International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 7; Issue 7(C); July 2018; Page No. 14047-14050
DOI: http://dx.doi.org/10.24327/ijcar.2018.14050.2534

Research Article

OFF-PUMP CORONARY ARTERY BYPASS GRAFTING (OPCABG) IN PATIENTS WITH SIGNIFICANT LEFT MAIN CORONARY ARTERY (LMCA) DISEASE - A SINGLE CENTRE EXPERIENCE

Vijayant Devenraj[1*]., Akshyaya Pradhan[2]., Sarvesh Kumar[1]., Vivek Tewarson[1] and Shradha[1]

[1]Department of Cardiothoracic and Vascular Surgery, King George's Medical University, Lucknow, Uttar Pradesh
[2]Department of Cardiology, King George's Medical University, Lucknow, Uttar Pradesh

A R T I C L E I N F O

Article History:

Received 25th April, 2018
Received in revised form 13th May, 2018 Accepted 7th June, 2018
Published online 28th July, 2018

Key words:

Offpump coronary bypass surgery (OPCABG) and Left main coronary artery disease (LMCA).

A B S T R A C T

Objectives: This study was aimed to analyze the results of off-pump coronary artery bypass grafting (OPCABG) in patients with significant left main coronary artery disease (LMCA) versus patients without LMCA disease.
Methods: A retrospective and prospective study was conducted from January 2011 to December 2014. A total of 140 propensity matched patients who underwent OPCABG were included in our study; 70 with significant LMCA disease versus 70 in non-LMCA group. Patient demographics and preoperative co-morbidities were recorded. Intra-operative and post-operative parameters were analyzed. Statistical analysis was done and p-values less than 0.05 were considered significant.
Results: In both the groups (LMCA vs. non-LMCA) of patients undergoing OPCABG, patients parameters and co-morbidities were matched. Intra-operatively, there was no significant differences in the number of distal grafts (p = 0.21), revascularization percentage (96% vs 97%). No significant difference was observed in post-operative parameters like ventilatory time (p=0.68); ICU stay (p=0.72); myocardial infarction (p=0.62); reoperation for bleeding (3% vs 3%); cerebral stroke (p=0.79); hemodialysis (p=0.76) and arrythmias (p=0.91). There was equivocal mortality (2.8% vs.4.2%; p=1.00).
Conclusions: OPCABG is a safe, effective and feasible method of coronary revascularization in patients with significant LMCA disease.

INTRODUCTION

Left main coronary artery (LMCA) disease is an important risk factor for increased morbidity mortality at all stages of diagnosis and treatment of coronary artery disease [1]. Surgical revascularization for patients suffering with LMCA disease has been reported to be have better prognosis than expectangt medical therapy in various studies. [2,3]. Coronary artery bypass grafting (CABG) surgery is treatment of choice for LMCA disease and revascularization using cardio pulmonary bypass (CPB) has remained gold standard treatment for past many decades [4]. CPB has many undesirable effects with a potential to affect the post operative outcomes in high risk population and the use of off-pump techniques during CABG surgery has been shown to improve early outcomes significantly [5,6].

The beating heart technique of off-pump coronary artery bypass surgery (OPCABG) was resurrected in early 1990's. Initially this technique was restricted to patients with good vessels & ventricles & without significant LMCA disease.

Corresponding author:* **Vijayant Devenraj
Department of Cardiothoracic and Vascular Surgery, King George's Medical University, Lucknow, Uttar Pradesh

The technological developments in instrumentations for OPCABG, better anesthesiology, better & newer medications have widened scope of this technique for even LMCA disease [7].

The purpose of the present study was to compare the clinical outcome of OPCABG surgery between propensity-matched groups with and without significant LMCA disease.

