

Short-Term Outcome of bilateral Internal Mammary Artery Harvesting

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Harvesting

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ABSTRACT

Objective: To describe our experience about the short-term outcome of bilateral internal mammary artery (BIMA) harvesting for coronary artery bypass grafting (CABG) at our tertiary care hospital.

Study Design: Prospective Cross-sectional study

Place and Duration of Study: This study was conducted at the Ch. Pervaiz Elahi Institute of Cardiology, Multan, Pakistan from January 2018 to December 2020.

Materials and Methods: A total of 42 patients of both genders undergoing BIMA harvesting for CABG were included. Among these cases, both left and right Internal mammary arteries were harvested by semi skeletonization technique. Demographic characteristics along with clinical features, comorbid conditions, underlying diseases and severity were recorded among all study cases. Short-term outcomes in terms of 3-months operative death, stroke, renal dysfunction or renal failure, need for re-operation, duration of ventilation, superficial and deep wound infection, and arrhythmias were noted for possible outcomes among all study cases.

Results: Among a total of 42 cases, mean age was noted to be 49.52±8.1 years while most the patients, 23 (54.8%) were between 40 to 60 years of age. There were 39 (92.9%) male patients while mean BMI was noted to be 25.1±3.6 kg/m². Hypertension was the most commonly found co-morbidity noted among 34 (81.0%) patients, dyslipidemia in 24 (57.1%) while diabetes mellitus was noted in 18 (42.9%). There were 31 (73.8%) patients who were found to have triple vessels disease. Mean number of anastomosis were recorded to be 3.62±0.85. Mean duration of ICU stay was recorded to be 6.14±1.78 days. Superficial wound infection was noted in 2 (4.8%) patients while pleural effusion was the commonest post-operative complications seen in 4 (9.5%) patients. No mortality was recorded.

Conclusion: The short-term outcome of bilateral internal mammary artery harvesting was found to be acceptable.

Key Words: Mammary Arteries, coronary artery bypass, dyslipidemia.

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INTRODUCTION

Coronary artery bypass grafting (CABG) is done commonly to treat coronary artery disease globally.¹ Since the introduction of saphenous vein graft (SVG) in 1967, lots of advancements have been made in the past few decades regarding conduit in the form of graft patency, decline in re-occlusion as increase in patient's survival.²

Literature establishes that due to better long-term patency and less chance of angina pectoris or

subsequent cardiac events, arterial grafts are much better than SVGs.³

Researchers have found bilateral internal mammary arteries (BIMA) grafts to have advantages over single internal mammary artery (IMA) grafting as BIMA demonstrates better overall outcome and much longer cardiac events free survival.^{4,5} Contrary to SVGs, IMA provides us options of utilizing it as a pedicle, a skeletonized or as a free graft.^{2,6} There are advantages and disadvantages linked to various methods of harvesting but irrespective of these, BIMA grafting has been found to be superior in terms of long-term outcomes and survival rates in comparison to one IMA grafting.^{4,5} A study done by Hemo E et al revealed that BIMA harvesting was associated with 10% risk of re-intervention at 10 year duration in comparison to 20% with those who had one IMA harvesting while the risk of re-intervention increased to 30% in those patients who had no IMA.⁷

Not many local studies have been published describing outcomes of BIMA harvesting in Pakistan so the current study was planned to describe our experience about the short-term outcome of BIMA harvesting for

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CABG at our tertiary care hospital. The findings of this study were thought to present safety and efficacy aspects of BIMA harvesting so that local cardiac surgeons are aware the potential risks and benefits related with this technique.

MATERIALS AND METHODS

This prospective cross-sectional study was carried out at Ch. Pervaiz Elahi Institute of Cardiology, Multan, Pakistan from January 2018 to December 2020. Approval from institutional ethical committee was acquired whereas written consent was sought from all study participants.

A total of 42 patients of both genders undergoing BIMA harvesting for CABG at Ch. Pervaiz Elahi Institute of Cardiology, Multan, Pakistan were included. Internal mammary arteries were harvested by semi skeletonization technique while one IMA was utilized to bypass left anterior descending artery whereas second IMA was use to bypass either right coronary artery or left circumflex artery as per surgeon's preference according to position of the targeted vessels. Thirty-nine procedure were done on pump while three cases were done off pump beating heart.

Demographic characteristics along with clinical features, comorbid conditions, underlying diseases and severity were recorded among all study cases. Short-term outcomes in terms of 3-month operative death, stroke, renal dysfunction or renal failure, need for re-operation, duration of ventilation, superficial and deep wound infection, and arrhythmias were noted for possible outcomes among all study cases.⁸

A special proforma was designed to record all study information. Data was analyzed using SPSS version 26.0. Gender, co-morbid conditions, types of vessel disease and post-operative complications like arrhythmias, pleural effusion, renal dysfunction and superficial wound infection were represented as frequency and percentages. Age (years), BMI (kg/m^2), number of anastomosis, duration of intensive care unit (ICU) stay (days), duration of ventilator (hours) and duration of inotropic use (hours) were shown as mean and standard deviation.

RESULTS

Among a total of 42 cases, mean age was noted to be 49.52 ± 8.1 years (ranging 30 to 75 years) while most the patients, 23 (54.8%) were between 40 to 60 years of age. There were 39 (92.9%) male patients while mean BMI was noted to be $25.1 \pm 3.6 \text{ kg}/\text{m}^2$. Hypertension was the most commonly found co-morbidity noted among 34 (81.0%) patients, dyslipidemia in 24 (57.1%) while diabetes mellitus was noted in 18 (42.9%). There were 31 (73.8%) patients who were found to have triple vessels disease. Table 1 is showing baseline

characteristics of patients undergoing BIMA Harvesting in the present study.

