *ACS with STS - acute coronary syndrome with ST-segment elevation.*

**Table 2 - Angiographic characteristics of percutaneous procedures (coronariographies and percutaneous coronary interventions) from March/2007-May/2008**

| Variables | n | |
|---|---|---|
| Number of procedures | 1,410 | 100% |
| CAD extension* | | |
| Normal | 385 | 27.3% |
| Uniarterial | 372 | 26.4% |
| Biarterial | 293 | 20.8% |
| Triarterial | 329 | 23.3% |
| LCT † | 32 | 2.3% |
| Treated vessel | | |
| Left coronary trunk | 5 | 0.9% |
| Anterior descending artery | 253 | 46.3% |
| Circumflex artery | 113 | 20.7% |
| Right coronary artery | 148 | 27.1% |
| Saphenous vein graft | 18 | 3.3% |
| Mammary artery graft | 10 | 1.8% |
| Type of treated vein ‡ | | |
| A | 3 | 0.5% |
| B1 | 72 | 13.2% |
| B2 | 342 | 62.5% |
| C | 130 | 23.8% |
| Classification of treated lesion | | |
| Again | 530 | 96.9% |
| Re Stenosis | 16 | 2.9% |
| Thrombosis | 1 | 0.2% |
| Lesions > 20 mm (%) | 223 | 40.8% |

*CAD - coronary arterial disease; † LCT - left coronary trunk; ‡ Classification of the lesion type according to the American Heart Association/American College of Cardiology[11].*

**Table 3 - In-hospital evolution after PCI***

| Variables | n | |
|---|---|---|
| Death | 24 | 5.2% |
| Infarctation | 13 | 2.8% |
| Urgency MR † | 0 | 0.0% |
| Bleeding at access | 1 | 0.2% |
| Transfusion | 1 | 0.2% |
| Pseudoaneurysm | 0 | 0.0% |
| CVA ‡ | 0 | 0.0% |
| ARF § | 3 | 0.6% |
| Dyalisis | 1 | 0.2% |

**PCI - percutaneous coronary intervention; † MR - myocardial revascularization; ‡ CVA - cerebral vascular accident; § ARF - acute renal failure.*

Hospital stay was longer in patients with clinical symptoms of ACS (13.7 days).

### Comparative analysis between patients younger than 75 years old and older than or equal to 75 years old

Patients who are 75 years old or older had creatinine clearance (CrCL) lower than the patients younger than 75 years old (42.06 and 68.18 l/min/1.73m$^2$, respectively, $p < 0.00001$). In comparison with males, the female patients undergoing cardiac catheterization were older.

Mortality among those over 75 years old was higher than in those under 75 years old (5.0% *versus* 1%, $p = 0.000097$), as in previous CRF (5.3% *versus* 1.3%, $p = 0.0028$), as seen in Table 5. All deaths were in patients with ACS (with ST = 37.5%; without ST elevation = 62.5%).

## Discussion

The present study is the first report on clinical and angiographic characteristics of the population of servers in

**Table 4 - Drugs used in global population**

| | n | |
|---|---|---|
| ACEI* | 711 | 50.4% |
| Betablocker | 615 | 43.6% |
| Calcium blocker | 136 | 9.6% |
| Nitrate | 339 | 24.0% |
| Statin | 737 | 52.3% |
| Insulin | 80 | 5.7% |
| Antithrombin | | |
| Non fractionated heparin | 34 | 2.4% |
| Low molecular weight heparin | 219 | 15.5% |
| Acetylsalicylic acid | 927 | 65.7% |
| Clopidogrel | 565 | 40.1% |
| Tirofiban | 13 | 0.9% |

