# Clinical features and outcome of emergency percutaneous intervention of left main coronary artery occlusion in acute myocardial infarction

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## ABSTRACT

**Introduction: Acute myocardial infarction (AMI) due to left main coronary artery (LMCA) occlusion carries a grave prognosis. Large series reporting on the outcome of emergency revascularisation (percutaneous or surgical) of acute LMCA occlusion have been scarce. We seek to identify, in our local population, the clinical presentation and outcome of this group of patients.**

**Methods: From January 2000 to December 2005, a total of 1,539 patients underwent primary percutaneous coronary angioplasty for AMI in our institution. 11 patients (0.8 percent) underwent percutaneous intervention to the LMCA. These patients became the subjects of our study. Data on demography, clinical features and outcome was collected from all in-hospital and clinical notes. One sub-investigator, who was blinded to the study outcome, assessed the angiographical features.**

**Results: The overall inpatient mortality was 82 percent (9 out of 11). Nine out of 11 patients presented with cardiogenic shock. All patients presented with shock died during the hospital stay. All patients required intra-aortic balloon counter pulsation insertion. Of the two patients who survived till discharge, one had angioplasty followed by bypass surgery. The remaining one had angioplasty and stenting to the left main artery. Both survivors have been doing well without further major adverse cardiac event after an average of 64 months of follow-up.**

**Conclusion: Percutaneous revascularisation of acute LMCA occlusion is feasible and the best outcome is seen in stable patients. Prognosis is still poor in patients with unfavourable clinical features.**


**Keywords: acute myocardial infarction, emergency coronary revascularisation, intra-aortic balloon counter pulsation, left main coronary artery occlusion, primary percutaneous coronary angioplasty**

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## INTRODUCTION

Acute myocardial infarction (AMI) due to left main coronary artery (LMCA) occlusion carries a grave prognosis. The true incidence cannot be ascertained as many patients with this condition may present with sudden cardiac death before reaching the hospital. Those patients receiving medical attention are usually haemodynamically unstable and are in cardiogenic shock due to a large area of myocardium being in jeopardy. Without collateral flow or prompt revascularisation, the outcome is invariably fatal.[1] Large report series on the outcome of emergency revascularisation (percutaneous or surgical) of acute LMCA occlusion have been scarce. Published studies have so far reported on small numbers of patients.[2-5] To our knowledge, no data on this group of patients is available locally. We sought to identify, in our local population, the clinical presentation and outcome of this group of patients, and to identify factors that may influence the outcome.

## METHODS

From January 2000 to December 2005, a total of 1,539 patients underwent primary percutaneous coronary angioplasty (PTCA) for AMI in our institution. Among these, 12 (0.8%) patients suffered from acute total or subtotal occlusion of LMCA. Of these 12 patients, 11 underwent percutaneous intervention to the LMCA. The remaining one patient passed away before the angioplasty could be attempted. These 11 patients

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**Table I. Clinical and angiographical characteristics (n = 11).**

| Characteristics | no. (%) |
|---|---|
| Age (mean ± SD) (years) | 57 ± 15 |
| Men | 10 (90) |
| Hypertension | 4 (36) |
| Hypercholesterolaemia | 4 (36) |
| Smoking | 7 (63) |
| Diabetes mellitius | 3 (27) |
| Previous AMI | 0 |
| Previous PCI | 0 |
| Preinfarct angina | 3 (27) |
| Cardiogenic shock on presentation | 9 (82) |
| Mean SBP on presentation (mmHg)* | 76 |
| IABP | 11 (100) |
| Haemodynamic significant VT/VF | 8 (72) |
| Mortality (inhospital, overall) | 9/11 (82) |
| Shock | 9/9 (100) |
| Not in shock | 0/2 (0) |
| RCA dominant | 11 (100) |
| RCA stenosis > 50% | 2 (18) |
| Collateral RCA to LAD | 1 (9) |
| Total / subtotal LM occlusion | 11 (100) |
| Proximal | 1 (9) |
| Mid | 6 (55) |
| Distal | 4 (36) |
| Use of thrombectomy device | 2 (18) |

*n = 9 (2 patients' BP unrecordable).

are the subjects of our study. Data on demography, clinical features and outcome was collected from all inhospital and clinical notes. One sub-investigator, who was blinded to the study outcome, assessed the angiographical features.

We used the following definitions of terms. Angiographical success was defined as a reduction to residual stenosis of < 50% by balloon angioplasty, or successful stent deployment with a residual stenosis < 30% with final thrombolysis in myocardial infarction (TIMI) grade 3 flow in the infarct-related artery. Angiographical no-reflow was defined as reduction in antegrade coronary flow (TIMI flow 0 or 1) in the absence of apparent flow-limiting dissection, spasm, or distal macro-embolisation. Haemodynamically significant VT was defined as VT needing immediate electrical cardioversion.

## RESULTS

The basic clinical and angiographical features of our patients are shown in Table I. The majority of patients were middle-aged males. 63% were smokers. None had previous myocardial infarction or percutaneous coronary intervention (PCI). Cardiogenic shock was a common presentation (82%) and all patients had intra-aortic balloon counter pulsation (IABP) inserted. Haemodynamically-significant VT/VF developed in eight out of 11 patients. The overall inhospital mortality was 82% (nine out of 11). All patients who were in shock passed away. The mortality rate for those presented with cardiogenic shock was 100%. The two patients who did not develop shock survived till hospital discharge.