Table No.1: Characteristics of Patients undergoing bilateral Internal Mammary Artery Harvesting (n=42)

Characteristics		Number (%)
Gender	Male	39 (92.9%)
	Female	3 (7.1%)
Age (years)	<40	10 (23.8%)
	40-60	23 (54.8%)
	>60	9 (21.4%)
BMI (kg/m^2)	<25	23 (54.8%)
	25-30	15 (35.7%)
	>30	4 (9.5%)
Diabetes Mellitus		18 (42.9%)
Hypertension		34 (81.0%)
History of Myocardial Infarction		18 (42.9%)
History of Smoking		20 (47.6%)
Dyslipidemia		24 (57.1%)
Chronic Kidney Disease		5 (11.9%)
Chronic Obstructive Pulmonary Disease / Asthma		4 (9.5%)
Calcified Aorta		2 (4.8%)
Ejection Fraction < 40%		4 (9.5%)
Types of Vessel Disease	Double	11 (26.2%)
	Triple	31 (73.8%)

Mean number of anastomosis were recorded to be 3.62 ± 0.85 . Mean duration of ICU stay was recorded to be 6.14 ± 1.78 days. Superficial wound infection was noted in 2 (4.8%) patients while pleural effusion was the commonest post-operative complications seen in 4 (9.5%) patients. No mortality was recorded. Table 2 is showing short-term outcomes and complications among patients who underwent BIMA in the present study.

Table No.2: Short-Term Outcomes and Complications among Patients who underwent bilateral Internal Mammary Artery Harvesting

Short-Term Outcomes and Complications	Number (%) / Mean \pm SD
Duration of ICU Stay (days)	6.14 ± 0.78
Duration of Ventilator Required (hours)	6.29 ± 4.07
Duration of Inotropic Use (hours)	17.71 ± 8.79
Frequency of Superficial Wound Infection	2 (4.8%)
Frequency of Arrhythmias	2 (4.8%)
Frequency of Pleural Effusion	4 (9.5%)
Frequency of Renal Dysfunction	1 (2.4%)

DISCUSSION

In the past, researchers have found BIMA harvesting to be associated with significantly better short-term as well as long-term outcomes in comparison to single IMA harvesting or venous grafts alone.³⁻⁶ A study done by Lytle BW et al revealed 15% increase in terms of

20-years survival among cases undergoing BIMA harvesting.⁹ When comparing to venous grafting, IMA grafting is also known to induce increased release of endothelial-derived relaxing factor (NO) at molecular level and as we know that NO is found to regulate blood-flow and it induces inhibition of platelet functioning and helps allowing lesser neutrophil adhesion to the endothelium coinciding with increased short-term as well long-term vessel patency.^{10,11} Some cardio-thoracic surgeons are of the view that BIMA grafting should not be used in routine aiming coronary revascularization as it is complicated procedure requiring longer duration to perform needing optimum surgical skills while a compromise in the said features could contribute to in-hospital mortality and morbidity especially deep sternal wound infections.¹² Due to all these controversies, this study was carried out to present our local experience about BIMA harvesting and short-term outcomes related with it. We found BIMA harvesting to be a relatively safe and effective technique as no peri-operative or post-operative mortality was recorded in the present set of patients. Superficial wound infection was noted in 2 (4.8%) patients while pleural effusion was the commonest post-operative complications seen in 4 (9.5%) patients. A previous local study from Agha Khan University Hospital Karachi evaluating short-term efficacy and safety of BIMA grafting revealed it to be clinically good.¹³

Some researchers have advocated BIMA grafting to be done in relatively young patients who have greater life-expectancy.¹⁴ Mean age in the present study was noted to be 49.52+8.1 years. Our findings are quite consistent with a study done in Bangladesh where mean age of the patients undergoing BIMA was recorded to be 48.73+8.42 years.¹⁵ Local data also recorded mean age among patients undergoing BIMA to be 48+9.4 years¹³ which is quite similar to the present findings. In the present study, 42.9% of the patients had diabetes mellitus while researchers in the past have highlighted diabetes mellitus to be risk factor for post-surgery deep sternal wound infection.¹⁶ We had aimed strict diabetes control among our diabetic patients and it was seen that no major post-operative complications were seen among diabetic patients in the present study.

Safety of IMA grafting have been evaluated on the basis of in-hospital deaths, arrhythmias, sternal infections of post-surgery myocardial infarctions in the literature.^{13,17} We did not note any peri-operative or post-operative deaths in our patients while frequency of superficial wound infection and arrhythmias was noted to be in 4.8% each in the present study.

There were few limitations to this research. As this was a single center study from South Punjab, Pakistan, our findings cannot be generalized regarding short-term outcomes of BIMA grafting aiming coronary revascularization. There was no comparative group or

any other contemporary techniques compared in the present study so further studies with better comparative designs are required to further establish the short-term outcomes related to BIMA in our local population. We only evaluated short-term outcomes in the present study so further studies evaluating long-term outcomes of BIMA grafting should be done to further enlighten us about different aspects of BIMA grafting.

CONCLUSION

The short-term outcome of bilateral internal mammary artery harvesting was found to be acceptable. Studies involving large sets of patients from multiple centers with long-term follow ups and outcomes should be done to further elaborate the safety and effectiveness of bilateral internal mammary artery harvesting.

Author's Contribution:

Concept & Design of Study:	Muhammad Moeen
Drafting:	Shafqat Hussain, Iftikhar Paras
Data Analysis:	Muhammad Ali Khan, Muhammad Hamid Chaudhary
Revisiting Critically:	Muhammad Moeen, Shafqat Hussain
Final Approval of version:	Muhammad Moeen

Conflict of Interest: The study has no conflict of interest to declare by any author.

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