SHORT TERM OUTCOMES OF LEFT MAIN CORONARY ARTERY STENTING

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ABSTRACT

Objective: To determine the short term outcomes of left main coronary artery stenting and whether stenting of unprotected left main coronary artery (ULMCA) stenosis in carefully selected patients with normal left ventricular (LV) systolic function is safe and thus may provide an alternative treatment to coronary artery bypass graft (CABG).

Study Design: Descriptive study.

Place and Duration of Study: Army Cardiac Center Lahore from Jan 2016 to Jun 2017.

Patients and Methods: A total of 50 patients with ULMCA stenosis who were treated with stent angioplasty by using drug eluting stents were evaluated. Patients were followed closely with monthly telephone interviews and follow-up angiography was done at 3 months. The occurrence of major in hospital complications like death, fatal and non fatal myocardial infarction (MI), acute or subacute stent thrombosis and urgent CABG in these patients were recorded. Along with this occurrence of angiographic restenosis and target vessel revascularization rates were recorded after 3 months of angiographic followup.

Results: The procedural success rate was 100%. Major events like acute or subacute stent thrombosis, death, fatal or nonfatal MI, urgent CABG didn't occur in any patient. Three months follow-up angiography was performed in 20 of 50 patients. Other patients (without angiographic follow-up) remained asymptomatic. All of 20/50 patients had patent stents of left main coronary artery and hence target vessel revascularization rate was zero in these patients.

Conclusion: Stenting of ULMCA stenosis may be a safe and effective alternative to CABG in carefully selected patients.

Keywords: Coronary artery bypass graft, Left main coronary artery, Per cutaneous coronary intervention.

INTRODUCTION

The prevalence of left main coronary artery disease in patients with coronary artery atherosclerosis varies from 5% to 7%[1]. Mortality of such patients with ULMCA disease at 3 years who were treated medically was 60%. Coronary artery bypass graft (CABG) remains the standard treatment of choice in patients with unprotected left main coronary artery (ULMCA) disease. However, stenting of unprotected LMCA stenosis has been attempted in selected patients with prohibitive surgical risk, usually as a result of noncardiac related comorbidities. A few cases of stenting of such unprotected LMCA stenotic lesions have also been reported in bailout situations. Initially, rates of restenosis following PCI with balloon angioplasty were 30-40% and 20-25% with bare-metal stent[2]. Sirolimus-Eluting Stents have demonstrated persistent neointimal hyperplasia inhibition for up to 2 years, while many other studies have shown restenosis rates to less than 10%. The advent of aggressive antiplatelets protocols and drug-eluting stents has led to renewed interest in the applicability of PCI as modality for LMCA stenosis. It has been shown in various studies that with the advent of newer drug eluting stents, better intravascular imaging modalities like intravascular ultrasound, fractional flow reserve (FFR), optical coherence tomography (OCT) and careful selection of patients, use of per cutaneous coronary intervention (PCI) in this setting is increasing with results showing non inferiority of PCI as compared to CABG[3]. The objective of the current study was to determine short term outcomes of LMCA stenting by using drug eluting stents in

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terms of major in hospital complicatins like death, fatal or non fatal myocardial infaction, acute or sub acute stent thrombosis, urgent CABG angiographic evidence of restosis and target vessel revascularization in carefully selected patients with normal left ventricular (LV) systolic function as an alternative treatment to CABG.

PATIENTS AND METHODS

A descriptive study was conducted at Army Cardiac Center Lahore from Jan 2016 to Jun 2017, 50 patients with significant unprotected LMCA stenosis who either declined CABG or were at high risk case for CABG due to non cardiac comorbidities were treated with stent implantation as shown in table. Forty six out of 50 Stent implantation was performed electively and in bailout situations in the other four patients. The inclusion criteria were 1) clinical symptoms or objective evidence of myocardial ischemia during stress test in form of ETT or pharmacological thallium scan and 2) coronary angiographic evidence of ≥50% diameter stenosis of the LMCA. The criteria for exclusion were 1) contraindication for dual antiplatelets and 2) reduced LV function (ejection fraction ≤40%).

