Original Article

Outcome of Emergency Conventional Coronary Surgery for Acute Coronary Syndrome Due to Left Main Coronary Disease

Mitsumasa Hata, MD, Motomi Shiono, MD, Akira Sezai, MD, Mitsuru Iida, MD, Isamu Yoshitake, MD, Shinji Wakui, MD, Makoto Taoka, MD, Nanao Negishi, MD, and Yukiyasu Sezai, MD

Background: Outcomes of emergency coronary artery bypass grafting (CABG) for acute coronary syndrome (ACS) due to left main coronary (LMT) disease remain unclear. This study aimed to assess prognoses for patients undergoing emergency CABG for ACS due to LMT disease.
Methods: One hundred and four patients undergoing emergency CABG for ACS due to LMT disease were retrospectively reviewed. All patients had intra-aortic balloon pumping (IABP) support and underwent surgery within 48 hours after onset. We determined predictors for operative mortality and calculated cardiac event free, actuarial survival, and cumulative graft patency rates.
Results: We found that 9 patients (8.7%) developed pre-operative cardiogenic shock and 7 of them required percutaneous cardiopulmonary support (PCPS). Operative mortality affected 9 patients (8.7%). Cardiac event free rate and actuarial survival rate at 10 years were 80.7 and 75.4%, respectively. Logistic regression analysis showed that pre-operative cardiogenic shock was the only predictor for operative mortality (p=0.0146, odds 5.96). Cumulative graft patency rates for internal thoracic artery and saphenous vein (SVG) at 5 years were 92.6 and 72.4%, respectively. One year-graft patency rate for the radial artery (RA) was 100%.
Conclusion: It is still very hard to treat patients with cardiogenic shock. We suggest that immediate percutaneous coronary intervention (PCI) with mechanical supports is required prior to CABG for survival of patients with left main shock syndrome. (Ann Thorac Cardiovasc Surg 2006; 12: 28–31)

Key words: emergency coronary artery bypass grafting, left main coronary disease

Introduction

Acute coronary syndrome (ACS) includes acute myocardial infarction (AMI) and unstable angina (UA) because the etiology of both diseases is pathologically similar.[1] In ACS, although percutaneous coronary intervention (PCI) is recommended to complete early reperfusion for culprit lesions,[2] surgical intervention with appropriate assisted circulation has to be undertaken as soon as possible due to left main trunk (LMT) diseases. Several investigators reported the efficacy of emergency coronary artery bypass grafting (CABG) for ACS.[3-6] However, outcomes of emergency CABG for ACS due to LMT diseases have not been investigated. This study aimed to review emergency CABG for ACS due to LMT disease over the last 10 years and to assess prognoses for patients.

From Department of Cardiovascular Surgery, Nihon University School of Medicine, Tokyo, Japan

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Address reprint requests to Mitsumasa Hata, MD: Department of Cardiovascular Surgery, Nihon University School of Medicine, 30-1 Oyaguchi-kami-machi, Itabashi-ku, Tokyo 173-8610, Japan.

Patients and Methods

Between July 1994 and December 2004, 104 patients underwent emergency CABG due to LMT stenosis of more than 75% at our institution. Seventy-five patients

Table 1. Patients' profile

Age (year)	65.7±10.0 (31-87)
Sex (male/female)	75/29
AMI/UA	37/67
DM	46 (44.2%)
HT	69 (66.3%)
HL	64 (61.5%)
Smoking	49 (47.1%)
Family	21 (20.2%)
CRF	7 (6.7%)

AMI, acute myocardial infarction; UA, unstable angina; DM, diabetes mellitus; HT, hypertension; HL, hyperlipidemia; CRF, chronic renal failure.

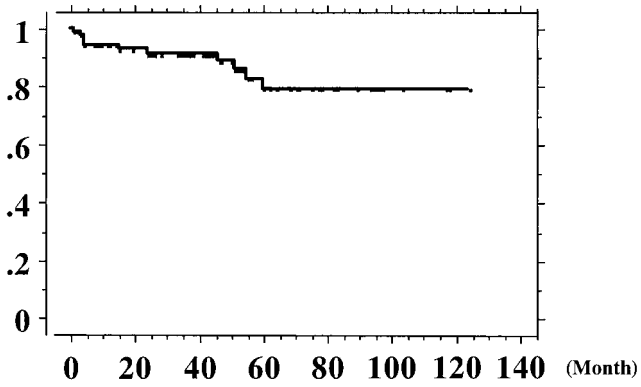

Fig. 1. Cardiac event free rates.
Cardiac event free rates at 1, 5, and 10 years were 94.2, 83.7, and 80.7%, respectively.

