

COMPARISON OF SAPHENOUS VEIN GRAFT AND INTERNAL MAMMARY ARTERY TO LEFT DESCENDING ARTERY AFTER CORONARY ENDARTERECTOMY IN CORONARY ARTERY BYPASS GRAFTING PATIENTS FOR DIFFUSE CORONARY ARTERY DISEASE: EARLY POST OPERATIVE OUTCOME

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ABSTRACT

Objective: To compare early postoperative outcomes of saphenous vein graft (SVG) and internal mammary artery (IMA) to left anterior descending artery (LAD) after coronary endarterectomy (CE) in coronary artery disease (CAD) patients.

Study Design: Comparative cross sectional study.

Place and Duration of Study: Armed Forces Institute of Cardiology, Rawalpindi Pakistan, from Jan 2018 to Dec 2019.

Methodology: This study was carried out on patients undergoing endarterectomy. They were divided into two groups. Group 1 (n=115) had internal mammary artery grafted to left anterior descending artery and group 2 (n=42) consisted of patients undergoing saphenous vein graft to left anterior descending artery. Data was collected on a specially designed proforma.

Results: Between group 1 internal mammary artery and group-2 saphenous vein graft, mortality was 9% vs. 11% respectively (p -value 0.01) which was statistically significant. Inotropic score of group 2 was more than group 1 (statistically significant). The difference observed in intra-aortic balloon pump insertion (24% vs. 36%, $p=0.08$), ventilation time 17.67 ± 26.9 vs. 37.71 ± 62.3 , $p=0.05$, dysrhythmias (24% vs. 21%, $p=0.44$), duration of inotropic support (90.57 ± 94.7 vs. 101.37 ± 99.6 , $p=0.53$), reopening (14% vs. 14%, $p=0.56$), intensive care unit stay (109.69 ± 135.4 vs. 136.2 ± 157.3 , $p=0.30$) and hospital stay (07 ± 0.6 vs. 09 ± 0.2 , $p=0.34$) were statistically insignificant.

Conclusion: Internal mammary artery grafting showed better short term results in terms of mortality and inotropic score and as internal mammary artery graft has a proven long term patency compared to saphenous vein graft, it should be preferred as a conduit whenever possible.

Keywords: Coronary artery bypass grafting, Internal mammary artery, Left anterior descending artery, Saphenous vein graft.

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INTRODUCTION

Coronary artery bypass surgery restores normal blood flow to the heart by creating a "detour" (bypass) around the blocked artery/arteries. This is done by using a healthy blood vessel, called a graft. It is still the most commonly performed cardiac surgery procedure worldwide, representing annual volumes of approximately 200,000 isolated cases in the US and an average incidence rate of 62 per 100,000 inhabitants in western European countries¹.

With new advances in PCI for the treatment of ischemic heart disease and the life expectancy increasing in the past two decades, patients referred to the cardiac surgeon have a more extensive and diffuse disease, which is not amenable to complete revascularization with conventional bypass grafting techniques². Hence, the forgotten art of endarterectomy is back in the debating circles, with the argument that the surgical removal of atheroma widens the caliber of the vessel to be grafted, resulting in effective revascularization³⁻⁵.

Those against it, point out the ensuing endothelial layer injury following endarterectomy, which makes the vessel more prone to thrombosis^{6,7}.

Another point of contention is the selection of conduit. While internal mammary artery (IMA) has documented superiority over saphenous vein graft (SVG) in terms of graft patency and progression of disease⁸, the caliber of IMA in our population is considerably smaller than that found in the western countries⁹. Moreover, its flow in the immediate postop period can be suboptimal resulting in a complicated immediate and early postoperative recovery¹⁰, occasionally, necessitating graft revision with a saphenous vein. SVG on the other hand has a good flow right away when anastomosed to the aorta and thus decreases the chances of thrombosis in the injured vessel.

The objective of this study was to compare the 30 day outcome of IMA and SVG to left anterior descending artery (LAD) after coronary endarterectomy (CE) in patients presenting with diffuse coronary artery disease. objective of the study was to compare early postoperative outcome of SVG and IMA to LAD after CE

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in CAD patients. Early post op period-30 days after surgery. Primary outcome is the mortality within 30 days of surgery.