**ACEI - angiotensin converting enzyme inhibitor.*

**Table 5 - Clinical characteristics and in-hospital mortality from March/2007-May/2008**

| | Non death | Death | p |
|---|---|---|---|
| Age ≥ 75 years old | 21.1% | 58.3% | < 0.001* |
| Male | 53.7% | 50.0% | 0.44 |
| Diabetes mellitus | 29.4% | 43.5% | 0.11 |
| Systemic arterial hypertension | 79.3% | 91.7% | 0.10 |
| Current smoking | 17.7% | 4.2% | 0.06 |
| Family history | 8.1% | 4.2% | 0.41 |
| Dislypidemia | 43.5% | 37.5% | 0.36 |
| Previous chronic renal failure | 12.7% | 37.5% | 0.002* |
| Previous PCI† | 5.7% | 0.0% | 0.25 |
| MR ‡ previous surgery | 9.0% | 8.3% | 0.63 |
| Previous cardiac failure | 3.3% | 4.2% | 0.55 |

**p < 0.05; †PCI - percutaneous coronary intervention; ‡ MR - myocardial revascularization.*

the state of São Paulo who underwent cardiac catheterization for clarifying diagnosis of coronary artery disease and therapeutic treatment of coronary stenoses in the *Serviço de Hemodinâmica e Cardiologia do Servidor Público Estadual (HSPE) - Francisco Morato de Oliveira (FMO), IAMSPE*.

The population served in HSPE-FMO, IAMSPE is characterized by the prevalence of elderly patients and patients over 70 years old account for approximately 30.0% of the admissions information of great importance since such patients are often excluded from clinical trials[34]. It can also evaluate the use and adherence to the medical therapeutic procedures[34, 35]. With this record, we describe a specific population, presenting your profile and how it has led to the diagnosis of CAD research and treatment of this clinical entity in light of the recommended guidelines and numerous clinical trials.

According to data from *Fundação Seade*, the number of elderly people in São Paulo state is 4.3 million and from this total, 1.9 million is composed of persons aged 70 or older (www.seade.org.br ). In 2020, there will be 7.1 million elderly people in São Paulo state, from this total, consisting of 2.9 million people aged 70 or more. Hence, the great importance of epidemiological studies showing prevalence of elderly population.

One of the most important observations was the large number of patients with ACS without ST elevation (38.7%) in a general hospital, a figure comparable to the 40.0% of emergency centers in cardiology[16]. The coronary angiography allows the precise identification of the extent and severity of coronary obstructions, complements the prognostic stratification and the identification of the most appropriate treatment (medical, surgical or percutaneous revascularization), regarding the coronary anatomy presented angiographically.

Two strategies emerge for the treatment of these patients: an early invasive strategy, coronariography within 72 hours, and conservative strategy, after 72 hours of hospital admission[17,18]. Although there is not unanimity on the best strategy, the most recent evidence supports an early invasive strategy. All these trials support the prescription of the "invasive strategy" because it reduced the mortality and the occurrence of late infarctation such as re-hospitalization due to ACS[18-21].

On this record, we applied the early invasive strategy to identify patients at highest risk, as patients with severe multi artery CAD (23.0%) and stenoses in left coronary trunk (2.0%). Despite this conduct, we observed a delay in the indication for catheterization, and the patient was referred to the hemodynamics frequently only when admitted to the coronary care unit or cardiology ward, after evaluation by a cardiologist. Such conduct is possibly reflected in a longer period of hospitalization.

In patients with ACS with STS, the elapsed time between the onset of pain and coronary recanalization, chemical or mechanical, is the fundamental factor for the benefit of treatment, both immediate and late, considering the relationship with mortality and morbidity in patients treated within 12 hours of onset of pain. Concerning, in relation to patients with such diagnosis transferred from other hospitals, is the fact that they do not receive appropriate reperfusion therapy, either by delay in transferring or no previous administration of thrombolytic therapy (only 19.0% of primary PCI in the first 12 hours and 12.0% of thrombolytic therapy in this record). This fact affected the success rate of the procedure as described in the results, since patients undergoing PCI within the first 12 hours were successful in 97.1% and those who underwent late PCI, 90.4% (PCI was performed, as, according to the clinical condition of patients, there was clinical myocardial ischemia evidence).

