



## EARLY OUTCOMES; OFF-PUMP MULTIPLE OR TOTAL ARTERIAL CORONARY REVASCULARIZATION.

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**ABSTRACT... Objectives:** Off pump TACR/MACR performed in experienced hands has comparable results to on pump TACR/MACR. **Period:** January-2012 to December-2015. **Material and method:** 405 patients with two and three vessel coronary artery disease (two & three VCAD) underwent OPCAB at the department of cardiac surgery, Jinnah hospital, Lahore. 73 of them got total or multiple arterial coronary revascularizations. 34 patients (41%) had two VCAD and 47 (59%) had three VCAD. Total arterial revascularization was performed in 70 (95.8%) patients using right internal mammary artery and left internal mammary artery and/or radial artery. 3 (4.10%) patients got multiple arterial grafts using BITA, RA and SVG. **Results:** There was no death reported in first 30 days post operatively. Deep sternal wound infection occurred in only one patient. The rate of perioperative stroke and renal failure was zero. Two (2.46%) patients had acute MI and 1 patient was reopened due to bleeding. **Conclusion:** We conclude that early outcome of OPCAB total or multiple arterial coronary revascularizations, in experienced hands, are as safe and effective as ONCAB.

**Key words:** Total arterial revascularization, multiple arterial revascularizations, bilateral internal mammary artery, ONCAB, OPCAB, two or three vessel coronary artery disease

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### INTRODUCTION

Coronary artery bypass graft surgery has been the procedure of choice worldwide for coronary artery disease. This surgery uses left internal mammary artery (LIMA) as a conduit to left anterior descending artery (LAD) and saphenous vein to other occluded or stenosed arteries. It is observed that results of off pump TACR/MACR performed in experienced hands are comparable to on pump TACR/MACR. The drawbacks of cardiopulmonary bypass are expressed as physiological disturbance secondary to the exposure of blood to oxygenators, filters and plastic tubes which destroy red blood cells. Moreover, it has been the reason that activates the inflammatory system and releases the cytokines that precipitates the enhanced capillary leakage. This presents potential threat to most of the other organs of human body.<sup>1</sup>

Off pump coronary artery surgery for TACR is equally useful without compromising perfection of

revascularization. Avoidance of CBP offers many other benefits that include remarkable decreased use of mechanical ventilator and duration of ICU-stay. Moreover, the manipulation of the anterior aorta during clamping and cannulation is a prime independent risk factor for stroke. The embolism caused by atherosclerotic material and/or air can be the possible cause.<sup>2</sup>

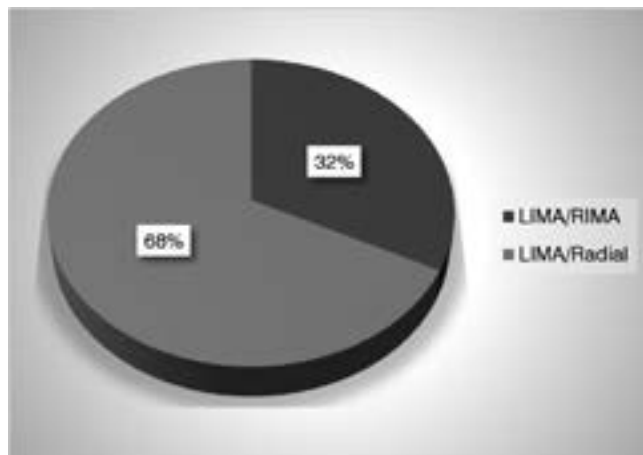
OPCAB technique demonstrates decreased mortality and morbidity in terms of Stroke. The merits of this technique depend on the patient's general condition at the time of the surgery, the ejection fraction of the heart, and coronary anatomy, as well as on the surgeon's experience.<sup>3,4</sup>

In a restricted experience, 95% unselected, consecutive OPCAB patients recovered without any major wound complication. It has been well documented that off-pump CABG using LITA grafting can be adopted routinely with excellent early outcomes without any harm.<sup>5</sup>

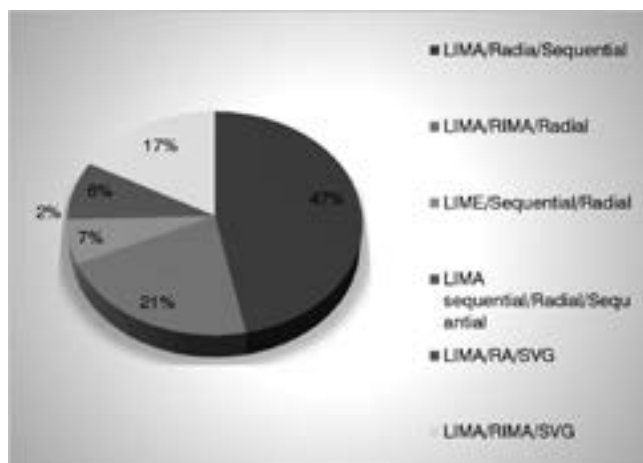
The left coronary artery system can be bypassed with BITAs. But it is not always possible to bypass the left and right coronary artery (RCA) with pedicled IMAs. Bypassing the RCA with a radial artery is an alternative option in that case. The aim of this study was to evaluate the early outcomes among patients who have undergone off-pump total/multiple arterial revascularization using BITA and RA in double or triple-vessel disease.

