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# Percutaneous Coronary Intervention in Unprotected Left Main Coronary Artery Disease

Hafeez Ahmed, Javed Majid Tai and Sajid Dhakam

## ABSTRACT

Percutaneous coronary intervention for unprotected left main coronary artery disease is potentially an important intervention in surgically unstable patients. A detailed review of medical record and visual analysis of coronary angiography and PCI procedure was undertaken. The study was conducted at the Aga Khan University Hospital, from January 2003 to December 2007. Patients included in the study had unprotected > 70% left main stenosis with ongoing ischemia, considered unsuitable for surgical revascularization. A total of 9 patients were included with a mean age of 70.1 years. Six patients had cardiogenic shock. Eight patients had bifurcation lesion. Simultaneous kissing stenting technique was used in 4 patients. There were 4 in-hospital deaths while 5 patients were alive at discharge. All 4 patients who expired had cardiogenic shock. Four patients were alive at a mean follow-up of 17 months. PCI turned out to be an alternative therapeutic option for unprotected left main coronary artery disease when surgery is declined.

**Key words:** *Percutaneous coronary intervention. Unprotected left main coronary artery disease. Kissing stent technique. Cardiogenic shock.*

Coronary artery bypass surgery (CABG) is considered to be the most preferable therapeutic option for unprotected left main coronary artery disease. However, with the advancement of percutaneous stenting technique, the paradigm for left main percutaneous coronary intervention (PCI), coronary disease therapy appears to be changing. Gruntzig in 1978 first published the performance of percutaneous coronary angioplasty (PCA) in left main coronary disease.<sup>1</sup> At present, the main indication for stent implantation in unprotected left main coronary disease include situations in which immediate re-vascularization is required such as acute myocardial infarction and cardiogenic shock or the presence of other serious co-morbidities which make the more invasive surgery unsuitable. The main aim of the present study was to describe the results of percutaneous stenting for unprotected left main coronary artery disease with elaboration of its associated high risk profile and clinical outcome.

The study was conducted at the Aga Khan University Hospital. All patients undergoing percutaneous coronary intervention for unprotected left main coronary disease between January 2003 to December 2007, were included. All those patients were evaluated by cardiothoracic surgery prior to percutaneous intervention but were deemed unfit for surgery due to unstable hemodynamics, underlying severe left ventricular dysfunction

and associated serious co-morbid conditions. A detailed review of the medical records and follow-up of concerned patients was done. Patients with protected left main disease having a patent graft to left anterior descending coronary artery or left circumflex coronary artery and patients who had received thrombolytic therapy in the preceding 24 hours were excluded. Descriptive statistics were presented as mean  $\pm$  standard deviation, median with range for quantitative variables and number (percentages) for qualitative variables. All analyses were performed in SPSS 16.0 for Windows.

A total of 9 patients were included. Five patients were male and mean age of the patients was  $70.1 \pm 11.9$  years. Five patients had Diabetes (55.6%) while 8 patients were hypertensive (88.9%). Six (66.7%) patients were in cardiogenic shock. Three patients had ongoing ST elevation myocardial infarction, 3 had non-ST elevation myocardial infarction and 5 patients were in acute pulmonary edema. Six patients had three-vessel disease and 3 patients had two-vessel disease. One patient underwent PCI of the right coronary artery (RCA) and one of the LCx along with left main stenting. The site of left main coronary stenosis, type of interventional technique employed, procedural results, in-hospital and long-term outcome of these patients are detailed in Table I. Drug eluting stents (DES) were used in 6 patients just to decrease the chances of in-stent restenosis in left main as compared to BMS (bare metal stent). POBA (percutaneous only balloon angioplasty) was used in one patient only because he twice had cardiac arrest on table and had a poor chance of survival. Four patients expired during hospital stay while 5 patients were alive at the time of discharge. All the 4

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**Table I:** Type of LM disease, stenting technique and clinical outcomes.