Secondary outcomes were low cardiac output syndrome (requiring inotropic support to maintain systolic pressure >90 mmhg ± intra aortic balloon pump support), periop MI, prolonged acidosis necessitating mechanical ventilation, Inotropic Score during ICU stay, duration of inotropic stay, postoperative arrhythmias (AF and VT), Total ICU and hospital stay.

Peri-op MI is an elevation of CK MB to >5 x 99th percentile of the normal reference range during first 72 hrs after a CABG plus a new pathological q-waves or Imaging evidence of new loss of viable myocardium.

Inotropic score-highest doses of vasoactive and inotropic medications administered during the first 24 hours. (dopamine dose x 1) + (dobutamine dose x 1) + (adrenaline dose x100) + (noradrenaline x 100). Mild-1-20, moderate 20 -45, severe >45¹¹.

METHODOLOGY

This prospective comparative study was carried out at Armed Forces Institute of Cardiology/National Institute of Heart Disease, Rawalpindi, from Jan 2018 to Dec 2019. Ejection fraction <35%, emergency or salvage CABG, Patients with obstructive/restrictive lung disease, patients on haemodialysis, and patients with a history of previous cardiac surgery procedure were excluded from the study. Patients undergoing endarterectomy regardless of no. Of grafts, age group and gender were included in the study. They were divided into 2 groups. Group-1 had IMA to LAD while group-2 consisted of patients undergoing SVG to LAD. In group 1, pedicled LIMA or RIMA was harvested and pleura was opened. In group 2 Saphenous vein was harvested. The decision to use saphenous vein conduit for LAD was mostly influenced by small caliber poor flow LIMA. Both groups underwent On pump CABG with standard ST Thomas cardioplegia. Myocardial protection was achieved by antegrade and retrograde route was only used in patients with Left Mainstem Disease. Data analysis was carried out using SPSS-24. Quantitative variables were described as mean & standard deviation/median & interquartile range where appropriate. Qualitative variables were described as frequencies and percentages. The significance of differences between the two groups will be compared using independent samples't-test for continuous variables and chi square test for categorical variables, assuming a p-value of <0.05 as significant.

RESULTS

Between group 1 (LIMA) and group 2 (SVG), mortality was 9% vs 11% respectively (p-value 0.01) which was statistically significant. Inotropic score of group-2 was more than group 1 and the difference was statistically significant. The difference observed in IABP insertion, ventilation time, periop MI, dysarrhythmias, duration of inotropic support, reopening, ICU and hospital stay were statistically insignificant.

Table-I: Comparison of demographic and baseline characteristics between both the groups.

Parameters	Group I (IMA) n=115	Group 2 (SVG) n=42	p-value
Age (years)	59.1 ± 8.1	61.2 ± 7.6	0.22
Gender			
Male	108	31	
Female	7	11	0.001
Body Mass Index (kg/m ²)	26.9 ± 4.42	25.86 ± 2.78	0.06
Body Surface Area (m ²)	1.72 ± 0.36	1.76 ± 0.23	0.23
CKMB levels	11.39 ± 19	10.4 ± 11.5	0.75
LVEF (%)	52.9 ± 9.41	50.5 ± 10.76	0.219

Table-II: Comparison of operative details between both the groups.

Parameters	Group I (IMA) n=115	Group II (SVG) n=42	p-value
Bypass Time (min)	137.9 ± 84.3	155.1 ± 68.0	0.007
Cross Clamp Time (min)	91.1 ± 41.5	94.0 ± 63.1	0.001

Table-III: Outcome (mortality and major post operative complications).