**MATERIAL AND METHODS**

From January-2012 to December-2015, 405 patients with double & triple-vessel disease underwent OPCAB at the cardiac surgery department, Jinnah hospital, Lahore. CAD patients with valvular disease were excluded. Patients with emergency or redo CABG, and those with single vessel disease were also excluded from this study. Patients with isolated CABG and patients with previous PCI were included. Moreover, all smoker, hypertensive and diabetic patients were also included. Among these 405 patients, 73 patients were selected for OPCAB, 34 (41.9%) patients were having with 2VCAD and 47(59.02%) with 3VCAD. Total arterial revascularization was performed in 70(95.8%) patients using radial artery or right internal mammary artery with left internal mammary artery. 3(4.2%) patients got multiple arterial grafts using LIMA, RIMA, RA and SVG. (15%) of the above 73 patients got LIMA /RIMA configuration and (32.5%) got LIMA/RADIAL configuration (Figure-1). Out of the above 47 three vessel disease patients, (31.4%) got LIMA/Radial Sequential configuration, (14.2%) got LIMA/RIMA/Radial configuration, (4.2%) got LIMA Sequential/Radial artery configuration, (1.42%) got LIMA sequential/Radial Sequential configuration, (4.2%) got BIMA/RA/ SVG configuration (Figure-2).



**Figure-1. Patients who got double arterial coronary revascularizations**



**Figure-2. Patients who got multiple arterial coronary revascularizations**

We used arterial grafts among patients having more than 90% stenosis in RCA. We retrospectively analysed the clinical data of patients preserved in records after approval of Ethical Review Committee of Jinnah Hospital. The patient’s graft distribution is given in table-I below.

Year	LIMA/RIMA	LIMA/RDIAL	LIMA/RA SEQ	BIMA/RADIAL	LIMA SEQ/RA	LIMA& RA SEQ Both	BIMA/RA SVG	Total
2012		02	-	-	-	-	-	02
2013	01	09	11	04	01	01	01	28
2014	02	07	11	01	02	-	02	25
2015	08	05	-	05	-	-	-	18
Total	11	23	22	10	03	01	03	73