Studies have shown that PCI elective prescription for an occluded coronary artery within one to 28 days after the AMI occurrence in stable patients, did not provide any benefit greater than that offered by medical therapy consisting of aspirin, betablockers, angiotensin converting enzyme inhibitors and statins in preserving left ventricular contractile function and new cardiovascular events[22,23].

Literature data have shown the benefits of primary PCI, compared to fibrinolysis. Primary PCI is capable of restoring normal epicardial coronary flow (TIMI grade 3) in more than 90.0% of patients, which is associated with reduced rates of recurrent ischemia and re infarctation, without the risk of severe bleeding complications, such as CBA[24-26].

Groups of patients considered as high risk, such as the elderly, often have an indication of coronary angiography delayed or prevented, in evident contradiction to literature[27,28]. This strategy deprives these patients of the possibility of treatment, as they would have greater benefit in early revascularization, reflected in mortality and/or re infarctation rates. This behavior seems to occur in this record, considering the average age of 65.4 years old (± 10.9) of patients undergoing catheterization, being 20.1% aged 75 years or more.

In CSA, the elderly have a higher incidence of complications, which implies the need for more intensive treatment. However, especially for those above 75 years old, often the best therapy, with beta-blockers, ASA, anticoagulant and hypolipemiant is not used[9,29]. During in-hospital period, this difference in drug prescription was not observed in this record.

Our study found that among patients undergoing PCI, those aged 75 years old or more had a higher mortality, although the angiographic success was similar for persons under 75 years old. Complications remain more common in older patients, the prevalence of post-procedure renal failure due to contrast-induced nephropathy was consistent with the literature. Mehran et al[30] assessed the risk factors for contrast-induced nephropathy, determining a score for stratification of risk for the development of acute renal failure after PCI. Whereas the elderly population has reduced glomerular filtration rate, it is presumed that the contrast-induced nephropathy would occur more often in this group of individuals. Although this event can be anticipated, the related morbidity is still significant, making this risk considered in indicating the procedure. In cases of patients with high probability for contrast-induced nephropathy, prophylactic measures such as hydration, use of low molecular weight contrast and alternative measures, such as hydration and bicarbonate[31] and acetylcysteine[32], should be considered.

The increased risk of developing acute renal failure has also been reported in patients with chronic renal failure with ACS with STS undergoing early PCI[33,34]. In this group of patients, prophylaxis of acute renal failure can be done, and usually it is possible to obtain clinical stability of patients before intervention, unlike patients with ACS with STS who underwent primary PCI, when prior hydration is not possible and the hemodynamic instability is more common. Our record has identified that patients with chronic renal failure had higher in-hospital mortality, despite renal preparation accomplish and avoidance of the early invasive strategy in these patients.

Elderly patients are more often multiarterial disease. The survival time decreases with the involvement of additional vessels, with the involvement of the anterior descending and left ventricular dysfunction[35,36].

Our analysis shows that both younger and elderly patients can benefit from the PCI, with high rates of success, a fact that has also been observed by other authors[37,38]. Age can not be considered a limiting factor for percutaneous procedures.

## Conclusion

In this population, there is a predominance of elderly, 20.1% above 75 years old and male. Among the risk factors for CAD, the most common ones were systemic arterial hypertension and dyslipidemia. There was a predominance of acute coronary syndrome. Age greater than or equal to 75 years old, multiarterial CAD and chronic renal failure were predictors of in-hospital deaths in patients undergoing PCI.

Patients aged 75 years or more showed clinical/angiographic high-risk and rate of procedural success similar to younger patients, showing that the PCI is a technique safe and effective in this group of patients.

### Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

### Sources of Funding

There were no external funding sources for this study.