Variables	n (%)
<b>Technique</b>	
SKS	04 (44.4)
LM → LAD	03 (33.3)
LM → LCx	01 (11.1)
KB	01 (11.1)
<b>Stent</b>	
DES	06 (66.7)
BMS	02 (22.2)
POBA only	01 (11.1)
<b>Post procedural TIMI flow</b>	
0	1 (11.1)
I	1 (11.1)
III	07 (77.8)
LM Ostial	1 (11.1)
LM Shaft	0
LM Distal	08 (88.9)
Dissection	02 (22.2)
Haziness	02 (22.2)
No re-flow	02 (22.2)
In-Hospital death	04 (44.4)
Death in patients with cardiogenic shock (06)	04 (66.66)
Death in patients without cardiogenic shock (03)	0 (0)
Discharged alive	05 (55.6)
Survival at 17 months of follow-up	04 (44.4)

SKS = Simultaneous Kissing Stenting technique; DES = Drug eluting stent;  
TIMI flow = Thrombolysis in Myocardial Infarction flow; KB = Kissing ballooning only;  
LM = left main; LAD = left anterior descending artery; LCx = left circumflex artery;  
POBA = Percutaneous only balloon angioplasty.

patients who died had cardiogenic shock, thereby reflecting the high mortality associated with this clinical presentation. Of the 5 patients who were alive at the time of discharge, 4 patients were alive at a mean follow-up of 17 months with no reported "major adverse cardiac events" (MACE). One patient died after 2 months hospital discharge due to massive intra-abdominal haemorrhage as she was on oral anti-coagulant therapy for a prosthetic mitral valve.

One of the largest series published by O'Keefe *et al.* in 1989 demonstrated the technical feasibility of percutaneous management of left main coronary artery disease but it had 64%, 3-year mortality rate.<sup>2</sup> Unprotected Left Main Trunk Intervention Multi-Center Assessment (ULTIMA) registry enrolled 279 patients with unprotected LMCA disease who were managed by percutaneous coronary re-vascularization (69% bare metal stent), mortality at a one-year follow-up was 40% in high-risk patients while it was 3.5% in low-risk patient cohorts. Twenty percent of these patients were in cardiogenic shock at the time of PCI and 50% had an IABP (Intra-aortic balloon pump).<sup>3</sup> Seung *et al.* in a recently published large registry compared unprotected left main stenting (1102 patients) with CABG (1138 patients) on propensity analysis score. In the overall matched cohort, there was no significant difference between stenting and CABG groups in the risk of death or of composite outcome.<sup>4</sup> This study patients comprised a very high risk group. Six patients were in

cardiogenic shock and 6 patients had acute myocardial infarction. Five patients required intra aortic balloon counter pulsation for unstable hemodynamics. Left main distal bifurcation lesion is more frequently encountered in clinical practice than ostial disease. In this limited series of patients, 8 patients had distal bifurcation lesions while only one patient had ostial left main disease reflecting the presence of high risk lesions for stenting. In this study, all the 4 patients who died during hospital stay were in cardiogenic shock. All those deaths happened within 36 hours suggesting that if these patients survived during the initial period of this serious illness then they had a good chance of survival to discharge. At a mean follow-up of 17.75 months (ranging from 6 to 27 months), 4 patients were still alive while one patient died due to a non-cardiac cause. Currently, left main PCI is not a very commonly used procedure. In a registry of 7752 patients undergoing PCI in 140 centres over 6 months in 2005, only 110 patients had LMS (left main stenting) stenting equivalent to 2%.<sup>5</sup> However, the recently completed 2 years data of syntax trial showed that PCI of unprotected left main had MACE equal to the CABG except for high re-vascularization rate with PCI.

In the current perspective, CABG is still considered the first choice in left main disease. Percutaneous stenting is an alternative therapeutic option for patients with unprotected left main disease who are not suitable for surgical re-vascularization. It is associated with favourable in-hospital and long-term outcomes in patients without cardiogenic shock. However, more prospective randomized clinical trials are needed to better define the role of percutaneous stenting in left main coronary disease.

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