Original Article

Complications after elective percutaneous coronary interventions: A comparison between public and private hospitals

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ABSTRACT

Objective: Complications after percutaneous coronary interventions (PCI) are associated with significant morbidity and mortality, although institutional discrepancies can occur when public and private hospitals coexist within the healthcare system. The aim of this study was to compare the in-hospital complication rates and mortality in addition to long-term survival following elective PCI in two reference public and private cardiology hospitals in Rio de Janeiro, Brazil.
Methods: From January 1st 2013 to December 31st 2014, a total of 440 procedures were identified in both hospitals (public: 328 vs. private: 112) and retrospectively analyzed by chart review.
Results: There were no significant differences between the two hospitals regarding the total number of procedures with at least one complication (public: 23.8 vs. private: 17.9%, $p = 0.2$) or in-hospital mortality rates (public: 0.6% vs. private: 0%, $p = 0.5$). Post-procedural renal insufficiency was more frequent in the private hospital, whereas coronary-related complications were more prevalent in the public hospital. After a mean follow up of 30.3 months (SD $\pm$ 9.2), the survival rate was also similar.
Conclusions: Clinical complications after elective PCI are common both in public and private hospitals. Meticulous pre-procedural clinical assessment and patient selection as well as adherence to guideline-based practices could minimize the risk of PCI-related adverse events.

1. Introduction

Over the last decade, the number of percutaneous coronary interventions (PCI) performed in developing countries such as Brazil and India has steadily risen.[1,2] An in-hospital mortality rate as high as 3.64% and an overall complication rate of 6.0% have been previously reported, even after elective angioplasties.[1,3] However, in healthcare systems where private and public providers coexist, encountering institutional discrepancies is to be expected. Previous data suggest that major in-hospital complications and mortality are generally similar between public and private institutions.[4] Nevertheless, little is known about the performance of these procedures in highly referenced private and public hospitals within a healthcare system that includes both types of providers. As such, the aim of this study was to determine the prevalence of clinically relevant in-hospital complications and mortality, in addition to long-term survival after elective PCI, in two highly specialized public and private hospitals in Rio de Janeiro, Brazil.

2. Methods

Consecutive patients submitted to PCI were screened between January 2013 and December 2014 in two reference cardiology hospitals, one in the public and one in the private health system, in Rio de Janeiro, Brazil. The public hospital that was selected specializes in high-complexity cardiovascular procedures and was responsible for over 60% of the PCIs that were performed by this type of provider in Rio de Janeiro State between 2013 and 2014. Conversely, the private hospital that was analyzed is considered a leading institution in terms of medical technology in the state. As such, both hospitals were representative of the highest quality of medical assistance that is available in Rio de Janeiro, although access to the private hospital is restricted to patients with higher income.

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Only elective procedures were included, and they were defined by the absence of myocardial infarction (MI) in the two weeks preceding the intervention. Hospitalization for more than seven days before the procedure, sepsis, and active cancer were further exclusion criteria. Additionally, only patients with post-procedural troponin I (TnI) measurements were considered, in order to accurately estimate the prevalence of PCI-related myocardial injury. Troponin I (Abbot Laboratories, Architect STAT Troponin I or Architect High Sensitive STAT Troponin I) elevation was assessed by measurements performed between six and 24 h after the intervention. Data regarding clinical, angiographic, and procedural characteristics were collected retrospectively by chart review and correlated to post-procedural complications. All in-hospital complications related to the procedure that were reported in the medical charts during the same hospitalization period were considered relevant. The prevalence and the total rates of each complication were compared between the two hospitals. Besides aspirin, a clopidogrel loading dose between 300 and 600 mg was routinely administered to all patients during or immediately after the intervention, along with an intravenous bolus dose of unfractionated heparin.