### Study Association

This article is part of the thesis of master submitted by Micheli Zanotti Galon, from *Instituto de Assistência Médica ao Servidor Público Estadual*.

## References

1. Ministério da Saúde. Datasus. Morbidade e mortalidade no Brasil por doenças cardiovasculares. [acesso em 2007 dez 19]. Disponível em http://www.datasus.gov.br.
2. US Department of Health and Human Services. Advance report of final mortality statistics. Washington: Public Health Service; 1990.
3. US Department of Health and Human Services. National hospital discharge survey. Washington: Public Health Service; 1987.
4. Fraker TD Jr, Fihn SD, Gibbons RJ, Abrams J, Chatterjee K, Daley J, et al. 2007 chronic angina focused update of the ACC/AHA 2002 guidelines for the management of patients with chronic stable angina: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines Writing Group to develop the focused update of the 2002 guidelines for the management of patients with chronic stable angina. J Am Coll Cardiol. 2007; 50 (23): 2264-74.
5. Alexander KP, Anstrom KJ, Muhlbaier LH, Grosswald RD, Smith PK, Jones RH, et al. Outcomes of cardiac surgery in patients > or = 80 years: results from the National Cardiovascular Network. J Am Coll Cardiol. 2000; 35 (3): 731-8.
6. Thompson RC, Holmes DR Jr, Gersh BJ, Mock MB, Bailey KR. Percutaneous transluminal coronary angioplasty in the elderly: early and long-term results.

J Am Coll Cardiol. 1991; 17 (6): 1245-50.

7. Wennberg DE, Makenka DJ, Sengupta A, Lucas FL, VaitkusPT, Quinton H, et al. Percutaneous transluminal coronary angioplasty in the elderly: epidemiology, clinical risk factors, and in-hospital outcomes. The Northern New England Cardiovascular Disease Study Group. Am Heart J. 1999; 137 (4 pt 1): 639-45.

8. Keller NM, Feit F. Coronary artery disease in the geriatric population. Prog Cardiovasc Dis. 1996; 38 (5): 407-18.

9. Randomised trial of intravenous streptokinase, oral aspirin, both, or neither among 17,187 cases of suspected acute myocardial infarction: ISIS-2. ISIS-2 (Second International Study of Infarct Survival) Collaborative Group. Lancet. 1988; 2 (8607): 349-60.

10. Sokolyk S, Tresch D. Treatment of myocardial infarction in elderly patients. Compr Ther. 1994; 20 (10): 537-44.

11. King SB 3rd, Smith SC Jr, Hirshfeld JW Jr, Jacobs AK, Morrison DA, Williams DO, et al. 2007 Focused Update of the ACC/AHA/SCAI 2005 Guideline Update for Percutaneous Coronary Intervention: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines: 2007 Writing Group to Review New Evidence and Update the ACC/AHA/SCAI 2005 Guideline Update for Percutaneous Coronary Intervention, Writing on Behalf of the 2005 Writing Committee. Circulation. 2008; 117 (2): 261-95.

12. Silber S, Albertsson P, Aviles FF, Camici PG, Colombo A, Hamm C, et al. Guidelines for percutaneous coronary interventions. The Task Force for Percutaneous Coronary Interventions of the European Society of Cardiology. Eur Heart J. 2005; 26 (8): 804-47.

13. Smith SC Jr, Feldman TE, Hirshfeld JW Jr, Jacobs AK, Kern MJ, King SB 3rd, et al. ACC/AHA/SCAI 2005 guideline update for percutaneous coronary intervention: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/SCAI Writing Committee to Update 2001 Guidelines for Percutaneous Coronary Intervention). Circulation. 2006; 113 (7): e166-286.

14. Steg PG, Goldeberg RJ, Gore JM, Fox KA, Eagle KA, Flather MD, et al. Baseline characteristics, management practices, and in-hospital outcomes of patients hospitalized with acute coronary syndromes in the Global Registry of Acute Coronary Events (GRACE). Am J Cardiol. 2002; 90 (4): 358-63.

