

## VEIN GRAFT PATENCY IN POST-CABG SYMPTOMATIC PATIENTS: AN ANGIOGRAPHIC STUDY

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### ABSTRACT

**OBJECTIVE:** To study the time taken for venous grafts to occlude or stenose after CABG in symptomatic patients.

**STUDY DESIGN:** Cross-sectional study.

**PLACE AND DURATION OF STUDY:** This study was carried out in the Cardiology ward and Department of Cardiac Catheterization & Interventional Cardiology of Punjab Institute of Cardiology, Lahore, from 1<sup>st</sup> November, 2007 to 30<sup>th</sup> April, 2008.

**METHODOLOGY:** One hundred post-CABG patients admitted in cardiology ward with symptoms of myocardial ischemia proceeding for coronary angiography were enrolled in the study. After taking history and clinical examination, the coronary angiography was done.

**RESULTS:** Out of these 100 patients, 86 (86%) were males and 14 (14%) were females between 38-80 years of age. 53.3% of the grafts were patent in 6 months to 5 years duration after CABG. 21.4% grafts were patent in >10 years duration after CABG.

**CONCLUSION:** Patients presenting within 5 years with symptoms of myocardial ischemia after CABG have more patent vein grafts. Patients with duration of >10 years after CABG have more diseased vein grafts.

**KEY WORDS:** Vein graft patency, Post-CABG, Angiography, Symptomatic, Diseased grafts.

### INTRODUCTION

Despite recent advances in diagnosis and management of IHD over the last four decades of time, myocardial ischemia continues to be a significant public health problem risk in the developing countries of the world.<sup>1,2</sup> In the USA more than 2.5 million patients annually come across with acute and unstable myocardial ischemia. Although the death rate from IHD has declined by about 35 percent over the last decade of time, its development is still life threatening in about one third of patients.<sup>3</sup> In the management of IHD, very satisfactory short, intermediate and long term results

observed during follow up of patients after CABG. In 2001, more than 0.4 million patients treated with CABG surgery in USA.<sup>4</sup>

The success of CABG depends on the patency and sufficient distal flow of the grafts. Worldwide, more than 0.9 million patients got CABG surgery annually, with approximately 360,000 patients operated annually in the USA. Most of the patients get LIMA grafts to the LAD or Diagonal branch of LAD and SVGs to

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other vessels. According to small studies of some groups, it is estimated that SVGs have a 35% to 50% 10-year patency rate and that the LIMA has a 85% to 95% 10-year patency rate.<sup>11</sup> The saphenous veins are the routinely used venous conduits during CABG surgery. Saphenous vein graft markers are usually implanted to guide graft study and coronary angiography operators during angiography procedure and saves time of the operator and dye load to the patient.<sup>12</sup>

During CABG the saphenous vein graft (SVG) is mainly used for RCA and Left circumflex coronary artery and it gives better flow due to good sizing and the beauty to harvest easily.<sup>4</sup>

A research program was launched observing 10-year angiographic follow-up study of patients to solve the matter of long-term patency of saphenous vein and LIMA grafts. These trials were also designed to see the effect of anti-platelet agents on graft patency after CABG.<sup>13-17</sup>

Recurrent episodes of angina in patients with history of CABG surgery is a major health problem. Seventy five percent of SVGs remain patent and provide sufficient distal blood flow 5 years after surgery.<sup>18,19</sup> After the 5th to the 7th postoperative year there is a progressive deterioration of function due to disease process in saphenous vein grafts. At 10–12 years only 40–50% of the SVGs are functioning normally with adequate distal flow.<sup>20</sup>

With disease progression, 40% of patients complain of recurrence of angina after 5 years.<sup>21</sup> In a study of 1,118 post-CABG patients, significant graft stenosis and disease appeared on an average of 72 months after CABG procedure. These results must be considered significant causing major health related issue among cardiac patients.<sup>22</sup>

When there are many factors who define disease progression and fate of the patients. Significant predictors of disease progression and outcome are age, smoking, history of MI, body mass index and diabetes mellitus.<sup>23</sup> Close follow up and treatment of deranged lipid profile help to avoid further coronary artery ischemic attacks. In fact lipids are most identified factor defining grafts outcome.<sup>24</sup>

Regular use of medications after CABG is associated with lower rate of adverse cardiac events. Among these medications are anti-

platelets, high intensity lipid lowering statins (PCSK 9 inhibitors are under trials), beta blockers and ACE inhibitors are commonly recommended.<sup>25</sup> 15-35% vein grafts are occluded by 1 year and 50% by 10 years. 10-15% of the patients present with significant symptoms of ischemia by 1 year after venous grafts.<sup>4</sup> Diagnosed event free rates for MI were lower in the SVG conduit groups. The factors involved were discussed earlier during introduction.<sup>26</sup>

According to a study conducted for patients post operatively, radial arterial grafts had patency rate of 95% in comparison with venous conduits having 80% patency rate. The patients included have significant symptoms.<sup>27</sup>

The objective of this study was to evaluate the time period taken for venous graft to occlude or stenose in symptomatic post-CABG patients. We might have to search for other possible grafts if venous grafts fail to give optimal results or occlude or stenose early. We shall recommend continuing using venous grafts if they give required and good results.