All complications were assessed considering the number of patient-procedures in each hospital. However, mortality rates and long-term survival were evaluated by including only the most recent procedure among those with multiple interventions. The follow-up period began on the day of the procedure. Mortality was established by consulting a public regional online database of births and deaths in Rio de Janeiro State, and an 18-month minimum follow-up was available for all included patients. In accordance with the Declaration of Helsinki, the study was approved by both hospitals' human research committees and obtaining informed consent was not necessary since the data collection was based on retrospective chart review.

Stata® 11.0 software was used for statistical analysis. Categorical variables were analyzed with Pearson's χ^2, Fisher's exact test, and the two-sample test of proportions. Continuous normally distributed variables were expressed as mean ± standard deviation (SD) and assessed by two-sample t tests. Non-normal distributions were represented by the median associated with the 25th to 75th percentile interquartile range (IQR) and analyzed by the Wilcoxon-Mann-Whitney test. The associations between continuous variables and the probability of any post-PCI complication were assessed by fractional polynomial plots. Survival curves were constructed from Kaplan Meier survival estimates with follow-up being censored at 30 months. Differences between the curves were analyzed using the Cox proportional hazards model. A p value <0.05 was considered significant.

3. Results

A total of 1078 elective patient-procedures were initially identified in both hospitals during the study period, according to the predefined inclusion and exclusion criteria. Thereafter, an additional 638 procedures without post-PCI TnI measurements were excluded from the study. Hence, the remaining 440 patient-procedures, performed in 414 individual patients, were included in the analysis. In the public hospital, 328 interventions were performed in 322 patients; in the private hospital, 112 procedures were performed in 92 patients. In order to verify the possibility of selection bias, the one-year mortality of the cohort of patients without enzyme measurements was compared to that of the patients included in the study. Since the mortality difference was not statistically significant (without TnI: 4.3% vs. with TnI: 5.6%, p = 0.4), the possibility of selection bias was minimized.

Clinical, angiographic, and procedural characteristics according to each healthcare provider are listed in Table 1. In the private

Table 1
Clinical, angiographic, and procedural characteristics according to each healthcare provider.

Characteristics	Total (%)	Public (%)	Private (%)
Total patient-procedures (n)	440	328	112
Mean age, years (SD±)	64.6 (11)	62.5 (10.1)	70.7 (11.3)
Male gender	71.8	66.8	86.6
Hypertension	89.3	88.4	92
Diabetes	31.6	30.2	35.7
Hyperlipidemia	69.6	63.1	88.4
BMI ≥30 kg/m^2	12	8.2	23.2
Current or prior tobacco use	24.8	22	33
Mean baseline hemoglobin, mg/dL (SD ±)	13.5 (1.5)	13.6 (1.5)	13.1 (1.5)
Median baseline creatinine, mg/dL (IQR)	0.97 (0.8–1.2)	0.92 (0.9–1.1)	1.03 (0.9–1.2)
Heart failure or LVD	10.7	8.8	16.1
Symptomatic CAD	57.7	52.4	73.2
Prior PCI	32.3	26.2	50
Prior CABG	12.3	9.5	20.5
Pre-procedural medications[a]			
Aspirin	49.1	40.9	73.2
Clopidogrel	27.5	21.7	44.6
ß-blockers	54.8	58.2	44.6
ACEi or ARB	59.6	60.7	56.3
CCB	23.9	22.3	28.6
Statins	59.1	54.3	73.2
Angiographic and procedural aspects			
Multivessel disease[b]	31.1	28.1	40.2
Multivessel angioplasty[c]	27.1	27.7	25
Multistenting[d]	43.9	45.1	40.2

SD – standard deviation; IQR – interquartile range; BMI – body mass index; CAD – coronary artery disease; LVD – left ventricular dysfunction; PCI – percutaneous coronary intervention; CABG – coronary artery bypass grafting; ACEi – angiotensin converting enzyme inhibitors; ARB – angiotensin receptor blockers; CCB – calcium channel blockers.
[a] Medication usage at hospital admission.
[b] ≥70% obstruction in ≥2 vessels.
[c] Intervention in ≥2 vessels.
[d] Implantation of ≥2 stents.