15. Caro JJ, Magliaccio-Walle K. for the CAPRA (CAPRIE Actual Practice Rates Analysis) Study Group. Generalizing the results of clinical trials to actual practice: the example of clopidogrel therapy for the prevention of vascular events. Am J Med. 1999; 107 (6): 568-72.

16. Santos ES, Minuzzo L,Pereira MP, Castillo MT, Palacio MA, Ramos RF, et al. Registro de síndrome coronariana em um centro de emergências em cardiologia. Arq Bras Cardiol. 2006; 87 (5): 597-602.

17. Bucher HC, Hengstler P, Schindler C, Guyatt GH. Percutaneous transluminal coronary angioplasty versus medical treatment for non-acute coronary heart disease: meta-analysis of randomized controlled trials. Br Med J. 2000; 321 (7253): 73-7.

18. Bassand JP, Hamm CW, Ardissino D, Boersma E, Budaj A, Fernández-Avilés F, et al. Task Force for Diagnosis and Treatment of Non-ST-Segment Elevation Acute Coronary Syndromes of European Society of Cardiology. Guidelines for the diagnosis and treatment of non-ST-segment elevation acute coronary syndromes. Eur Heart J. 2007; 28 (13): 1598-660.

19. Anderson JL, Adams CD, Antman EM, Bridges CR, Califf RM, Casey DE Jr, et al. American College of Cardiology; American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines for the Management of Patients With Unstable Angina/Non-ST-Elevation Myocardial Infarction). ACC/AHA 2007 guidelines for the management of patients with unstable angina/non-ST-Elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines for the Management of Patients With Unstable Angina/Non-ST-Elevation Myocardial Infarction) developed in collaboration with the American College of Emergency Physicians, the Society for Cardiovascular Angiography and Interventions, and the Society of Thoracic Surgeons endorsed by the American Association of Cardiovasculr and Pulmonary Rehabilitation and the Society for Academic Emergency Medicine. J Am Coll Cardiol. 2007; 50 (7): e1-e157.

20. Nicolau JC, Timerman A, Piegas LS, Marin-Neto JA, Rassi A Jr. Guidelines for unstable angina and non-ST-segment elevation myocardial infarction of the Brazilian Society of Cardiology (II Edition, 2007). Arq Bras Cardiol. 2007; 89 (4): e89-e131.

21. Bavry AA, Kumbhani DJ, Rassi AN, Bhatt DL, Askari AT. Benefit of early invasive therapy in acute coronary syndromes: a meta-analysis of contemporary randomized clinical trials. J Am Coll Cardiol. 2006; 48 (7): 1319-25.

22. Dzavík V, Buller CE, Lamas GA, Rankin JM, Mancini GB, Cantor WJ, et al. TOSCA-2 Investigators. Randomized trial of percutaneous coronary intervention for subacute infarct-related coronary artery occlusion to achieve long-term patency and improve ventricular function: the Total Occlusion Study of Canada (TOSCA)-2 trial. Circulation. 2006; 114 (23): 2449-57.

23. Hochman JS, Lamas GA, Buller CE, Dzavik V, Reynolds HR, Abramsky SJ, et al. (Occluded Artery Trial Investigators). Coronary intervention for persistent occlusion after myocardial infarction. N Engl J Med. 2006; 355 (23): 2395-407.

24. Van de WF, Ardissino D, Betriu A, Cokkinos DV, Falk E, Fox KA, et al. Management of acute myocardial infarction in patients presenting with STsegment elevation. The Task Force on the Management of Acute Myocardial Infarction of the European Society of Cardiology. Eur Heart J. 2003; 24 (1): 28-66.

25. Bertrand ME, Simoons ML, Fox KA, Wallentin LC, Hamm CW, McFadden E, et al. Management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J. 2002; 23 (23): 1809-40.