The angiographical and procedural features with outcome of our patients are shown in Table II. Four out of nine mortalities occurred while the patients were still in the cardiovascular laboratory. Two patients survived till discharge. One survivor had balloon angioplasty done, followed by successful emergency bypass surgery. Another survivor had successful angioplasty and stenting. Both survivors have been doing well without and further major adverse cardiac

**Table II. Angiographical and procedural features with outcome (n = 11).**

| Patient no. | Initial TIMI flow | Reperfusion method | Thrombectomy device | No reflow post-balloon/ stent | Final TIMI flow | Procedure success | Mortality (lab/hospital) | Survival follow-up (months) |
|---|---|---|---|---|---|---|---|---|
| 1. | 1 | Balloon/stent | No | Yes | 1 | No | Yes (lab) | n/a |
| 2. | 0 | Balloon/stent | No | Yes | 1 | No | Yes (lab) | n/a |
| 3. | 0 | Balloon/CABG | No | No | 2 | No | No | 63 |
| 4. | 0 | Balloon/stent | No | No | 3 | Yes | No | 64 |
| 5. | 1 | Balloon/CABG | No | Yes | 1 | No | Yes (hosp) | n/a |
| 6. | 0 | Balloon/stent | No | Yes | 1 | No | Yes (hosp) | n/a |
| 7. | 1 | Balloon/stent | Yes | Yes | 1 | No | Yes (hosp) | n/a |
| 8. | 1 | Balloon/stent | No | No | 2 | No | Yes (hosp) | n/a |
| 9. | 0 | Balloon/stent | Yes | Yes | 1 | No | Yes (hosp) | n/a |
| 10. | 1 | Balloon/stent | No | No | 2 | No | Yes (lab) | n/a |
| 11. | 0 | Balloon/stent | No | Yes | 1 | No | Yes (lab) | n/a |

event after an average of 64 months of follow-up. Angiographical no-reflow phenomenon was noted during PTCA in 64% of the patients (seven out of 11). None of the patients who had angiographic no-reflow survived. In those patients without this phenomenon, half of them survived till discharge (two out of four). A collateral vessel from right coronary artery to left anterior descending artery (LAD) was observed in one patient only. That patient, despite having a collateral vessel, did not survive.

## DISCUSSION

LMCA occlusion has a grave prognosis with high mortality. The survivors in our series were not in shock on presentation and underwent successful revascularisation (one percutaneously and the other one bypass surgery). Shock on presentation, unsuccessful revascularisation and the presence of angiographical no-reflow phenomenon were associated with poor outcome in our series. This was consistent with the findings of other series.[2-4] The clinical presentation of acute LMCA occlusion is usually stormy. The majority of the patients is in cardiogenic shock on admission and need IABP or other circulatory support. Malignant arrhythmia and cardiorespiratory failure requiring cardiopulmonary resuscitation and ventilation are common. Yip et al described cardiogenic shock in 77.8% of their patients,[4] which was comparable with our series.

Published series on the outcome of emergency revascularisation of acute LMCA occlusion, whether treated surgically or percutaneously, have been small and scarce. There have been no trials comparing the outcome of these two different approaches of revascularisation. Earlier series by Chauhan et al[6] and Quigley et al[1] showed poor outcome for patients with AMI and LMCA disease. The inhospital mortality was 83% and 94%, respectively. However, subsequent series showed better results.[2-5] For example, in the largest series, Marso et al reported 40 patients who underwent emergency percutaneous left main intervention for AMI in the ULTIMA registry. The inhospital mortality was 55%, with better outcome reported in patients with stent implanted.[3] Whether stenting is superior to angioplasty has yet to be determined in a randomised trial.

With regard to surgical revascularisation, Nakanishi et al reported 70 patients with AMI undergoing emergency CABG.[7] There were 13 patients who had significant left main trunk stenosis. The perioperative mortality rate for the entire group was 40%: 46% for patients with AMI and significant left main trunk stenosis and 53% for patients in cardiogenic shock. These results appear comparable with that obtained from using the percutaneous approach. However, no valid comparison can be made between these two approaches based solely on observational data.

Determinants of survival have been identified in some of the published series.[2-5] Presence of collaterals to LAD, a dominant right coronary artery (RCA), absence of cardiogenic shock and successful reperfusion have been shown to be associated with survivors of LMCA AMI. These findings were comparable to our series. In the latest series by Sakai et al, shock patients, when compared to non-shock patients in LMCA AMI, had lower successful PCI rates (69.7% vs. 100%, $p = 0.040$), higher inhospital mortality (71.4% vs 10%, $p = 0.0008$), and higher one-year mortality rates ($p = 0.0064$).[5] All shock patients, who had failed angioplasty, died in the series. Of note, angiographical no-reflow phenomenon is common in PCI of acutely-occluded LMCA. During the same period, in a separate study, angiographical no-reflow or slow flow rate in primary PTCA was 26% in LAD; 16% in left circumflex artery (LCX), and 6% in RCA in our institution. The reason for this unusually high rate of no-reflow/slow-flow for LMCA primary PTCA is not entirely clear. More importantly, successful reperfusion has been shown to improve outcome in all series.

Apart from pharmacological antithrombotic and antiplatelet agents, mechanical thrombectomy devices also offer hope of improved rates of successful reperfusion. This can hopefully translate into better survival rates. Focusing on this area may provide potential for more successful reperfusion rates.[8] LMCA AMI presents a tremendous challenge, especially to the interventional cardiologist. Percutaneous revascularisation is feasible and the best outcome is seen in stable patients. Prognosis is still poor in patients with unfavourable clinical features.

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