Incidence of Myocardial Infarction after Open Heart Surgery

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Abstract

Background- One of the most common surgical procedures performed today is open heart surgery, and with it comes complications. One of these complications is post-operative myocardial infarction (MI), and others are post-operative stroke, neurological problems, wound infection, respiratory complications, etc.

Methods- This prospective study included 424 patients who underwent open heart surgery at our center between November 2005 and May 2006. All relevant clinical, electrocardiographic, echocardiographic, and laboratory data were gathered in all the patients, and the patients were observed for the development of MI after surgery.

Results- Post-operative MI occurred in 45 (10.8%) patients. By the univariate analysis, systemic hypertension, on-pump surgery, and increased serum levels of LDL cholesterol and triglycerides (TG) were significantly associated with the occurrence of post-operative MI (all P-values<0.05).

Conclusion-The results of the present study demonstrated that systemic hypertension, on-pump surgery, and serum levels of LDL and TG were related to post-operative MI. Therefore, clinical data, laboratory data, ECG, and echocardiography may be useful in the risk stratification of high-risk patients for the occurrence of post-operative MI ***(Iranian Heart Journal 2008; 9 (4):19-22).***

Key words: myocardial infarction ■ cardiac surgery ■ regional wall motion abnormality

Post-operative myocardial infarction (MI) is one of the most serious complications of open heart surgery, occurring in 3-15% of patients.[2]

The development of MI has been associated with a higher morbidity, mortality, and cost.[9,20] MI can be due to the incomplete revascularization of atherosclerotic vessels, technical problems at anastomotic sites, hemodynamic disturbances during and after surgery, and tachycardia.[2,4]

The most common cause of post-operative MI is the imbalance between myocardial demand and supply.[2]

The incidence of early mortality due to MI is about 10-15%.

Diagnosis is often difficult, but can be made with increased levels of cardiac enzymes (troponin or CK-MB),[3,7,10,18] electrocardiography changes, and by echocardiography.

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Methods

Patients

Of all adult patients who underwent open heart surgery at our center between November 2005 and May 2006, 424 patients were included in this prospective study by simple random sampling.

Data collection

All the patients gave informed consent, and for each patient a form including data related to the pre-, intra-, and post-operative periods was completed by the cardiology resident.

Demographic data (gender and age) were recorded, and a thorough medical history was taken.

A standard 12-lead resting ECG, trans-thoracic echocardiography, laboratory tests (cardiac enzymes, lipid profile), and blood pressure measurements were obtained in all the patients. The blood samples were taken after surgery for CK-MB. The methods of surgery and revascularization (on-pump or off-pump), emergency surgery, pump time, anesthesia data, intubation time, use of intra-aortic balloon pump (IABP), and inotropic agents were recorded.

As a routine, the patients were sent to the open heart ICU for at least 48 hours post-operatively and then were discharged to the ward. All the patients had daily standard 12-lead ECGs for the entire ICU stay. CK-MB was measured three times in the ICU.

Transthoracic echocardiography was done before and after surgery, and ejection fraction and any new regional wall motion abnormality were recorded. MI was considered positive when two of the above-mentioned criteria were observed.

Statistical analysis

All the continuous variables are presented as mean ± SD. We tested the association of pre-, intra-, and post-operative factors with the occurrence of post-operative MI by using Student's *t*-test for the normally distributed continuous variables and chi-square tests and Fisher's exact probability test (when appropriate) for the categorical variables.

The software SPSS version 13.0 was used for the statistical analyses.

Results

Characteristics of study population

A total of 424 patients, comprising 244 (57.5%) women and 180 (42.5%) men with an age range of 18-83 years were included in the study. On-pump surgery was performed in 91.3%, and 8.7% underwent off-pump procedures (Fig. 1).

Concerning the surgical procedures, 297 (70%) patients underwent coronary artery bypass grafting (CABG), 54 (12.7%) underwent mitral valve replacement (MVR), 7 (1.7%) underwent tricuspid valve replacement (TVR), 29 (6.8%) underwent aortic valve replacement (AVR), 3 (0.7%) underwent redo-CABG, 9 (2.2%) underwent redo-valve surgery, and 45 (5.9%) underwent other surgical procedures (Fig. 2).