26. Braunwald E, Antman EM, Beasley JW, Califf RM, Cheitlin MD, Hochman JS, et al. ACC/AHA 2002 guideline update for the management of patients with unstable angina and non-ST-segment elevation myocardial infarction—summary article: a report of the American College of Cardiology/American Heart Association task force on practice guidelines (Committee on the Management of Patients With Unstable Angina). J Am Coll Cardiol. 2002; 40 (7): 1366-74.

27. Spencer FA, Goldberg RJ, Frederick PD, Malmgren J, Becker RC, Gore JM. Age and the utilization of cardiac catheterization following uncomplicated first acute myocardial infarction treated with thrombolytic therapy (The Second National Registry of Myocardial Infarction [NRMI-2]). Am J Cardiol. 2001; 88 (2): 107-11.

28. Pilote L, Miller DP, Califf RM, Rao JS, Weaver WD, Topol EJ. Determinants of the use of coronary angiography and revascularization after thrombolysis for acute myocardial infarction. N Engl J Med. 1996; 335 (16): 1198-205.

29. Sokolyk S, Tresch D. Treatment of myocardial infarction in elderly patients. Compr Ther. 1994; 20 (10): 537-44.

30. Mehran R, Aymong ED, Nikolsky E, Lasic Z, Iakovou I, Fahy M, et al. A simple risk score for prediction of contrast-induced nephropathy after percutaneous coronary intervention: development and initial validation. J Am Coll Cardiol. 2004; 44 (7): 1393-9.

31. Briguori C, Airoldi F, D'Andrea D, Bonizzoni E, Morici N, Focaccio A, et al. Renal Insufficiency Following Contrast Media Administration Trial (REMEDIAL): a randomized comparison of 3 preventive strategies. Circulation. 2007; 115 (10): 1211-7.

32. Azmus AD, Gottschall C, Manica A, Manica J, Duro K, Frey M, et al. Effectiveness of acetylcysteine in prevention of contrast nephropathy. J Invasive Cardiol. 2005; 17 (2): 80-4.

33. Wison S, Foo K, Cunningham J, Cooper J, Deaner A, Knight C, et al. Renal function and risk stratification in acute coronary syndromes. Am J Cardiol. 2003; 91 (9): 1051-4.

34. Freeman RV, Mehta RH, Al Badr W, Cooper JV, Kline-Rogers E, Eagle KA. Influence of concurrent renal dysfunction on outcomes of patients with acute coronary syndromes and implications of the use of glycoprotein IIb/IIIa inhibitors. J Am Coll Cardiol. 2003; 41 (5): 718-24.

35. Califf RM, Armstrong PW, Carver JR, D'Agostino RB, Strauss WE. 27th Bethesda Conference: matching the intensity of risk factor management with the hazard for coronary disease events. Task Force 5. Stratification of patients into high, medium and low risk subgroups for purposes of risk factor management. J Am Coll Cardiol. 1996; 27 (5): 1007-19.

36. Emond M, Mock MB, Davis KB, Fisher LD, Holmes DR, Chaitman BR, et

al. Long-term survival of medically treated patients in the Coronary Artery Surgery Study (CASS) Registry. Circulation. 1994; 90 (6): 2645-57.

37. Kobayashi Y, Mehran R, Mintz GS, Dangas G, Moussa I, Lansky AJ, et al. Comparison of in-hospital and one-year outcomes after multiple coronary arterial stenting in patients > or = 80 years old versus those < 80 years old. Am J Cardiol. 2003; 92 (4): 443-6.

38. Cohen HA, Williams DO, Holmes DR Jr, Selzer F, Kip KE, Johnston JM, et al. Impact of age on procedural and 1-year outcome in percutaneous transluminal coronary angioplasty: a report from the NHLBI Dynamic Registry. Am Heart J. 2003; 146 (3): 513-9.