PATIENTS AND METHODS

This was a retrospective as well as prospective study. From January 2011 to December 2014, a total of 177 patients underwent isolated OPCABG surgery at department of Cardiothoracic & Vascular Surgery (CTVS), King George's Medical University, Lucknow; 87 of whom had significant LMCA disease. A propensity score for LMCA disease was calculated to match pairs with similar clinical parameters of patients undergoing OPCABG without LMCA disease. To calculate the propensity score, backward selection and logistic regression was performed. By matching propensity score, 70 pairs (total of 140 patients) were successfully matched. We compared the clinical results between these propensity-matched groups of patients. OPCABG was performed in all elective isolated CABG cases. Patients with recent acute

myocardial infarction were also included, but emergency cases were excluded. Patients age, sex, co-morbidities like hypertension, diabetes mellitus, chronic pulmonary obstructive disease (COPD), smoking history, pre-existing chronic renal faiure, congestive heart failure (CHF), Left ventricular ejection fraction (LVEF), multi vessel disease, previous myocardial infarction (MI) and previous percutaneous intervention (PCI) were recorded and tabulated (Table-1).

Table 1 Preoperative Patient Characteristics in Propensity Matched Groups

Characteristics	LMCA (n=70)	non-LMCA (n=70)	p Value
Age (mean± SD)	61.9 ±9.2	62.8 ±10.5	0.77
Male gender	60 (86%)	58 (87.4%)	0.28
Smoking history	25 (36%)	24 (34%)	0.78
Hypertension	49 (70%)	52 (74%)	0.22
Hyperlipidemia	57 (82%)	56 (80%)	0.65
Diabetes mellitus	32 (47%)	33 (48%)	0.85
COPD	10 (15%)	8 (12%)	0.90
Previous stroke	6 (8%)	9 (13%)	0.14
Chronic renal failure (Creatinine >1.5)	5 (7%)	5 (6%)	0.90
Congestive heart failure	2 (3%)	3 (5%)	0.78
Three-vessel disease	55 (78%)	56 (76%)	0.92
Previous myocardial infarction	35 (50%)	47 (67%)	0.82
LVEF < 0.40	11 (16%)	13 (19%)	0.49
Previous PCI	10 (14%)	9 (12%)	0.9

LMCA - left main coronary artery; SD - standard deviation; COPD - chronic obstructive pulmonary disease; LVEF- left ventricular ejection fraction; PCI - percutaneous coronary intervention;.

Intra-operative and post -operative parameters were recorded. Operative parameters included emergency IABP (intra-operative balloon pump) use, number of coronary grafts, patients requiring emergency CPB support and total revascularization achieved as planned. Postoperative ventilator support time, reoperation for bleeding, ICU stay, cerebral stroke confirmed by computed tomography, acute renal failure requiring hemo-dialysis, peri-operative MI, deep wound infection and peri-operative mortality were recorded .(Table-2) Follow-up was done as outdoor patient records at 15th day post-operatively, at 1 months and at 3 months. Due ethical commitee clearance was obtained and written consent of patients taken for use of their surgical data for research purpose.

Table 2 Operative and Postoperative Data

Variables	LMCA (n=70)	Non-LMCA (n=70)	p Value (significant if <0.05)
Emergency IABP use	5 (7%)	6 (9%)	0.70
Complete revascularization	67 (96%)	68 (97%)	0.11
Distal anastomoses (number)	2.8 ± 0.5	3.1 ± 0.3	0.21
Ventilatory support (>24hours)	3.8 (6%)	3.5 (5%)	0.68
ICU hours	20.1 ± 2.3	21.1±2.1	0.72
Reopening for post-operative bleeding	2 (3%)	2 (3%)	1.0
Renal failure requiring hemodialysis	2.2 (3%)	2 (2%)	0.76
Cerebral stroke	0 (0.0%)	1 (1.4%)	0.79
Perioperative myocardial infarction	1 (1.4%)	2 (2.8%)	0.62
Cardiac arrythmia like atrial fibrillation,etc	11 (15.7%)	12 (17.1%)	0.91
Peri-operative Mortality (30 days)	2 (2.8%)	3 (4.2%)	1.0

Anesthetic and Surgical Techniques

All patients were operated under general anaesthesia and induction of anesthesia was achieved with fentanyl citrate, propofol infusion and vecuronium bromide. Anesthesia was maintained with fentanyl, propofol, and low concentrations of sevoflurane. Anticoagulation was done with heparin (1 mg/kg) after the conduits (LIMA & saphenous vein) were harvested. The activated clotting time was maintained at 300 seconds or greater. Heparin was reversed with protamine after completion of the anastomosis. Standard intraoperative monitoring techniques were used. Transesophageal echocardiography was used routinely.

