Original Article

Pak Armed Forces Med J 2015; 65(Suppl): S11-15

VEIN GRAFTS TO LEFT ANTERIOR DESCENDING (LAD) IN EMERGENCY CORONARY ARTERY BYPASS GRAFT (CABG) OF ELDERLY – DOES IT MERIT?

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ABSTRACT

Objective: To retrospectively analyze 30 days outcome of elderly patients (≥ 70 years) with Acute Coronary Syndrome (ACS) having an indication for emergency CABG within the first 06 hours after onset of symptoms comparing SVG with IMA for grafting LAD artery.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: Armed Forces Institute of Cardiology / National Institute of Heart Diseases (AFIC / NIHD) Rawalpindi from Jan 2009 to Dec 2013.

Patients and Methods: During the study period total 105 patients, who presented with ACS and merited emergency CABG were included in the study. Group I (n=49) received IMA and group II (n=56) received SVG to graft LAD. Primary outcome was mortality and secondary outcome was major complications within 30 days after surgery.

Results: Between group I (IMA) and group II (SVG) mortality was 24.49% vs 10.71% respectively (p=0.06). Significant difference was observed between the two groups in maximum Inotropic Score (p=0.049), total inotrope time (p=0.048), total ventilation time (p=0.046), Periop MI (p=0.050), renal replacement therapy (p=0.092), Bleeding (ml) (p=0.007), blood transfusion (p=0.016), Re-opening (p=0.030) and ICU Stay (p=0.055).

Conclusion: SVG provides improved survival and lesser complications during 30 days after emergency CABG in elderly as compared to IMA.

Keywords*:* Acute coronary syndrome, Emergency coronary artery bypass grafting, Saphenous vein graft, Internal mammary artery graft.

INTRODUCTION

Acute Coronary Syndrome (ACS) is the leading cause of morbidity and mortality in elderly[1]. WHO predicts that Coronary Artery Disease (CAD) will increase by 120% in women and 137% for men in the next two decades and this is due largely to the increase in the proportion of the elderly population and life expectancy[1].

Primary Percutaneous Coronary Intervention (PCI) has an established role in management of ACS;[1] nevertheless procedure has limitations. In a selected group of patients with Acute Myocardial Infarction (MI), American Heart Association (AHA) guidelines have Class I recommendations for emergency Coronary Artery Bypass Grafting (CABG)[2].

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An elderly patient[2] requiring an Emergency CABG is a challenging task for Cardiac Surgeons. Majority of management protocols have been standardized, yet debate exists about type of conduit used for grafting Left Anterior Descending (LAD) Artery in emergency[3]. The Internal Mammary Artery (IMA) is a transition artery, with microscopic features both of the elastic type, as in the aorta and of the muscular type such as the coronary arteries[7] whereas the Saphenous Vein (SV) is a long peripheral vein of large-caliber, featuring distinct longitudinal bundles of smooth muscle cells in the adventitia and the inner media[8].

IMA is superior for its long term patency rates,[9] whereas Saphenous Vein Graft (SVG) being larger caliber vessel achieves superior flow dynamics in the early postoperative period[10]. The smaller IMA caliber in Asian population due to

small body surface area[11] and an already compromised ischemic heart with low cardiac output makes IMA more prone to "IMA Malperfusion Syndrome",[12] and cannot suffice the myocardial demand in acute settings thus results in poorer outcome.

The aim of this study was to analyze 30 days outcome of elderly patients (>70 years) with ACS having an indication for emergency CABG within the first 6 hours after onset of symptoms comparing SVG with IMA for grafting LAD.

MATERIALS AND METHODS

This descriptive study was carried out at Armed Forces Institute of Cardiology – National Institute of Heart Disease (AFIC/NIHD) from January 2009 to December 2013. Retrospective data was used from cardiac surgery database. All patients ≥ 70 years of age, regardless of gender and number of grafts, who underwent Emergency CABG under AHA guidelines were included. This included patients presenting with AMI or Unstable Angina (UA) in whom Primary PCI has failed or cannot be performed, coronary anatomy was suitable for CABG, persistent ischemia of a significant area of myocardium at rest and/or hemodynamic instability refractory to medical therapy and life threatening ventricular arrhythmias thought to be ischemic in origin. Diagnosis of AMI was made by conventional ECG, cardiac troponin criteria and confirmed by coronary angiography. Exclusion criteria were: emergency CABG as salvage procedure, patient on hemodialysis, patients with obstructive/restrictive lung disease, previous cardiac surgical procedure (redo surgery), surgical repair of post-infarction mechanical complication of MI, concomitant other cardiac surgical procedures and patients with cardiogenic shock who already have a very high mortality despite surgical intervention. Total of 105 patients were included. They were divided into 2 groups: Group I – IMA graft to LAD (n = 49) and group II – SV graft to LAD (n = 56).

