Pak Heart J

FREQUENCY OF PERIPROCEDURAL MYOCARDIAL INFARCTION IN PATIENTS UNDERGOING ELECTIVE PERCUTANEOUS CORONARY INTERVENTION

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Date Received: January 26, 2013
Date Revised: March 26, 2013
Date Accepted: April 28, 2013

Contribution
All the authors contributed significantly to the research that resulted in the submitted manuscript.

All authors declare no conflict of interest.

ABSTRACT

Objective: To determine the frequency of periprocedural myocardial infarction in patients undergoing elective percutaneous coronary intervention.

Methodology: In this study 100 patients with an indication for elective PCI admitted in CCU at civil hospital Karachi were studied. Cardiac biomarker measurements were scheduled before PCI and 6 hours after PCI, with subsequent serial measurements for relevant biomarker increases or complaints until peak increase was established. We used the PMI definition from the third universal definition of MI: creatine kinase (CK-MB)3 times upper limit of normal. All statistical analyses were performed with SPSS 12.0 Frequency was calculated using chi-square.

Results: Patients in the study population had more diabetes mellitus (29% vs 16%, $p< 0.001$), hypertension (61% vs 51%, $p <0.001$), hypercholesterolemia (66% vs 54%, $p <0.001$), and family history of coronary artery disease (57% vs 50%, $p < 0.01$) Of the study population (29%) had a history of diabetes mellitus. PMI occurred in 5% of the study population. PMI occurred in five patients, 1 with 3 stents, 2 with 2 stents and 1 with 3 stents.

Conclusion: Frequency of PMI is low and is directly correlated with number of stents implanted. This needs to be confirmed in larger studies.

Keywords: Periprocedural Myocardial infarction, Percutaneous Coronary Intervention, Creatine kinase

INTRODUCTION

Revascularization procedures (percutaneous coronary intervention [PCI] and coronary bypass graft surgery [CABG]) are performed in more than 1.7 million patients with ischemic heart disease in the United States; more than 2.2 million PCIs alone are performed worldwide on an annual basis.[1] With technological advances in coronary intervention over the past [3] decades, procedural complications and long-term outcomes have significantly improved, yet periprocedural myocardial infarction (PMI) remains common.2 CK-MB (3 × ULN) levels detected after the procedure have been independently linked to a modest increase in mortality risk[3] Serum creatinine kinase (CK)-MB after an uncomplicated PCI is elevated in 1 to 38 percent of patients.[4] It has been demonstrated that elevation of CK-MB post-percutaneous coronary intervention (PCI) is associated with increased long-term mortality, with a graded increase in risk according to the extent of elevation.[5] Periprocedural MI is routinely used as an end point in clinical trials and increasingly as a quality performance metric.[6] Periprocedural myocardial infarction (PMI) is the most frequent adverse event after percutaneous coronary interventions (PCI). PMI is not necessarily a benign event and that patients with PMI may have a worse prognosis.[7] Periprocedural myocardial infarction in patients undergoing elective percutaneous coronary intervention is a not infrequent complication of percutaneous coronary intervention.

METHODOLOGY

From January 2011 through August 2011, 100 patients with an indication for elective PCI admitted in CCU at civil hospital Karachi were randomized. There were no angiographic exclusion criteria. The most important exclusion criterion was recent ST-segment elevation MI. All patents were given Aspirin 300 mg and clopidogel 300mg before the procedure.. In all patients cardiac biomarkers and electrocardiograms were systematically assessed and analyzed before and after PCI to identify PMI. Cardiac biomarker measurements were scheduled before PCI and 6 hours after PCI, with subsequent serial measurements for relevant biomarker increases or complaints until peak increase was established. We used the PMI definition from the third universal definition of MI: creatine kinase (CK) _3 times upper limit of normal with increase of CK-MB and/or troponin.[8] All statistical analyses were performed with SPSS 12.0 Frequency was calculated using chi-square. Whereas continuous variables were assessed with the Wilcoxon rank-sum test or Student's t test, as appropriate. Unless otherwise specified, p values and confidence intervals (CIs) were 2-sided and a p value _0.05 was considered statistically significant. Univariate and multivariate logistic regression analyses were performed to evaluate diabetic status as an independent predictor of PMI in the subpopulation of undetected diabetics and non-diabetics and in the subpopulation of undetected diabetics and known diabetics. All variables were evaluated as possible predictors, and only those with significance at a p value _0.15 for PMI were considered candidate variables for multivariate logistic regression analysis and were assessed for their relation with diabetes. To obtain a parsimonious model, we started with all candidate variables. Subsequently, we eliminated the variables with the highest p value step by step until the estimate for diabetes changed by _10% or only significant predictors remained