All procedures were performed through a median sternotomy. For all the patients, conduits used were LIMA for LAD grafting and reversed great saphenous vein for all other coronary vessel grafting. We used a suction-type mechanical stabilizer (Octopus ® Evolution; Medtronic, Minneapolis, MN) to immobilize the target coronary arteryn site. An intracoronary shunt were used routinely. The distal anastomosis was constructed with 7-0 polypropylene using continuous technique. A red blood cell saving device - cell saver was used in all cases. Post-operatively all patients were ventilated electively in ICU.

Statistical Analysis

Data are presented as the mean ±standard deviation. Categorical variables were analyzed using the chi-square test and paired t-test was used to compare matched data. A propensity score for LMCA disease was calculated to match pairs with similar clinical parameters of patients undergoing OPCABG without LMCA disease. Propensity score matching was performed to correct the effect of non-randomization of this study and selection bias. Calculated p values of less than 0.05 were considered significant. Data were analyzed using SPSS software, version 14 (SPSS Inc, Chicago, IL).

RESULTS

The pre-operative patients demographics and parameters are tabulated in Table-1. In both the groups (LMCA vs. non-LMCA) of patients undergoing OPCABG, patients demographics, cardiac parameters and co-morbidities were equally distributed and well-matched.

Majority of the patients (approx 80 %) were in age group >50 years (Figure 1). Notoriously silent as the LMCA disease is known to be, around 50% of patients with LMCA disease never suffered myocardial infarction (Figure -2)

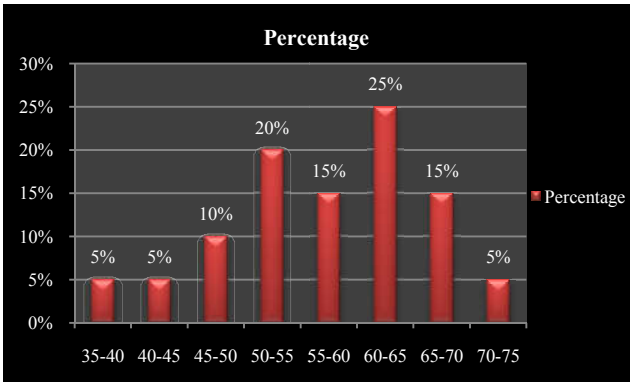

Figure 1 Age distribution of patients.

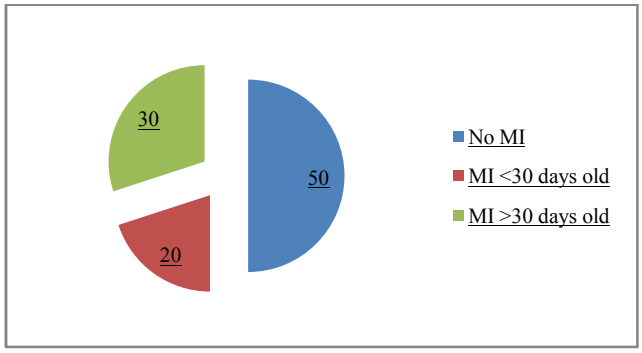

Figure 2 Patients with LMCA disease in relation to myocardial infarction (MI)

Operative and peri-operative outcomes are shown in Table 2. There was no significant differences in the number of distal grafts per patient (2.8 ± 0.5 vs 3.1 ± 0.3; p = 0.21) or achievement of complete revascularization (96% vs 97%; p = 0.11). In LMCA group, 5 patients had to be put on emergency intra aortic ballon pump (IABP) support whereas IABP was required as emergency in 6 patients in non-LMCA group, the relation found to be non-significant statistically (p=0.70).

Statistically, no significant difference was observed in post-operative morbidities between the two groups:- ventilatory support time more than 24 hours (6% vs 5%); ICU stay hours (p=0.72); peri-operative myocardial infarction (1.4% vs 2.8%); reoperation for bleeding (3% vs 3%); cerebral stroke (0.0% vs 1.4%,p=0.79); acute renal failure requiring hemodialysis (3% vs 2%) and cardiac arrythmias like atrial fibrillation (15.7% vs.17.1%).

Two patients in the LMCA group (2 of 70; 2.8%) died: one from low output syndrome and one from renal failure further deteriorating into multi organ failure. Three patients in the non-LMCA group (3 of 70; 4.2%) died: two with low output syndrome and one with respiratory failure and was a known case of COPD.