(72.1%) were male, and the average age was 65.7±10.0 years old, ranging from 31 to 87 years old. Thirty-seven patients had AMI, and the other 67 patients had UA. At admission, if serum CK-MB level was twice over the normal range (25 IU/l), the diagnosis was AMI. Patients' profiles are summarized in Table 1. Twelve patients had isolated LMT lesions, and triple vessel diseases were also present in the other patients. All patients had intra-aortic balloon pumping (IABP) support in the catheter-laboratory and underwent surgery within 48 hours after coronary angiography. CABG was performed under antegrade cardioplegic arrest with cardiopulmonary bypass. We used the left internal thoracic artery (LITA), saphenous vein (SVG), and/or radial artery (RA) as graft materials. Eighty-one LITAs were used for the left anterior descending artery (LAD). Eighteen SVGs were used for the LAD, 13 for the diagonal branch, 75 for the circumflex territory, and the other 62 the for right coronary artery, respectively. One RA was used for the LAD, 4 for the diagonal branch, and the other 14 for circumflex territory, respectively. As soon as distal anastomoses were completed, the aortic cross clamp was removed and heart beating was established by temporally electrical pacing. Top end anastomoses with SVG and/or RA were then carried out on the ascending aorta with aortic partial clamping. We assessed post-operative morbidity and mortality and determined independent risk factors for operative mortality. Graft angiography was conducted for 188 grafts (LITA: 65, SVG: 105, RA: 18). Thirty-eight scheduled angiographies were carried out at 1 to 2 months after surgery, 44 scheduled at 12 to 24 months, and the other 9 scheduled at 48 to 60 months after surgery, respectively. Otherwise, 8 patients had angiography at several post-operative stages due to a coronary event.

Statistical calculations were performed using StatView 5.0 (SAS Inc., USA). Univariate analysis and Logistic regression analysis were employed to identify predictors for operative mortality. The actuarial survival, cardiac event free rate, and cumulative graft patency rate were also calculated with the Kaplan-Meier method. A p value of less than 0.05 was considered statistically significant.

Results

Nine patients (8.7%) developed pre-operative cardiogenic shock and 7 of them required percutaneous cardiopulmonary support (PCPS). The average number of grafts was 2.71±0.81. Average durations of aortic clamping and cardiopulmonary bypass were 72.3±20.4 and 132.8±38.0 min, respectively. Post-operative maximum CK-MB level was 73.1±106.5 IU/l. Operative mortality was 8.7% (9 patients: UA, 0%, AMI, 24.3%). All of them had AMI. Late death was indicated in 6 patients due to arrhythmia, heart failure, or stroke. Mean follow-up duration was 40.8 months, ranging from 1 to 126 months. Cardiac event free rates at 1, 5, and 10 years were 94.2, 83.7, and 80.7%, respectively (Fig. 1). Actuarial survival rates at 1, 5, and 10 years were 88.9, 82.9, and 75.4%, respectively (Fig. 2). Univariate analysis detected AMI (p=0.0002), cardiogenic shock (p=0.0001), PCPS (p=0.0001), and chronic renal failure (CRF) (p=0.0481) as independent predictors for operative mortality. Logistic regression analysis showed that pre-operative cardiogenic shock was the only predictor for operative mortality (p=0.0146, odds 5.96). Cumulative graft patency rates for LITA at 1 and 5 years were 98.4 and 92.6 %, respectively. In SVG, they were

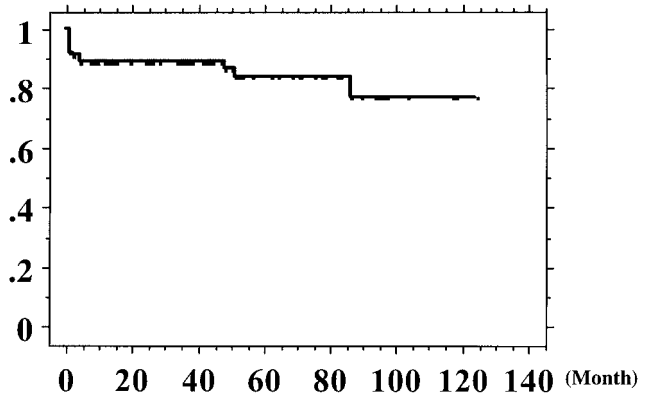

Fig. 2. Actuarial survival rates.
Actuarial survival rates at 1, 5, and 10 years were 88.9, 82.9, and 75.4%, respectively.