## METHODOLOGY:

One hundred post-CABG patients admitted in cardiology ward with symptoms of myocardial ischemia proceeding for coronary angiography were enrolled in the study. After taking history and clinical examination coronary angiography for nature of graft was done. Any occlusion or stenosis of the venous grafts was noted.

Data were recorded on a given proforma and analyzed statistically.

Association between angiographic findings and duration after CABG were made.

Data were entered into SPSS (Statistical Package for Social Sciences) Version 15 and analyzed.

The categorical variables (sex of patients, risk factors, mode of clinical presentation, angiographic findings and presence of LIMA grafts) were expressed as frequency and percentages while continuous variables (age of patient, number of SVG grafts and duration after CABG) were expressed as mean±SD (Standard Deviation). Mean time duration for venous grafts to occlude or stenose after CABG was calculated with standard deviation. Numbers of venous grafts occluded or stenosed

were mentioned as percentages. Chi-Square test was applied for association between angiographic findings and duration after CABG. P value <0.05 was considered as significant.

## RESULTS:

This study includes 100 patients admitted in Cardiology ward with symptoms of acute myocardial ischemia. There were 86(86%) males and 14(14%) females. Male to female ratio was 6.2:1. (Table-1)

**Table 1**  
**Distribution of patients according to sex**  
(n = 100)

Sex	Number of patients (Percentage)
Males	86(86%)
Females	14(14%)

Male to female ratio 6.2:1

The patients were divided in four age groups. The first group patients aged 38-50 years were 17(17%), in second group patients aged 51-60 years were 40(40%), in third group patients aged 61-70 years were 32(32%) and 4<sup>th</sup> group patients aged 71-80 years were 11(11%). The mean standard deviation among ages was 59.43±9.29 years. (Table-2)

**Table 2**  
**Distribution of patients according to age**  
(n = 100)

Age (years)	Number of patients (Percentage)
38 – 50	17(17%)
51 – 60	40(40%)
61 – 70	32(32%)
71 – 80	11(11%)

Mean SD 59.43±9.29

**Key:** SD Standard deviation

The risk factors frequency and percentage is shown in table- 3. Hypertension was most commonly present in these patients (52%). (Table-3)

**Table 3**  
**Risk factors of ischemic heart disease**  
(n = 100)

Risk factor	Number of patients (Percentage)
Smoking	38(38%)
Diabetes mellitus	46(46%)
Hypertension	52(52%)
Previous history of ischemic heart disease	37(37%)
Family history of ischemic heart disease	28(28%)
Dislipidemia	19(19%)
Stress	17(17%)

Unstable angina was most common presentation (59%) and ST elevation myocardial infarction was least commonly present (5%). (Table-4)

**Table 4**  
**Clinical presentation of symptomatic post-coronary artery bypass grafting patients**  
(n = 100)

Clinical presentation	Number of patients (Percentage)
Unstable angina	69(69%)
Stable angina	13(13%)
STEMI	5(5%)
NSTEMI	13(13%)

**Key:** STEMI: ST elevation myocardial infarction  
NSTEMI: Non ST elevation myocardial infarction

The duration of presentation after CABG was divided into three periods. First duration of period was from 6 months to 5 years with 49(49%) patients, second duration of period from 6-10 years with 33(33%) patients and third duration period of >10 years with 18(18%) patients. (Table-5)

**Table 5****Duration after coronary artery bypass grafting in symptomatic patients** (n = 100)

Duration (years)	Number of patients (Percentage)	Number of venous Grafts (Percentage)	Number of arterial grafts (Percentage)
0.5-5	49(49%)	90(49.45%)	43(47.7%)
6 – 10	33(33%)	61(33.5%)	29(32.2%)
>10	18(18%)	42(23.04%)	18(20%)

Mean SD6.42±4.59

**Key:** SD=standard deviation

Saphenous vein grafts were found 182 and 90 left internal mammary artery grafts were in these patients. (Table-6)

**Table 6****Total number of grafts studied in symptomatic post-coronary artery bypass grafting patients**

Grafts	Number
Left internal mammary artery (LIMA)	90
Saphenous vein graft (SVG)	182

Grafts were 53.3% patent in first duration of period, 41% patent in second duration group and 21.4% patent in third group according to duration after coronary artery bypass grafting. (Table-7)

**Table 7****Duration after coronary artery bypass grafting (CABG) and venous grafts findings**

Findings	Duration of after CABG (years)		
	0.5– 5	6 – 10	>10
Patent	48(53.3%)	25(41%)	9(21.4%)
Mild	5(5.5%)	5(8.2%)	1(2.4%)
Moderate	2(2.2%)	1(1.6%)	3(7.2%)
Severe	4(4.4%)	6(9.8%)	7(16.7%)
Subtotal	1(1.1%)	1(1.6%)	1(2.4%)
Total	30(33.3%)	23(37.7%)	21(50%)