DISCUSSION

Significant left main coronary aretry (LMCA) disease has been defined as LMCA stenosis greater than 50% of cross-sectional area of the artery assessed visually by cardiologist performing coronary angiography [8]. Historically, patients suffering from significant LMCA disease have known to be at higher risk for early death by all cause mortality [9]. The standard surgical revascularization procedure is coronary artery bypass surgery (CABG) [10,11]. Till last decade and even today, CABG has been performed for patients with LMCA using cardio pulmonary bypass (CPB) assistance, for the fear that the heart may not tolerate the beating heart off-pump CABG (OPCABG). [4]. With better understanding of surgical tecniques for beating heart off-pump CABG, anaesthetic improvements, better intra-operative patient monitoring and improved instrumentation, OPCABG has been used more often for revascularisation of patients undergoing CABG with favourable results at various centres [5,6,10,11]. OPCABG avoids the adverse effects of CPB which is especially important for frail, borderline patients and in good hands OPCABG has been found to be safe and effective for revascularization in patients with LMCA disease[4, 5].

Per cutaneous coronary intervention by cardiologists for LMCA disease has been reported in many studies to be comparable to CABG [12,13]. However, the results are still controversial and require to be analyzed further and also for long term survival benefit and survival of patients.

In our study, we tried to analyze the safety and efficacy of OPCABG in patients with significant LMCA disease and compared with demographics matched patients undergoing OPCABG without LMCA disease.

Jönsson A, *et al.*[14] showed an improvement in surgical results over three decades (1970s to 1990) and the neutralization of LMCA stenosis as a risk factor for both early and late death during the 1990s.

In our study , intra-operative data of two groups (with LMCA & non-LMCA group) showed that the percentage of revascularization achieved as per pre-surgery planned was good with results of 96% vs. 97% and distal anastomosis done was 2.8 ± 0.5 vs 3.1 ± 0.3 ; p = 0.21 , indicating the efficacy of OPCABG technique for LMCA disease. Dewey and colleagues [5] demonstrated in thier study the efficacy and safety of OPCABG in LMCA disease.

Yeatman *et al*. [7] reported the safety and efficacy of OPCAB for critical LMCA disease in a comparison of 75 OPCABG cases and 312 conventional CABG procedures. They observed a reduced need for blood transfusion, chest infection and a shorter hospital stay in critical LMCA patients operated by OPCABG technique. Lu and colleagues(15) compared 259 patients done OPCAB with 938 patients done on pump and analyzed the risk adjusted outcome. They found that OPCAB technique significantly reduced the need for inotrope and shortened the hospital stay.

There was no conversion of OPCABG to on-pump CPB support in both the groups of our study. It is quite clear that conversion rate can be significantly brought down by proper preoperative planning. However it is desirable to have a perfusionist on attendance during the procedure. Emergency intra-aortic baloon (IABP) was put in 7% patients of LMCA vs.9% patients of non-LMCA group and this was not significant (p=0.70), thus indicating that LMCA is not a single risk factor for OPCABG. Cosgrove and colleagues [10] found and reported that LMCA is not an independent risk factor for operative mortality for patients undergoing OPCABG. Many other studies have reported similar findings (11, 14).

Analysis of post-operative data of our study shows that statistically there is no significant difference between the two groups in relation to ventilator requirement, reopening due to bleeding, acute renal failure, intensive care unit stay or cerebral stroke (confirmed if any by computed tomography). Post-operative reported myocardial infarction or cardiac arrythmias like atrial fibrillation,etc were comparable in both the study groups.

The mortality in our groups were 2.8% in LMCA vs. 4.2 in non-LMCA group. This difference was comparable and not found to be significantly statistically (p=1.00). Similar finds were reported from study done by Suzuki *et al* [8] with a non-significant operative mortality difference between people undergoing OPCABG.

In conclusion from what we observe in our study, we understand and believe that OPCABG is safe, feasible and effective surgical revascularization technique in patients suffering from LMCA disease and should be routinely performed in these set of patients.