Predilation before stent implantation was performed with conventional angioplasty balloons. The stents were then deployed by inflating the stent delivery balloon at nominal pressure. The stented segment was post dilated with high pressure balloon inflation to achieve angiographic optimization. The balloon inflation time were brief (<30 s) and multiple (≥3) to avoid prolonged ischemia and its-related complications. Angiographic success of stenting was defined as residual stenosis <30% by visual analysis in the presence of Thrombolysis in Myocardial Infarction (TIMI) 3 flow grade as shown in

Table: Patients, angiographic and procedural characteristics.

Age (years)	
40-50	5
51-60	29
61-70	7
>70	9
Male	34
Female	16
Lesion confined to shaft	4
Lesion involving distal bifurcation	46
Size of stent	
<3.0 mm	2
3.0-3.5 mm	40
>3.5-4.0 mm	7
>4.0 mm	1
Type of stent	
Xience xpedition	16
Xience v	3
Xlimus	13
Firebird	2
Excel	6
Ultimaster	2
Biomatrix	7
Partner	1

fig-1. The size of stent was 3.0-3.5 mm in 80% of the lesions. The lesions at the ostium or shaft without involvement of the distal bifurcation comprised 12% of the lesions as in fig-2.

During the procedure, all patients received a 10,000-U bolus of heparin with a repeat bolus of 5,000 U every 30 min to maintain an activated clotting time >250 s. Patients were preloaded with 300 mg clopidogrel and 300 mg aspirin and were advised life-long aspirin together with 75 mg clopidogrel/day for at least 3 months. Glycoprotein IIb/IIIa inhibitors was given after the operator's discretion. All patients were kept in the coronary care unit for 24 h post stenting. Post stenting, all patients were given dual antiplatelets with the intent of keeping dual anitplatelets for 1 year and continuing aspirin for rest of the life.

Major in-hospital complications including acute or subacute stent thrombosis, fatal or non fatal myocardial infarction, emergency CABG or death didn't occur in any patient.

Clinical follow-up was obtained by monthly telephonic interviews. All patients were requested to visit outpatient clinics at 1and 3 months and to have followup angiograms at 3 months if symtomatic. Angiographic restenosis was defined as luminal diameter stenosis ≥30% at follow-up. Angiographic follow-up data were obtained for 20 of the 50 eligible patients who underwent LMCA stenting. Other patients who refused angiographic follow-up were asymptomatic. Follow-up angiography for the remaining patients is scheduled to be performed 3 months after the intervention. Angiographic restenosis did not occur in any of 20 patients who were angiographically followed up.

RESULTS

This study showed that LMCA stenting is safe and alternative treatment in carefully selected patients with normal left ventricular function. The procedure was successful in all patients, and there were no episodes of acute or subacute stent thrombosis. Angiographic restenosis didnot occur in any of the 20 patients who were followed up angiographically and hence there was zero target vessel revascularization rates. There were no incidences of sudden death, fatal or non fatal myocardial infarction and urgent CABG during the follow-up period.

DISCUSSION

Balloon angioplasty of unprotected LMCA stenosis has been generally associated with poor long-term prognosis.Coronary artery bypass surgery is considered the gold standard

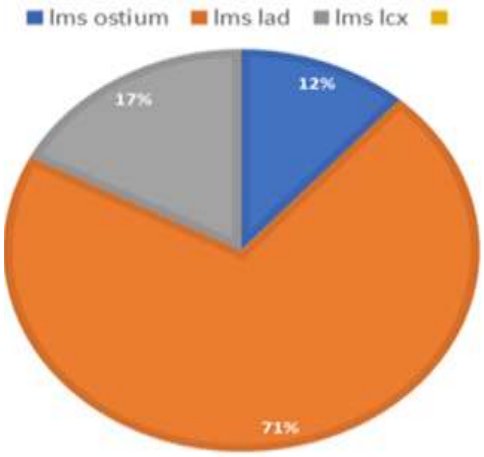

Figure-1: success of stenting as residual stenosis.