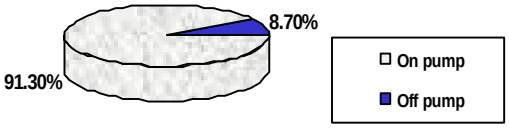

Fig. 1. Distribution of on-pump and off-pump surgery procedures.

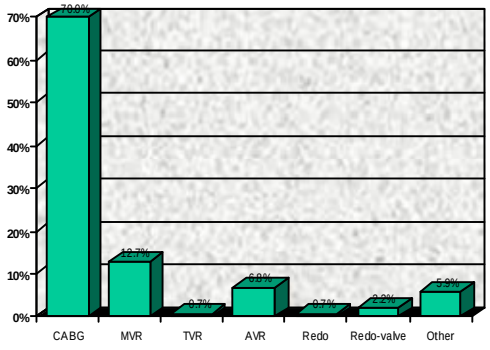

Fig. 2. Frequency of types of surgical procedures.

Of all the study population, 45 (10.8%) patients developed MI during the post-operative period. The rate of MI was not significantly different between the two genders (P-value= 0.56).

The serum levels of triglyceride and LDL cholesterol of the patients who developed MI were significantly higher than those who did not (P-values=0.001 and 0.003, respectively, Fig. 3).

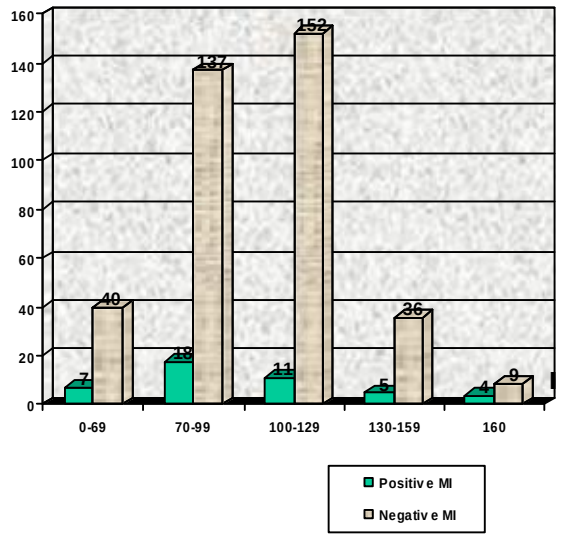

Fig. 3. Serum levels of LDL and MI.

Systemic hypertension, on-pump surgery, and CABG were significantly associated with the occurrence of MI (all P-values <0.05). Emergent surgery, left main lesion, smoking, diabetes mellitus, positive familial history of coronary artery disease, inotrope or IABP use, intubation, and pump time were not significantly associated with the occurrence of MI (P-value > 0.05).

No MI was observed in patients with surgery except in the case of CABG. There was no mortality in this study.

Discussion

Open heart surgery is accompanied with some complications[16] such as post-operative MI,[2] neurological sequelae,[12-17,21-26] etc.

MI is one of the most common and serious complications occurring after cardiac surgery.[2]

The development of MI has been associated with a higher incidence of mortality, morbidity, and cost.[9,20]

Many pre-operative and post-operative factors have been suggested to increase the incidence of MI after open heart surgery such as incomplete revascularization, technical problems, hemodynamic disturbances, tachycardia, left main lesion,[4] female gender,[2] and emergent operation.[4]

This study showed the incidence of MI to be about 10.8%.

Hypertriglyceridemia, hypercholesterolemia, and history of systemic hypertension were significantly associated with the occurrence of MI.

However, MI was not seen in patients who underwent off-pump surgery.[1,6,11]

In the present study, we failed to demonstrate the effect of emergent surgery, pump time, left main lesion, diabetes mellitus, positive familial history of coronary artery disease, intubation time, IABP, and inotrope agent usage on the occurrence of post-operative MI.

Conclusion

The results of the present study demonstrated that systemic hypertension, hypertriglyceridemia, hypercholesterolemia, and on-pump CABG were independent predictors of MI after cardiac surgery. Therefore, clinical data, ECG, and echocardiography may be useful in the pre-operative risk stratification of high-risk patients for the occurrence of post-operative MI.

Conflict of Interest

No conflicts of interest have been claimed by the authors.

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