At the same time we acknowledge that are few limitations in our study. Firstly, the sample size is small as total included patients were 140 only which might affect some result interpretation. Secondly, as the study was retrospective as well as prospective, it lacked randomization. We tried to work this out by having both the groups matched by calculate propensity score. Thirdly, the observed follow up is short as we could follow up these patients till 3 months properly as majority belong to rural areas and donot follow up as per advise in outdoor patient department and are difficult to reach on phone call. A further long term analysis is required to assess survival benefit to patients.

References

1. Chikwe J, Kim M, Goldstone AB, Fallahi A, Athanasiou T. Current diagnosis and management of left main coronary disease. *Eur J Cardiothorac Surg* 2010;38:420-30
2. Taylor HA, Deumite NJ, Chaitman BR, Davis KB, Killip T, Rogers WJ. Asymptomatic left main coronary artery disease in the Coronary Artery Surgery Study (CASS) registry. *Circulation* 1989;79:1171-9.
3. Eagle KA, Guyton RA, Davidoff R, *et al*. ACC/AHA 2004 guideline update for coronary artery bypass graft surgery: summary article: a report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for Coronary Artery Bypass Graft Surgery). *Circulation* 2004; 110:1168 -76.
4. Emmert MY, Salzberg SP, Seifert B, *et al*. Routine off-pump coronary artery bypass grafting is safe and feasible in high-risk with left main disease. *Ann Thorac Surg* 2010;89: 1125-30.
5. Dewey TM, Magee MJ, Edgerton JR, Mathison M, Tennison RN, Mack MJ. Off-pump bypass grafting is safe in patients with left main coronary disease. *Ann Thorac Surg* 2001;72: 788-92.
6. Beauford RB, Saunders CR, Lunceford TA, *et al*. Multivessel off-pump revascularization in patients with significant left main coronary artery stenosis: early and midterm outcome analysis. *J Card Surg* 2005;20:112- 8.
7. Yeatman M, Caputo M, Ascione R, Ciulli F, Angelini GD. Off-pump coronary artery bypass surgery for critical left main stem disease: safety, efficacy and outcome. *Eur J Cardiothorac Surg* 2001;19:239-44.
8. Suzuki T, Asai T, Matsubayashi K, *et al*. Left main coronary artery disease does not affect the outcome of off-pump coronary artery bypass grafting. *Ann Thorac Surg* 2010;90:1501-6.
9. Caracciolo EA, Davis KB, Sopko G, *et al*. Comparison of surgical and medical group survival in patients with left main coronary artery disease. Long-term CASS experience. *Circulation* 1995;91:2325-34.
10. Cosgrove DM, Loop FD, Lytle BW, *et al*. Primary myocardial revascularization. Trends in surgical mortality. *J Thorac Cardiovasc Surg* 1984;88(5 pt 1):673- 84.
11. d'Allonnes FR, Corbineau H, Le Breton H, Leclercq C, Leguerrier A, Daubert C. Isolated left main coronary artery stenosis: long term follow up in 106 patients after sugery. *Heart* 2002;87:544-8.
12. Seung KB, Park DW, Kim YH, *et al*. Stent versus coronaryartery bypass grafting for left main coronary artery disease. *N Engl J Med* 2008;358:1781-92.
13. Chieffo A, Morici N, Maisano F, *et al*. Percutaneous treatment with drug-eluting stent implantation versus bypass surgery for unprotected left main stenosis: a single-center experience. *Circulation* 2006;113:2542-7.
14. Jönsson A, Hammar N, Nordquist T, Ivert T. Left main coronary artery stenosis no longer a risk factor for early and late death after coronary artery bypass surgery- an experience covering three decades. *Eur J Cardiothorac Surg* 2006;30:311-7.
15. Lu JCY, Grayson AD, Pullan DM. On-pump versus offpump surgical revascularization for left main stem stenosis: risk adjusted outcomes. *Ann Thorac Surg* 2005;80: 136 - 43.

How to cite this article:

Vijayant Devenraj *et al* (2018) 'Off-Pump Coronary Artery Bypass Grafting (Opcabg) In Patients With Significant Left Main Coronary Artery (Lmca) Disease - A Single Centre Experience', *International Journal of Current Advanced Research,* 07(7), pp. 14047-14050. DOI: http://dx.doi.org/10.24327/ijcar.2018.14050.2534

****