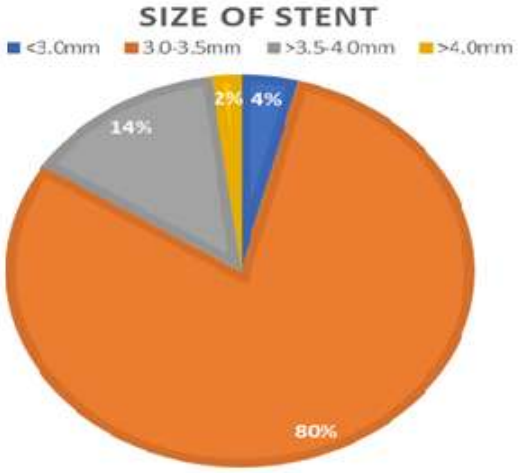

Figure-2: Showing size of stent.

treatment of unprotected left main coronary artery (ULMCA) disease. Compared with balloon angioplasty, low restenosis rates after stenting of LMCA disease may be attributed to larger post-stent arterial lumen dimensions and to the resistant effect of stent against pathologic arterial remodeling and acute recoil.

An additional benefit of PCI over CABG is seen in the duration of hospital stay. Patients undergoing PCI require a shorter hospital stay than the patients undergoing CABG, an issue of growing importance in a resourcescarce era (PCI 3.4 6 4.5 days vs. CABG 9.5 6 8.0 days)[4].

The SYNTAX (synergy between percutaneous intervention with taxus and cardiac surgery) provides the largest data regarding early and late outcomes of PCI of LMS (left main stem) stenosis.

The primary end point of death, stroke, myocardial infarction and repeat revascularization favored CABG over PCI. Whereas, the secondary end point of death, stroke and MI was not different between those who undergo PCI or CABG. Primary end point favoring CABG was driven primarily by increased rate of repeat revascularization in PCI group (13.7% with CABG vs 25.9% with PCI), though the rate of stroke was also significantly lower in PCI group (3.7% with CABG vs 2.4% with PCI)[5].

Calculating SYNTAX score is a class I indication for left main stem disease or multi vessel coronary artery disease as per recent AHA/ ACC PCI guidelines.

Patients with low (0-22) and intermediate syntax score (23-32) can be treated with PCI or CABG with equal results. Those with high syntax score (>32) do better with CABG.

SYNTAX score II[6] (SSII) provides 4-year mortality after coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) in order to facilitate decision-making between these two modalities. SSII has robust prognostic accuracy, both in CABG and in PCI patient groups and was more accurate as compared to syntax score 1 in stratifying patients for late mortality.

The recent EXCEL trial[7] (evaluation of Xience Prime or Xience V-eluting stent vs. CABG for effectiveness of LM revascularization) evaluated the safety and efficacy of PCI with Xience Prime or Xience V everolimus eluting stents (EES) vs. CABG in patients with ULMCA disease with a low or intermediate SYNTAX score (<33). This trial concluded that PCI with everolimus-eluting stents was noninferior to CABG in terms of the rate of composite end point of death, stroke, or myocardial infarction at 3 years.

Intracoronary Stenting and Angiographic Results: Drug-eluting Stents for Unprotected LM Lesions' (ISAR-LM2)[8] evaluated the efficacy and safety of everolimus EES vs zotarolimus eluting stent (ZES) and provided comparable clinical and angiographic outcomes at 1-year follow-up.

In the ERACI IV[9] study, patients treated with second generation DES were compared to the firstgeneration DES in patients with multiple vessel disease and unprotected left main stenosis. Those treated with second generation DES had lower incidence of MACCE.

Bio resorbable vascular scaffolds (BVS) in ostial left main stem lesions has the advantage of avoiding permanent metal struts protruding into the aorta[10].