RESULTS

Patients in the study population had more diabetes mellitus (29% vs 16%, p ≥0.001), hypertension (61% vs 51%, p ≥0.001), hypercholesterolemia (66% vs 54%, p ≥0.001), and family history of coronary artery disease (57% vs 50%, p ≥0.01) Of the study population (29%) had a history of diabetes mellitus. Baseline characteristics of the study population and subgroups are presented in Table 1. Angiographic and procedural characteristics are presented in Table 2. Side branch occlusion was observed in 2.6% of patients and distal embolization in 0.5%, with no significant difference between groups. Medication at discharge did not differ between groups except for higher rates of angiotensin-converting enzyme inhibitor and/or angiotensin receptor blocker prescription in undetected diabetics compared to nondiabetics . PMI occurred in 5% of the study population. In addition, number of stents placed was independently associated with a significantly higher rate of PMI, with an OR of 1.80 (95% CI 1.36 to 2.38, p ≥0.001) per additional stent placed.

DISCUSSION

Several studies have suggested that periprocedural myocardial infarction (MI) following percutaneous coronary intervention (PCI) is associated with worse prognosis, Among patients who had undergone PCI with stent implantation, the frequency of periprocedural MI was not rare, and mainly related to side-branch occlusion, To date, virtually all studies of periprocedural myocardial infarction have been limited by the lack of precision with which they determined preprocedural risk. Contemporary cardiac troponin assays have greatly enhanced our ability to detect myonecrosis before and after PCI.[9] Nevertheless, there is still an ongoing discussion on this issue as other studies were unable to show a significant relation between PMI and clinical outcome.[10] Current PCI guidelines give a class I recommendation for the measurement of cardiac biomarkers (the MB fraction of creatine kinase [CK-MB], cardiac troponin, or both) in patients who have signs or

Table 1: Baseline characteristics of patients (n-100)

Age	64.7±9.9
Body Mass Index	28.04
Hypertension	61
Hyperlipdema	66
Smoke	22
Family History of CAD	57
Stable Angina	68
Unstable Angina	19
NSTEMI	13

Table 2: Angiographic and procedural characteristics (n-100)

Left Anterior Descending	51
Left Circumflex	35
RCA	36
Multiverse Treatment	26
Side Branch Occlusion	2
Lesions Treated per patient One Vessel Stent	74
Two Vessel Stent	25
Three Vessel Stent	**1**

Table 3: Periprocedure MI in study population (n=5)

no. of Vessel Stented	Periprocedure MI
One Vessel Stent	1
Two Vessel Stent	3
Three Vessel Stent	1

symptoms suggestive of myocardial infarction during or after PCI and for those who have undergone complicated procedures.[11] Incidence of PMI, the most common adverse event after stent implantation, ranges from 2% to 20%12 Various studies have shown that PMI can be associated with an inferior clinical outcome.[11,12] Risk factors for occurrence of PMI are factors that are associated with an increase of the general atherosclerotic burden such as presence of multivessel disease, lesion eccentricity and calcification, thrombus formation, advanced age, and overt diabetes mellitus.[13] Increased risk of adverse events in diabetic patients undergoing PCI persisted after the introduction of DES and was seen in patients treated with first- and second-generation DES.[14] Studies have shown that even patients without a history of diabetes mellitus but with increased HbA1c levels (i.e., undetected diabetics) have an increased risk of cardiovascular complications,[15] measures to decrease PMI risk may be pretreatment with drugs that have anti-inflammatory and/or antithrombotic properties such as high-dose statins[16] and/or glycoprotein IIb/IIIa antagonists[17,18] or treatment with more aggressive antiplatelet regimens because diabetes is also associated with high platelet reactivity.[19]

CONCLUSION

Frequency of PMI is low and is directly correlated with number of stents implanted. This needs to be confirmed in larger studies.

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