

Early Graft Occlusion after Coronary Artery Bypass Grafting

Coronary Graft
Occlusion after
Bypass

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ABSTRACT

Objective: To determine the frequency of premature coronary bypass graft occlusions after coronary artery bypass graft surgery.

Study Design: Descriptive case series study.

Place and Duration of Study: This study was conducted at the department of cardiovascular medicine, Chaudhary Pervaiz Ellahi Institute of Cardiology, Multan from March to September 2018.

Materials and Methods: This descriptive case series included 292 consecutive patients between one week to six months after coronary artery bypass graft surgery. The age range between 40 to 70 years and includes patients of both genders. The patients were scanned using a 128-section multi-detector computerized tomography scanner. Findings were interpreted by a consultant cardiologist. Frequency of venous and arterial graft occlusions and associated risk factors were noted.

Results: Mean age of the patients was 52.60 ± 7.72 years. Out of the 292 patients, 242 (82.88%) were male and 50 (17.12%) were female. In this study, 584 were vein conduits and 292 were arterial conduits. CT coronary angiogram identified graft closure in 69 (7.88%) out of 876 total grafts. Out of total 584 vein conduits 52 (8.90%) were occluded. On the other hand, out of total 292 arterial conduits 17 (5.82%) were occluded.

Conclusion: There is a substantial overall frequency of early graft occlusion including both arterial and vein conduits. In patients who underwent coronary artery bypass surgery, 7.88% had early graft occlusion.

Key Words: Graft occlusions, Coronary artery bypass grafting, Venous graft, Arterial graft

Citation of article: Saleemi MS, Ahmed N, Rafiq Z, Mohy-ud-din MT, Khalid U, Saad AA. Early Graft Occlusion after Coronary Artery Bypass Grafting. Med Forum 2020;31(12):30-33.

INTRODUCTION

Coronary arterial bypass graft surgery (CABG) is opted as a standard treatment modality in patients with complex coronary arterial involvement by the atherosclerotic disease process. Short and long term outcomes in patients undergoing revascularization by coronary artery bypass grafting are determined by the patency of graft conduits.^{1,2,3} Now multi-slice CT scanner is used to evaluate grafts in post CABG patients while previously invasive coronary angiography was used for evaluation of grafts.^{4,5}

There is local damage particularly the endothelium of the harvested vascular conduit. This happens particularly when grafts are surgically harvested, and

anastomosis is done. This localized damage particularly of the endothelial lining of the graft conduits leads to localized inflammation and platelet activation with resultant graft failure. This particularly happens in the first month after surgical procedure.⁶ In addition to physical damage, hypercoagulable state, and high intraluminal pressure to which vein conduits are exposed leads to its stretch and distention. All these factors lead to premature vein graft failure within one month of a cardiac surgical procedure.⁷ Two types of grafts (venous and arterial) are used for CABG surgery.⁸ Venous grafts degenerate and occlude early as compared to arterial grafts that remain patent for a longer duration.⁹ Grafts occlusion occur early in 8 to 12 percent grafts, unfavorably

affecting short as well as long term outcomes in post CABG patients^{11,12}. In one study, a total of 366 grafts, comprising of 250 vein grafts and 116 arterial conduits were assessed. In that study multi-slice, CT found total 32 (8.7%) early occluded grafts. The study showed that 26 (10%) of venous conduits were occluded. On the other hand, 6(5%) of 116 arterial grafts were occluded.¹³

To our best of knowledge there is limited worldwide and scarce local data available regarding the frequency of early grafts occlusion, so we planned to conduct this study to assess the incidence of graft occlusion. The study will look for premature vein and arterial graft occlusion within one month of a cardiac surgical

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Received: May, 2020

Accepted: September, 2020

Printed: December, 2020

procedure. The results of the study will provide local area statistics about the premature graft occlusion and it will also help in appropriate management of such patients to improve post coronary artery bypass outcomes. Our local population differs ethnically, racially and socially from the western population, so different results can be expected in our population.

MATERIALS AND METHODS

This descriptive case series study was undertaken at the department of cardiovascular medicine, Chaudhary Pervaiz Ellahi Institute of Cardiology, Multan from 7th March to 6th Sept. 2018. The study was started after authorization of the ethical review board.

By using a WHO calculator, a sample size of 292 was calculated by taking 5% level of significance, 2.5% margin of error and taking occlusion of arterial grafts as 5% from previous studies.¹² Total of 292 consecutive patients having a total of 876 grafts were included in the study. The total number of vein conduits was 584 (66.67%) and these were grafted to the right and left circumflex coronary vessels. Out of total 876 grafts 292 (33.33%) were left internal mammary arterial conduits and grafted to the left anterior descending artery. The patients were studied between one week to 6 months after CABG, Patients aging 40-70 years of both genders were included after informed consent. All patients underwent CT- coronary angiography for either symptoms or postoperative surveillance. Patients with hypersensitivity to contrast agent, and nephropathy defined as creatinine more than 2mg/dl were excluded from the study. Patient data regarding age, gender and risk factors for ischemic heart disease (IHD) was noted. All the patients were studied by utilizing 128-section multi-detector cardiac tomography scanner. Findings were interpreted by consultant cardiologist and the presence or absence of graft occlusion was noted. IBM SPSS version 20.0 was used for statistical analysis. Mean and standard deviation was calculated for age. Frequency and percentage were calculated for gender, risk factors of IHD and occlusion of venous and arterial grafts.