As per Pil et al[11], the observed 3-year rates of target-vessel failure were not significantly different for the different types of second generation DES [16.7% for the CoCr-EES (cobalt-chromium everolimus-eluting stent), 13.2% for the BP-BES (biodegradable polymer-biolimus eluting stent), 18.7% for the PtCr-EES (platinum chromium everolimus-eluting stent), and 14.7% for the Re-ZES (resolute zotarolimus-eluting stent); p=0.15].

As per european society of cardiology guidelines 2014, PCI of LMS disease with low syntax score is a class Ib indication and in case of intermediate score PCI is class IIa indication.

The current study indicates that stenting of LMCA stenosis improves procedural success and clinical outcomes in part because of the low subacute stent thrombosis rate using optimal stent implantation techniques. Most of the procedures in this study were elective and balloon inflations were intentionally kept short. These facts may

explain the high procedural success rate in our cases. Major in-hospital complications did not occur in any of our patients. This finding suggests that antiplatelet therapy alone might be an effective post-stent antithrombotic regimen even in the LMCA stenting.

CONCLUSION

Stenting of unprotected LMCA stenosis may be a safe and effective alternative to CABG in carefully selected patients.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

REFFERNCES

1. Nitesh N, Francis JH, Kunal PV, Martin RB, James DC, Ian TM, et al. Percutaneous coronary intervention using drug-eluting stents versus coronary artery bypass grafting for unprotected left main coronary artery stenosis. Circulation: Cardiovasc Interv 2016; 9(12): e004729.
2. Mohammed A, Alan H, Brendan M, Rory O, Thomas G, Richard S, et al. Long-term clinical outcomes after unprotected left main coronary artery stenting in an all-comers patient population. Catheter Cardiovasc Interv 2013; 82: E411–E418.
3. Stuart JH, Milan M, Joost D, Jung-Min A, Eric B, Evald HC et al. Mortality after coronary artery bypass grafting versus percutaneous coronary intervention with stenting for coronary artery disease: A pooled analysis of individual patient data. The lancet-elsevier, 23rd feb 2018.
4. Serruys PW, Morice MC, Kappetein AP. Percutaneous coronary intervention versus coronary-artery bypass grafting for severe coronary artery disease. N Engl J Med 2009; 360: 961-72.
5. Mohr FW, Morice MC, Kappetein AP, Feldman TE, Ståhle E, Colombo A et al. Coronary artery bypass graft surgery versus percutaneous coronary intervention in patients with three-vessel disease and left main coronary disease: 5-year follow-up of the randomised, clinical SYNTAX trial. Lancet 2013; 381: 629-38.
6. Marie-Claude, Patrick WS, Pieter KA, Ted EF, Elisabeth S, Antonio C et al. Five-Year Outcomes in Patients with Left Main Disease Treated with Either Percutaneous Coronary Intervention or Coronary Artery Bypass Grafting in the SYNTAX Trial. Circulation 2014; 137(4): 2388-94.
7. Gregg WS, Joseph FS, Patrick WS, Charles AS, Philippe G, John Puskas et al. Everolimus-eluting stents or bypass Surgery for left main coronary artery disease. N Engl J Med 2016; 375: 2223-35.
8. Mehilli J, Richardt G, Valgimigli M, Schulz S, Singh A, Abdel-Wahab M et al. Zotarolimus- versus everolimus-eluting stents for unprotected left main coronary artery disease J Am Coll Cardiol 2013; 62(22): 2075-82.
9. Rodriguez AE. Second versus first generation DES in multiple vessel disease and unprotected left main stenosis: insights from ERACI IV Study. Minerva Cardioangiol 2015; 63(4): 317-27.
10. Everaert B, Capranzano P, Tamburino C, Seth A, van Geuns RJ. Bioresorbable vascular scaffolds in left main coronary artery disease. Euro Interv 2015; 11 Suppl V: V135-8.
11. Pil HL, Osung K, Jung-Min A, Cheol HL, Do-Yoon K, Jung-Bok L. Safety and Effectiveness of Second-Generation Drug-Eluting Stents in Patients With Left Main Coronary Artery Disease. J Am Coll Cardiol 2018; 71(8): 842-43.