ORIGINAL ARTICLE

Clinical Outcome of Patients with Elevated Cardiac Markers after Percutaneous Coronary Intervention

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ABSTRACT

Aim: To determine early clinical outcome in patients with normal and elevated cardiac enzymes after percutaneous coronary intervention (PCI).

Methods: From February 2009 to January 2010, total of 200 consecutive patients fulfilling the inclusion and exclusion criteria, who underwent PCI at Punjab Institute of Cardiology, Lahore were included in this survey. A prospective observational study was carried. Patients were divided into two groups randomly. The blood sample was drawn within 24 hours of the procedure and creatine kinase-myocardial band (CK-MB) level was analyzed. Based on cardiac enzyme level, Patients were divided into two groups; 150 patients in Group I with normal CK-MB level and 50 patients in group II above the upper reference limit. The primary end point of the study was in-hospital or 30 day mortality. Secondary clinical end points were major adverse cardiac events (MACE) including Q-wave and non-Q-wave myocardial infarction, emergent coronary artery bypass operation, or repeat target lesion revascularization (TLR) at 30 days after the index operation.

Results: During the study, out of 150 patients in Group I, Periprocedural complications were dissection (6%), side branch compromise (14%), slow flow (10%), no reflow (2%), sub-acute stent thrombosis (4%). In the other hand, out of 50 patients in Group II, slow flow was seen in 1.4% and Sub-acute stent thrombosis in 0.7%. On thirty day follow up, 32% patients became symptomatic among which 6% developed non ST elevation MI in group II while only 1.4% patients had symptoms of angina in the group I. 6% patients needed repeat target lesion revascularization in group II and only 0.7% in group I.

Conclusions: The findings confirm that raising cardiac enzymes had a worse clinical outcome in terms of mortality, myocardial infarction and repeat target lesion revascularization as compared to normal cardiac enzymes post PCI.

Keywords: Myocardial infarction, Percutaneous coronary intervention, Cardiac Enzyme.

INTRODUCTION

Multiple studies have shown an increased risk of mortality and adverse outcomes with elevated levels of CK-MB isoenzyme after PCI[1]. Large periprocedural myocardial infarctions, such as those caused by occlusion of a large side branch, flow-limiting dissection, or distal embolization of a large thrombus, would be undesirable and associated with worse subsequent cardiac outcomes, it is possible that even lower levels of periprocedural embolization may lead to microvascular obstruction and necrosis. Even this degree of necrosis may serve as a future nidus for arrhythmogenesis or may lower the arrhythmic threshold[2].

A few studies have reported a progressive increase in the risk of late death at any elevation in CK-MB levels[3], whereas others have found a non-linear relationship, with an excess risk being limited to the patients showing major enzyme release (more than five to eight times the upper reference limit)[4].

The incidence of CKMB elevation after PCI ranges from 11% to 35%, including low-level elevations with no associated signs or symptoms as well as large non–Q-wave and Q-wave myocardial infarction, but the clinical significance of elevated cardiac enzymes after PCI and the definition of periprocedural myocardial infarction remain controversial[5].

In Pakistan impact of cardiac enzyme elevation post PCI on early clinical outcome has never been studied before, this study is designed to compare the outcome in patients having normal versus raised cardiac enzymes after PCI.

PATIENTS AND METHODS

A total of 200 consecutive patients who underwent PCI from February 2009 to January 2010, at Punjab Institute of Cardiology, Lahore were included in this study. Patients were separated into two groups; 150

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patients in Group I with normal CK-MB level and 50 patients in group II above the upper character limit.

Patients who have Myocardial infarction within the previous 24 hours or Left ventricular ejection fraction <25% or do not have CK-MB levels measured <24hour after PCI or who have a measured total CK or CK-MB level >1 times the upper limit of normal in the 24hour before PCI and those who did not give consent were excluded from study.

A brief history and clinical examination were done of each patient. Age, sex, risk factors for ischemic heart disease like smoking, diabetes mellitus, hypertension, family history of ischemic heart disease and angiographic findings prior to PCI were especially recorded. Procedure variables like the size and balloon type and size of the stent and any complication like dissection, perforation and side branch compromise were also noted. A blood sample was drawn within 24 hours after the procedure. Four milliliters of blood were collected in an anticoagulant-free vial and sent to the biochemistry laboratory, where CK-MB level was analyzed by mass CK-MB levels using a dimension RxL/HM analyzer (Dade Behring, Glasgow, DE, USA).

Based on cardiac enzyme level, Patients were divided into two groups. The group I with normal CK-MB level in which upper reference limit for CK-MB was 5.0 ng/ml and in group II in which the cardiac enzymes CK-MB isoenzyme levels were above the upper reference limit in at least one of the two post-procedural samples six hours apart.

Clinical outcome was evaluated in hospital as well as on 30 days follow-up after discharge in both groups. Patient's clinical condition regarding symptoms of chest pain, shortness of breath was inquired on follow-up. The primary end point of the study was in-hospital or 30 day mortality. Secondary clinical end points were included a composite of major adverse cardiac events (MACE) including Q-wave and non-Q-wave myocardial infarction, emergent coronary artery bypass surgery, or repeat target lesion revascularization (TLR) at 30 days after the index procedure.