**Table-I. Distribution of patient according to graft used**

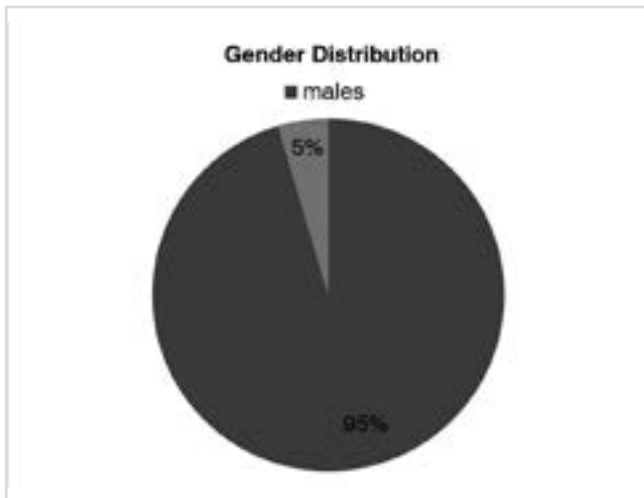


Figure-3. Chart showing patients gender distribution

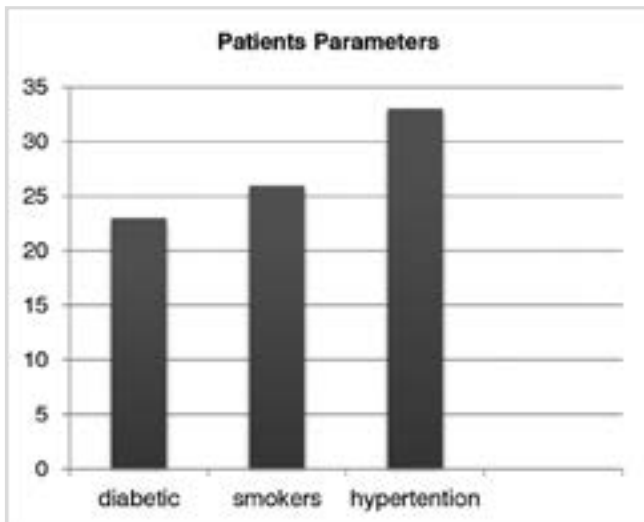


Figure-4. Patient parameters leading to cardiac event

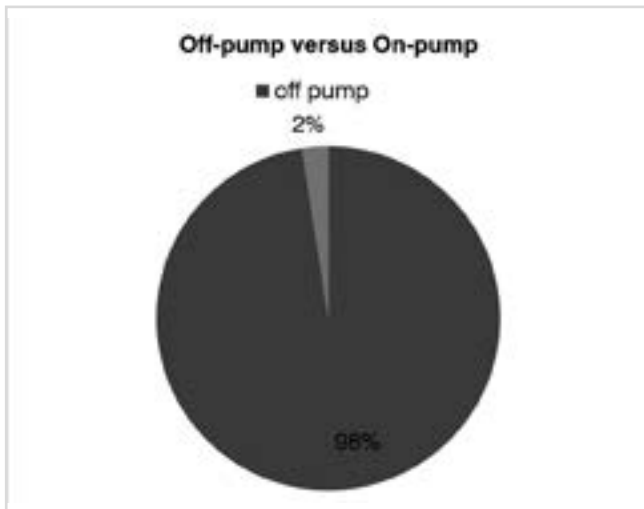


Figure-4. Patient parameters leading to cardiac event

Postoperative myocardial infarction is defined as new Q waves observed in electrocardiogram or a peak creatine kinase–MB greater than 5% of the creatine kinase. A postoperative stroke is defined as a central neurologic deficit that persists for more than 72 hours, and is confirmed by computed tomography (CT) or magnetic resonance imaging (MRI). Cardiac event may be defined as a myocardial infarction, heart failure, reoccurrence of angina and sudden death. Short hospital stay that is up to 6 days at our tertiary care center and long hospital stay is above 6 days. Long hospital stay was reported in 21 (28.7%) patients and short hospital stay was reported in 52(71.2%) patients.



**SURGICAL TECHNIQUE**

We prepared IMAs by the pedicle technique using sharp dissection and clipping of the branches. We performed Allen’s test first then radial artery was harvested from non-dominant forearm. It was preserved in papaverine solution. Heparin was administered at a dose of 150 IU/kg to achieve the target activated clotting time of 300s or more. A deep pericardial stay suture was used, by lifting the heart under gauze piece and the pericardium by tip of suture needle, taking utmost care of posterior mediastinal structures. After arteriotomy to obtain a bloodless field, the target coronary

artery was shunted by using different sized intra luminal shunts.

LIMA was anastomosed on circumflex territory while RIMA on LAD or PDA with a continuous running 7-0 Prolene suture (Ethicon). Similarly RA was anastomosed to circumflex territory or PDA in the same manner. All anastomoses on LAD and diagonal territory of heart were performed by stabilizing the part of heart with the use of Medtronic Octopus. The anastomoses on circumflex or PDA territory by using both star fish and Medtronic octopus. After completion of top ends on aorta, heparin was partially reversed with protamine sulfate (0.5 mg/kg). Minimum use of diathermy was ensured for haemostasis. Bone wax was used to stop bleeding from sternum. The pericardium and thoracic cavities were washed with gentamycin solution. 08 or more wires were used to close the sternum. Vancomycin powder was applied on the sternum and subcutaneous tissues. Subcutaneous tissues were approximated by vicryl 2/0 in two layers. After cleaning the wound edges with pyodine, skin was approximated with continuous running subcuticular 3/0 vicryl suture. Mepore antiseptic dressing was applied later on.

### STATISTICAL ANALYSIS

The number of mean distal anastomoses per patient was 2.45. The patient parameters after surgery are given in table 2 below.

No of distal anastomosis	2.52
ICU stay	03 DAYS
Hospital stay	07-08 DAYS
REOPERATION FOR BLEEING	1(1.23%)
CVA	00
DSWI	01
THIRTY DAY MORTALITY	00

**Table-II. Patient parameters after surgery**

### EARLY OUTCOME

No patient was reported to die within first 30 days. Deep sternal wound infection occurred in one patient (1.23%). The rate of perioperative stroke and renal failure was zero. Two patients (2.46%) had acute MI and one patient was reopened

for bleeding. The mean intensive care unit and postoperative hospital stays were 3 days and 7-8 days, respectively.