Parameters	Group I (IMA) n=115	Group II (SVG) n=42	p-value
Mortality	11 (9%)	5 (11%)	0.01
Inotropic Score			
Mild	74 (64%)	25 (60%)	
Moderate	35 (31%)	12 (28%)	0.001
High	6 (5%)	5 (12%)	
IABP	28 (24%)	15 (36%)	0.08
Total Ventilation Time (hrs)	17.67 ± 26.9	37.71 ± 62.3	0.05
Periop MI	30 (26%)	12 (28%)	0.46
Dysrhythmias	28 (24%)	9 (21%)	0.44
Duration of inotropic support	90.57 ± 94.9	101.37 ± 99.6	0.53
Re Opening	16 (14%)	6 (14%)	0.56
ICU Stay (hrs)	109.69 ± 135.4	136.2 ± 157.3	0.30
Hospital Stay (days)	07 ± 0.6	09 ± 0.2	0.34

DISCUSSION

Coronary endarterectomy (CE) was first practiced in 1950 and the experience was published by Bailey *et al*¹². The results were not encouraging and was abandoned in favor of grafting in 1960. Johnson *et al* published their data on SVG to diseased coronary arteries¹³. Initially there was reluctance in using IMA as conduit, but later studies¹⁴, showing superior graft patency, made it the conduit of choice.

With the advent of PCI and technological advancement in stenting, along with increased life expectancy, the pattern of CAD has become more diffuse and extensive. In such cases CE is the only effective option. This technique has its own set of complications which stem from extensive endothelial injury caused to the endarterectomized vessel which hampers the production of vasoactive amines resulting in thrombosis and inflammation of the vessel¹⁵. Mishra *et al*¹⁶, gave the principal indications for CE as follows: multiple obstructions in the same coronary artery, obstruction of the main vessel and its lateral branches, diffusely diseased artery, separation of the plaque during anastomosis, the calcified plaque impeding suturing and occlusion along the entire length of the artery.

Another important aspect in the postoperative outcome of endarterectomy is the choice of conduit. Diameters of chosen conduits play a major role in flow dynamics with a pressure gradient developed in the graft that reaches the distal vascular runoff¹⁷. Goldsmith *et al*¹⁸, comparing 194 Indoasians with white Caucasian patients concluded that Indoasian had a significantly lower use of arterial conduit due to poor quality and low flow. In an endarterectomized vessel with endothelial injury, such a conduit is more at risk of thrombosis in early post op period as compared to SVG which have a larger caliber and are resistant to spasm.

The long term patency and survival benefit of IMA over SVG is well established⁸ nevertheless Goldman *et al*¹⁸, demonstrated superior patency rates of SVG at 10 years when anastomosed to LAD as compared to SVG to other territories. In case of SVG stenosis, lesion can be adequately managed by PCI with Drug Eluting Stents and is recommended over reoperation^{19,20}.

In this study, patient's baseline characteristics e.g. age, BMI, BSA, LVEF, diabetes, hypertension, and smoking were almost similar among both the groups. The primary outcome, a low mortality has been demonstrated in IMA group (9% vs 11%) which was statis-

tically significant (0.01). Inotropic score of group-2 was more than group 1 (statistically significant).

In secondary outcome, the duration of inotropic support, incidence of intra-aortic balloon pump insertion, ventilation time, periop myocardial infarction, duration of ICU stay and total hospital stay was comparatively more in the group-2 but the difference was not statistically significant. Overall, IMA grafting showed mortality benefit in the short term postoperative period which was the primary outcome. It also showed superior results in the secondary outcome, but the difference was not statistically significant.

LIMITATION OF STUDY

It is a single center study where majority of patients are retired army personnel and families, so the sample was small. Group-2 was relatively high risk group that must have affected the final outcome. A Transit Time Flow Meter to compare per operative coronary graft flow between the two groups would have provided a more objective evidence of SVG's superior flow dynamics. We only studied outcome in 30 days, whereas a 5 years follow up would provide a wider image of the subject.

RECOMMENDATION

We recommend a multicenter randomized control trial with larger sample in the Pakistani population comparing SVG and IMA with coronary graft flow measurement per operatively apart from other parameters; and the patients be followed for 5 years.

CONCLUSION

IMA grafting showed better short term results in terms of mortality and inotropic score and as the IMA graft has a proven and documented long term patency, it should be preferred as a conduit for LAD wherever possible.

CONFLICT OF INTEREST

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

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Comparison of SVG and IMA

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