Statistical analysis was done using the SPSS (version 17). Baseline, angiographies, and procedural characteristics are presented as numbers and percentages for categorical variables and as Mean±standard deviations (SD) for continuous variables. Clinical outcome variable like mortality, Non-ST elevation MI or repeat target lesion revascularization were compared between Group I (Normal cardiac enzymes) vs Group II (raised cardiac enzymes) by Chi Square test. P≤0. 05 was considered to indicate a statistically significant difference.

RESULTS

Out of 150 patients in group I, 123 (82%) were males and 27 (18%) were females in the other hand, out of 50 in group II, there were 42 (84%) males and 8 (16%) females. The average age of the group I was 53.9±9.86 years and group II 56.7±12.62 years. The risk factors, frequency and percentage is indicated in (Table 1). Smoking was most frequently observed risk factor in both groups 57.3% in group I and 60% in group II. Among 371 significant angiographies lesions in both groups 159 were confined to left anterior descending (LAD), 113 right coronary (RC), 92 left circumflex (LCX) and 7 ramus intermedius (RI) arteries (Table 2). In group II, one patient (2%) died during a hospital stay after PCI, 32% patients developed symptoms of angina within 30 days follow up and were treated accordingly. Non-ST segment elevation myocardial infarction observed in 12% patients. Six percent of patients needed repeat target vessel revascularization.In group I, there was no hospital mortality. But 2 (1.4%) developed symptoms of angina within 30 day follow up. One patient 0.7% underwent repeat target vessel revascularization while other one treated conservatively (Table 3).

Table-1: Base line Characteristics among two groups

Variables	**GroupI (n=150)**	**Group II (n=50)**
Age(mean±SD)	53.9±9.8	56.7±12.6
Male	123(82%)	42(84%)
Female	27(18%)	8(16%)
Risk factors		
Smoking Yes	86(57.3%)	30(60%)
Smoking No	64(42.7%)	20(40%)
Hypertension		
Yes	83(55.5%)	28(56%)
No	67(44.5%)	22(44%)
Diabetes mellitus		
Yes	35(23.5%)	20(40%)
No	115(76.5%)	30(60%)
Obesity		
Yes	29(19.3%)	10(20%)
No	121(80.7%)	40(80%)
Past H/O IHD		
Yes	33(22%)	25(50%)
No	117(78%)	25(50%)
Family H/O IHD		
Yes	45(30%)	20(40%)
No	105(70%)	30(60%)
Dyslipidemia		
Yes	62(41.3%)	26(52%)
No	88(58.7%	24(48%)

Table 2: Patterns of coronary Vessels involvement percutanous interventions and procedural complications.

Variables	**Group I (n=50)**	**Group II (n=50)**
Single Vessel disease	99(66%)	21(42%)
Multiple Vessels disease	51(34%)	29(58%)
Distribution:(total=371 [G1=258 + G2=113])		
LAD	115(44.5%)	44(38.9%)
LCX	58(22.4%)	34(30%)
RC	80(31%)	33(29.2%)
IM	5(1.9%)	2(1.7%)
Percutanous intervensions: (total=260)		
Single	125(65.8%)	32(45.7%)
Multiple	65(34.2%)	38(54.3%)
Complications		
Dissection	-	3(6%)
Side branch compromise	-	7(14%)
Slow Flow	2(1.4%)	5(10%)
No Flow	-	1(2%)
Subacute Stent thrombosis	1(0.7%)	2(4%)

Keys:
LAD: Left anterior descending; LCX - Left circumflex; RCA - Right coronary artery; RI -Ramus intermedius

Table 3: Outcome parameters among two groups (n = 200)

Outcome	**Group I (n=50)**	**Group II (n=50)**
In hospital mortality	-	1(2%)
30 days follow up		
Symptomatic patient	2(1.4%)	16(32%)
NSTEMI	-	6(12%)
Repeat TLR	1(0.7%)	3(6%)

DISCUSSION

Originally derived as “enzyme leaks” or “myocardial infarctlets,” periprocedural myocardial infarction (MI) has now been definitively linked in large data sets to long-term adverse outcomes, most notably mortality[6, 7,8]. Large creatine kinase (CK) elevation caused by closure of a major side branch, flow limiting dissection, no reflow or slow flow resulting in chest pain and development of new Q waves is obviously undesirable and causally related to the interventional procedure and patient related risk factors such as arterial inflammation, degree of atheroma burden leading to periprocedural myonecrosis[9,10,11].

Roe at al analyzed 6164 patients with acute coronary syndrome from four randomized trials, namely GUSTO-II b, PURSUIT, PARAGONE-A and PARAGONE-B[12, 13]; which showed worse clinical outcome of patients with raised cardiac enzymes (CK-MB) in terms of mortality, non ST elevation MI, and the need for more revascularization procedure like to repeat target lesion revascularization and coronary artery bypass graft surgery (CABG).

Abdelmeguid et al studied 4664 patients with acute coronary syndrome who underwent percutaneous coronary intervention. It was observed that even mild elevation of creatinine kinase MB (>2 times ULN) associated with worse clinical outcome in terms of mortality, repeat target vessel revascularization and coronary artery bypass graft surgery[14].

CONCLUSION

Raised cardiac enzymes after percutaneous coronary intervention are associated with an increased risk of mortality and other early adverse cardiac events. Nonetheless, these outcomes suggest that risk stratification of acute coronary syndrome patients should include routine surveillance of creatine kinase MB level after percutaneous coronary intervention to assess the individual risk of adverse effect.

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