In group I, pedicled IMA (left) was harvested and left pleura was opened. In group II only SV was harvested and pleurae were kept intact. SV was also harvested in group I for grafting coronary targets other than LAD. The decision of using SV conduit for LAD was mainly influenced by factors like small caliber poor flow IMA, Obesity, Female Gender, Insulin dependent Diabetes Mellitus and Pre-operative hemodynamic instability. Both groups under went On-Pump CABG with cardioplegic arrest. Myocardial protection was achieved by ante-grade route and retro-grade route was only used in patients with Left Main Stem disease.

The Primary Outcome was Death within 30 days after CABG surgery. The Secondary Outcome were Low Cardiac Output (Systolic blood pressure < 80 mmHg) requiring inotropic support ± Intra-aortic Balloon Pump (IABP), Respiratory Acidosis necessitating Mechanical Ventilation, Acute Renal Failure requiring Continuous Renal Replacement Therapy, Peri Operative MI (new onset Q-wave or STEMI along with elevation of Creatinine Kinase MB after initial normal level in the post operative period) and Postoperative bleeding requiring transfusion. Inotropic requirement was measured by calculating maximum Inotropic Score[13] at single point of time during ICU stay and total duration of inotropic support. Total ICU and hospital stay was also calculated.

Inotropic Score = (Dopamine dose x 1) + (Dobutamine dose x 1) +
(Adrenaline dose x 100) + (Noradrenaline dose x 100)

Data analysis was carried out using SPSS 18. Quantitative variables were described mean & standard deviation/median & interquartile range where appropriate whereas qualitative variables were described as frequencies and percentages. The significance of differences between the two groups were compared using independent samples' t-test/ mann-whitney U test for quantitative variables and chi square test for qualitative variables, assuming a p value of < 0.05 as significant.

RESULTS

One hundred and five patients assigned to both the groups. The baseline patient characteristics of both the groups are shown in Table-1. There was no statistically significant difference in demographic and baseline characterstics between these two groups.

The operative details are given in Table-2. Group I had higher bypass time, cross clamp time and higher number of Coronary Grafts but the difference was statistically insignificant.

Comparison of primary and secondary outcome has been summarized in Table-3. Overall mortality was 17.14%.

Table-1: Comparison of demographic & baseline characteristics between both the groups.

Parameters	Group I (IMA) n=49	Group II (SVG) n=56	*p*-value
Age (years)	73.19 ± 2.66	72.67 ± 2.16	0.930
Gender distribution (M:F)	40:13	40: 12	0.812
Body Mass Index (kg/m^2)	25.86 ± 4.01	25.63 ± 4.16	0.770
Body Surface Area (m^2)	1.82 ± 0.15	1.77 ± 0.13	0.087
Diabetes	13 (26.00%)	13 (26.00%)	1.000
Hypertension	25 (50.00%)	17 (34.00%)	0.105
Smoking	6 (12.00%)	4 (8.00%)	0.505
LVEF (%)	54.64 ± 6.86	53.40 ± 7.45	0.389

Table-2: Comparison of operative details between both the groups.

Parameters	Group I (IMA) n=49	Group II (SVG) n=56	*p*-value
Bypass Time (min)	112 (IQR: 81.5 – 148.5)	99 (IQR: 80 – 137.5)	0.226
Cross Clamp Time (min)	63 (IQR: 48 – 82.5)	54 (IQR: 42.25 – 71.75)	0.100
Coronary Grafts	3.08± 0.66	2.84± 0.55	0.052
Endarterectomy	5 (10.00%)	2 (4.00%)	0.240

Table-3: Outcome (Mortality & Major Post Operative Complications).