Number of patients followed up	72(88.8%)
Angina	0
Reopening for bleeding	1(1.23%)
Acute myocardial infarction	2(2.46%)
Cardiac death	0
Sudden death	0

**Table-III. Table indicating early outcome of patients**

### DISCUSSION

The forthcoming evidence supporting the patency of the BIMA and the RA as conduits has become attractive topic for discussion of total arterial revascularization.<sup>10,11,12,13</sup> This methodology is linked to enhance long-term survival. This is due to the greater patency of arterial conduits and the protective effects of arteries on the native circulation.<sup>14</sup> Spasm of heel side of graft is most commonly occurring problem peri-operatively, but can also occur days to months later. Some other factors that can lead to arterial graft failure are also reported. Partial occlusion usually occurs soon after surgery and the likelihood may be some technical mishap. Localized stenosis is due to local trauma, or a local vascular wall abnormality which is not recognized at the time of harvest. Thirdly and most importantly, competitive flow is the cause for arterial graft occlusion. Such free grafts do not “reopen” when the native coronary becomes occluded, although there are reports of *in situ* LITA grafts doing so. Arterial grafts are superior in patency as they never become atheromatous.<sup>14,15,16,17</sup> Long-term survival after CABG is considered to be in proportional correlation with late patency of the selected conduits and grafts constructed.<sup>18</sup> Thus, the superiority in long-term survival observed among TACR or MACR patients, compared with LIMA/SV patients, may be related to the accelerated atherosclerosis of vein grafts with their higher rates of subsequent occlusion around 10 years [19]. Arterial grafts possess various mechanisms that potentiate blood flow and resistance to atherosclerosis.<sup>20</sup>

Since bilateral internal thoracic artery (BITA) grafting to the left anterior descending coronary artery and circumflex coronary arteries offer the best long-term survival and the lowest rates of re-intervention in patients undergoing CABG. Following these reasons we adopted this approach. However, the best graft for the right coronary artery in patients with triple-vessel disease has not been well established. The right coronary artery can be bypassed with a saphenous vein graft, the radial artery, RGEA or a combination of LITA and RITA grafts.

## CONCLUSION

We concluded that total arterial revascularization or multiple arterial coronary revascularizations using OPCAB with BIMA and RA grafts is safe and effective, in patients with double or triple-vessel disease provided good surgical technique is being used. It has comparable results to ONCAB surgery technique.

## LIMITATIONS

In this study we used a retrospective and non-random design. We did not routinely perform preoperative and postoperative myocardial perfusion tests; therefore, we could not determine competitive flow patterns that contribute to myocardial ischemia. Furthermore, the follow-up was not up to that extend to draw a definite conclusion.

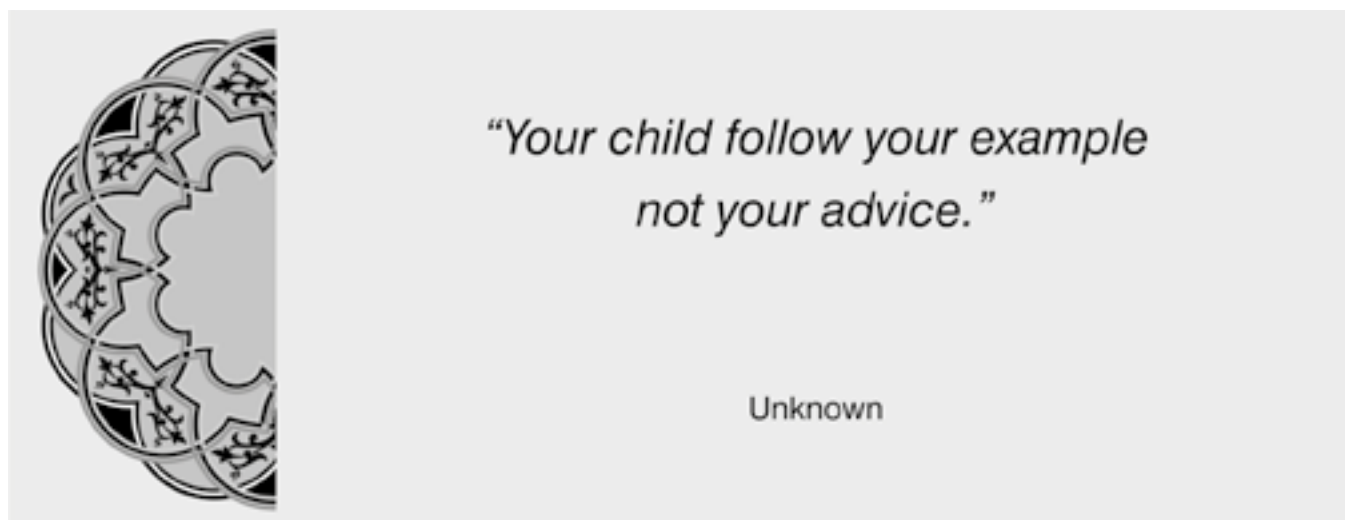
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