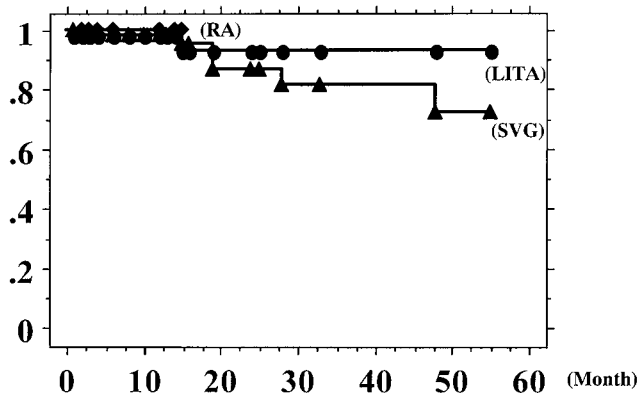

Fig. 3. Cumulative graft patency rates.
Cumulative graft patency rates for LITA at 1 and 5 years were 98.4 and 92.6%, respectively. In SVG, they were 98 and 72.4%, respectively. One year-graft patency rate for RA was 100%. RA, radial artery; LITA, left internal thoracic artery; SVG, saphenous vein graft.

98 and 72.4%, respectively. One year-graft patency rate for RA was 100% (Fig. 3).

Discussion

Hospital mortality for elective CABG has improved from 3.1 to 1.7% over the last 5 years, while mortality for emergency CABG has remained the same for that same period (from 14.9 to 12.3%).[7] In particular, mortality for emergency CABG within 24 hours after onset of AMI was reported to have increased from 9.1 to 17.4%.[3] In the present study, mortality for emergency CABG for AMI was also quite high (over 20%). This is because all patients underwent emergency CABG for ACS due to LMT diseases. LMT disease is one risk factor closely associated with operative mortality.[5] Kennedy et al. described that elective surgical mortality for patients with LMT diseases was 4.2%, while emergency surgical mortality was 40%.[8]

In the present study, emergency operative mortality affected 9 patients (8.7%) and 8 out of 9 patients had preoperative cardiogenic shock. In such patients, irreversible myocardial damage might have already developed pre-operatively in most of the myocardium and severe pump failure had not been recovered by surgical revascularization. Hospital mortality for patients with cardiogenic shock undergoing emergency CABG was reported as 42-55%.[4,9] Furthermore, Quigley et al. reported that mortality for patients with left main shock syndrome was about 80%, regardless of emergency surgical recanalization.[10]

In our institute, if the coronary angiogram for patients with ACS showed LMT stenoses, those patients were diagnosed to have emergency CABG as soon as possible. However, the guidelines of AHA/ACC show that there is no indication for emergency CABG for AMI through the whole myocardium.[2] It is impossible to treat all patients with AMI using emergency CABG, therefore other treatments such as emergency supported PCI rather than emergency CABG particularly for patients with cardiogenic shock, have to be discussed. Several investigators reported that immediate application of mechanical support and recanalization for LMT diseases by emergency PCI prior to CABG were necessary to prevent enlargement of the infarction area and saved patients with left main shock syndrome.[6,11] Okamoto et al. reported that it took 3.8 hours to complete emergency PCI for AMI, on the other hand, emergency CABG needed more than 9 hours to complete recanalization.[6] In the patients with LMT shock syndrome, the infarction area is enlarging until successful recanalization is carried out. Obviously, there is a positive correlation between the value of peak CPK and the time duration to complete recanalization. In the present patients with LMT shock syndrome, global ventricular function has already deteriorated until complete surgical intervention is achieved due to the considerable amount of myocardial infarction with Q wave on ECG. According to previous reports and the present results, we also consider that the first treatment for ACS must involve PCI prior to CABG, especially for patients with cardiogenic shock, even though these patients have ACS due to LMT

diseases which have been a contraindication of PCI. It might be necessary for patients to undergo complete recanalization by PCI as soon as possible with the appropriate mechanical support, to ensure survival. On the other hand, if a patient with ACS due to LMT stenoses was stabilized using IABP support, emergency CABG was definitely required as soon as possible.

Conclusion

It is still very hard to treat patients with cardiogenic shock. We suggest that immediate PCI with mechanical supports should be performed prior to surgery to help survival of patients with left main shock syndrome.

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