RESULTS

The age range in this study was from 40 to 70 years with a mean age of 52.60 ± 7.72 years (Table No 1.) Most of the study cases 166 (56.85%) were within the age bracket of 40 to 55 years of age.

Table No. 1: Age distribution of the study patients

| Age | Minimum | Maximum | Mean age±sd |
|-------|---------|---------|-------------|
| Years | 40 | 70 | 52.6± 7.72 |

Out of the total 292 study patients, 242 (82.88%) were having male and 50 (17.12%) were having female gender (Table No 2)

Table No. 2: Gender distribution of study patients

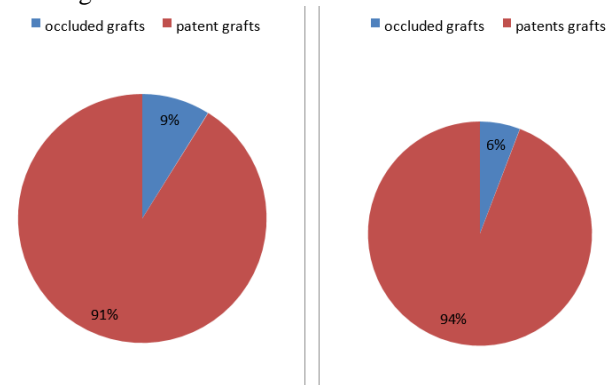
| Gender | Number | Percentage |
|--------|--------|------------|
| Male | 242 | 82.88% |
| Female | 50 | 17.12% |
| Total | 292 | 100% |

Among the study patients 135 (46.23%) were diabetics, 210 (68.84%) were hypertensive, 183 (62.67%) were smokers and 183 (62.67%) had dyslipidemia (Table 3).

Table No. 3: Frequency and distribution of risk factors among the study patients

| Risk factors | Number | Percentage |
|-------------------|--------|------------|
| Diabetes mellitus | 135 | 46.23% |
| Hypertension | 210 | 68.84% |
| Smoking | 183 | 62.67% |
| Hyperlipidemia | 183 | 62.67% |

In this study, 584 were vein conduits and 292 were arterial conduits. CT coronary angiogram identified graft closure in 69 (7.88%) out of 876 total grafts. Out of total 584 vein conduits 52 (8.90%) were occluded. On the other hand, out of total 292 arterial conduits 17 (5.82%) were occluded. Figure 1 shows the frequency and percentage of graft occlusion in venous and arterial grafts. Stratification of early graft occlusion with diabetes mellitus, hypertension, smoking and dyslipidemia showed p-value more than 0.05 depicting non-significant results.



P-value 0.11 (non-significant)

Figure No.1: Pie charts for early graft occlusion in venous and arterial grafts

DISCUSSION

For a long time, invasive Coronary artery angiography (CAG) was employed for assessment of grafts after CABG. Invasive CAG not only increases hospital cost but also has hazards of dreadful complications as ST-elevation MI leading to myocardial damage, ischemic/embolic neurological complications with resultant neurological complications, and ventricular arrhythmias.¹³ After the development of new noninvasive procedures like electron-beam tomography and helical scan computed tomography, these modalities are now being used increasingly for

assessing graft patency, but they have certain limitations which are multiple artefacts created due to motion of the patient, respiratory movements and metallic clips.^{14, 15}

Bassri et al assessed and reported that out of 366 grafts including arterial and vein conduits. Two hundred and fifty were vein conduits and one hundred and sixteen were arterial conduits. Coronary angiography and graft study by cardiac tomography showed premature and early graft closure in 32 (8.7%) of all the grafts. The study showed that 26 (10%) of 250 venous conduits were occluded. While 6 (5%) of 116 arterial conduits were occluded. The results were non-significant for venous vs arterial grafts.¹² In our study we also found that early graft occlusion has no association whether the graft was arterial or venous. In a mean follow Benedetto et al done a meta-analysis of five studies. They demonstrated that the occlusion rate of arterial and venous conduits is almost the same. It was 14.1% in the case of arterial conduits, while the rate of occlusion in venous conduits was 14.6%. The study patients were followed for a mean period of twenty-two months.¹⁶

Athanasίου et al demonstrated patency rates of 3678 arterial conduits and 7506 vein conduits. They recorded the patency at less than a year, between one to five years, and longer than five years, which they termed as short term, medium-term and long term follow up respectively.¹⁷ The study highlighted the fact that there was no statistically significant difference with an odds ratio of 1.04 when a short term comparison was done among arterial and venous conduits. The study also demonstrated that there was a statistically significant superior arterial conduit patency over the medium and long term period of follow up with an odds ratio of 2.06 and 2.28 respectively. Our study also showed similar results that there is no significant difference between early arterial and venous conduit occlusion.

Our study has certain limitations. This is an observational study without long term follow-up with a small sample size. However, it paves a way for a larger study with longer follow up to assess the long term graft patency and also to assess the frequency of venous graft occlusion as compared to arterial graft occlusion.

CONCLUSION

There is a substantial overall frequency of early graft occlusion (venous and arterial) in post coronary artery bypass grafting patients (7.88%).

Acknowledgement: Special thanks to Saima Dastgeer who is working as Assistant Professor in Department of Psychology, Govt. College of Home Economics Multan, for her valuable contribution in data analysis and proof reading of our study.

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

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