**DISCUSSION:**

Vein graft atherosclerosis and stenosis, causing significant distal flow disturbance, is generally a time taking slow process and has been associated with the elevation of serum LDL, low HDL cholesterol levels, high serum triglycerides, family history, Hypertension, DM, sedentary life style, high BMI and smoking.<sup>28</sup>

Secondary prevention treatments are beneficial after ACS, but these benefits are not much clear after CABG. But this issue is under

consideration. Regular use of indicated secondary prevention medications is definitely beneficial with a lower 2-year rate of adverse cardiac events.<sup>29</sup>

The discussion about survival benefit of CABG has been no doubt settled in favour of LIMA. In patients who underwent SVGs interventions, survival is significantly influenced by the presence of patent LIMA conduit which usually has a trend to get diseased very slowly. In contrast, SVG patency had no significant survival benefit but was correlated with an

decrease risk of nonfatal myocardial ischemia.<sup>30</sup> Those patients who received SVGs alone, about 85% were free of angina at 1 year. In the following 4 years, the recurrence rate was about 3 percent per year and 5 percent per year after that. Approximate rate of freedom from angina episodes was 78 percent at 5 years, which was decreased to approximately 50 and 25 percent at 10 and 15 years, respectively.<sup>31</sup>

In our study, patients presenting with ACS within first 5 years of CABG usually have more patent grafts with less disease presence to cause significant symptoms. After that the number of stenosed and diseased grafts increases gradually with the passage of time to cause significant ischemic events. Number of patent and stenosed grafts is almost equal in symptomatic patients presenting from 6 years to 10 years. The number of significantly stenosed and diseased grafts is more than patent grafts from 10 years onward after CABG procedure.

Since risk of mortality following CABG is increased with low level of HDL cholesterol and high level of LDL among the diabetic patients so close monitoring and treatment of lipid levels and periodic good glycemic control is necessary to prevent further coronary ischemic events and for better survival.<sup>24</sup>

The most often discussed results in usual published material are that at 10 years, SVGs have about a 40% to 60% patency and that LIMA grafts have a 85% to 95% 10-year patency rate.<sup>32-37</sup> In these studies, graft study was not done on everyone but rather on symptomatic patients.<sup>38</sup>

Most of the studies from the 1980s were done before the routine use of anti-platelet therapy and other newer and recommended treatment options after CABG, and it is now well established that regular aspirin use helps to promotes SVG patency rates and slows disease progression.<sup>15-17, 39,40</sup> In the 1980s, very little attention was given to risk factors control and their modifications.<sup>41-43</sup> Lastly, surgical techniques have been improved with regard to harvesting and preparation of the vein graft before implantation.<sup>44</sup>

In routine studies comparisons are often made between veins and arteries used as grafts for CABG. In fact, the LIMA has been number one in any way. An editorial published in 1985 in the

New England Journal of Medicine<sup>44</sup> stated that at 10 years 90% LIMA grafts remained in patent condition. It gives LIMA graft an outstanding winning edge.

LIMA is also used in off pump CABG procedures. In the past surgeons tended to use LIMA conduits in better CABG candidates.<sup>15,40,44</sup> This argument is probably not valid today, when the characteristics of patients have dramatically changed toward more complex disease patterns and diverse presentations. In a present study, the 10-year patency of LIMA grafts to the LAD is 85%, as opposed to 69% for SVGs to the LAD.<sup>38,45,46</sup>

CABG improves survival. It may be reasonable to assume that graft patency influenced survival. The data are only from the survivors who, by definition, may have had better graft patency than the non-survivors cardiac patients. At present not being able to address whether graft patency influenced survival is a potential weakness in our study. Owing to the long-term nature of the study and the fact that coronary artery disease is a progressive disease we may need more studies to study this issue.

## CONCLUSION:

The vein graft disease progression is mostly time bound for initial periods of presentation. Vein grafts are 53.3% patent in patients presenting within 5 years after coronary artery bypass grafting with symptoms of myocardial ischemia. The patients presenting from 6 to 10 years period after coronary artery bypass grafting have 41% patent grafts. In patients presenting with >10 years after coronary artery bypass grafting have 21.4% patent grafts.

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Nearest to the prophets are those persons who have to those prophets and obey them". Saying this, Imam Ali cited a passage from the Holy Qur'an 'Best liked by Abraham and nearest to him were the people who obeyed him'. He further said, "That the present times are the times of our Holy Prophet and his faithful followers. The best friend of our Holy Prophet is he who, though not related to him, obeys the orders of Allah and his greatest enemy is the man who though related to him, disobeys Allah '.

Imam Ali was told of a Kharijite that he got up in the night to pray and recite the Holy Book. Imam Ali said, "To sleep with having sincere faith in religion and Allah is better than to pray with wavering faith".

Whenever a tradition of the Holy Prophet is related to you, scrutinize it, do not be satisfied with mere verbatim repetition of the same because there are many people who repeat the words containing knowledge but only few ponder over them and try to fully grasp the meaning they convey.

***Hazrat Ali (Karmulha Wajhay)***