Parameters	Group I (IMA) n=49	Group II (SVG) n=56	*p*-value
Mortality	12 (24.49%)	6 (10.71%)	0.06
Maximum Inotropic Score	13 (IQR: 8 - 21)	11 (IQR: 5 – 16.75)	0.049
Total Inotrope Time (hrs)	81 (IQR: 58.5 – 112.5)	65.5 (IQR: 25.25 - 99)	0.048
IABP	16 (32.00%)	16 (32.00%)	1.000
Total Ventilation Time (hrs)	13 (IQR: 8 – 24.5)	11 (IQR: 6 - 16)	0.046
Periop MI	6 (12.00%)	1 (2.00%)	0.050
Dysrhythmias	7 (14.00%)	9 (18.00%)	0.585
Renal Replacement Therapy	5 (10.00%)	1 (2.00%)	0.092
Bleeding - Drains (ml)	890 (IQR: 620 - 1500)	650 (IQR: 435 – 1027.5)	0.007
Blood Transfusion (ml)	450 (IQR: 450 - 1350)	450 (IQR: 0 - 900)	0.016
Re Opening	9 (18.00%)	2 (4.00%)	0.025
ICU Stay (hrs)	90 (IQR: 64 – 122.5)	73 (IQR: 42.5 – 103.75)	0.030
Hospital Stay (days)	8 (IQR: 6 - 11)	7 (IQR: 5.25 - 9)	0.055

DISCUSSION

Physiologically elderly are expected to have poor surgical outcome as compared to young adults. The line where a person would be labeled

as elderly is poorly defined. It is affected by socioeconomic and racial status, yet WHO defines 60+ years as elderly[6]. It was determined that mortality from trauma begins to increase at the age of 40 years; for each 1 year increase in age over 65, the odds of dying after trauma increases by over 6%,[14] the fact makes elderly high risk candidates for emergency CABG. We kept 70 years as cut off limit in our study.

Little debate exists in favor of SVG in current literature as choice of conduit for emergency CABG in elderly patient. Rastan AJ et al[15] used IMA on all patients comparing beating heart surgery with conventional cardioplegic arrest in elderly population. Beating heart surgery had improved hospital outcome but no significant impact on mortality. Hirose H et al[16] studied 1570 elderly patients of elective CABG and supported the idea of using IMA in this group, however kept a low threshold for using vein graft when quality of IMA was in doubt.

Important aspect in the elderly is the quality of IMA and anatomy of the target coronary artery. Poiseuille law[17] has demonstrated that diameters of chosen conduits play a major role in flow and pressure gradient developed in the graft that reaches the distal vascular runoff. Gold smith I et al[11] comparing 194 Indo-Asians (predominantly Indians and Pakistanis) with white caucasians concluded that Indo-Asians had a significantly lower use of arterial conduits due to poor quality and relatively higher in-hospital mortality due to higher proportion of emergency CABG. SVG comparatively have larger caliber and are resistant to spasm. With increasing global burden of CAD1 and advancement in PCI, cardiac surgeons now encounter diffusely diseased coronaries more frequently. The smaller arterial conduit size, diffuse CAD, poor hemodynamics in emergency scenario and resistance of SVG to spasm shifts the pendulum in favor of SVG.

The long term patency and survival benefit of IMA over SVG is well established;[9] nevertheless Goldman S et al[11] demonstrated superior patency rates of SVG at 10 years when anastomosed to LAD as compared to SVG to other territories[18]. In case of SVG stenosis, lesion can be adequately managed by PCI with Drug Eluting Stents and is recommended over reoperation[19].

In this study, patient's baseline characteristics e.g. age, gender ratio, BMI, BSA, LVEF, diabetes, hypertension, and smoking were almost similar among both the groups. The IMA group had longer bypass and cross clamp time, probably due to more number of coronary grafts. The primary outcome, a low mortality has been demonstrated in SVG group (10.71% vs 24.49%) which did not reach statistical significance (0.06). In secondary outcome, the SVG group needed lesser inotropic support for shorter duration and less frequent events of peri-op MI; which was statistically significant and supported our hypothesis of superior flow dynamics by SVG. The SVG group had shorter ventilation time, lesser bleeding, less requirement for blood transfusion and less frequent reopening; all appears to be contributed by the reason that the left pleura was kept intact in this group. The mean ICU stay was significantly shorter in the SVG group. Overall the SVG group was superior to IMA group in terms of mortality and major complications within first 30 days after CABG. A point worth mentioning here is that group II (SVG) patients were relatively high risk as compared to group I (IMA) patients, nevertheless group II had comparable results and were superior in certain parameter.

CONCLUSION

SVG should be preferred over IMA for emergency CABG in elderly population. It provides improved survival and lesser complications during 30 days after surgery. Although long term patency is an issue but it can be adequately managed with statins and PCI for stenosis.

Conflict of Interest

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

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