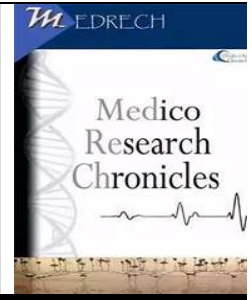




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### Assessment of Graft Patency Between Pedicled Saphenous Vein and Conventional Saphenous Vein Conduits for Coronary Artery Bypass Surgery

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#### ABSTRACT

**Introduction:** The long-term successes of coronary artery bypass graft surgery depends on continued patency of the bypass conduits. After coronary artery bypass graft, however, the saphenous vein grafts show a high incidence of accelerated atherosclerosis. A major contributing factor to the early atherosclerotic process is damage to the vessel wall, especially endothelial injury that occurs during the conventional harvesting of the vein, using high- pressure distension. A new pedicled saphenous vein technique, the saphenous vein is harvested with its pedicled of surrounding tissue, preserves the entire vein wall including the vasa vasorum. **Objective:** To determine the patency rate in between pedicled saphenous vein and Conventional saphenous vein by coronary computed tomography angiogram. **Methods:** This comparative cross-sectional study was carried out at the department of cardiac surgery in National Heart Foundation Hospital & Research Institute, Dhaka, Bangladesh. The period of study was from January, 2019 to September, 2020 and purposive sampling method was applied for this study. The study population was 80, with two groups having 40 patients each. Grouping of patients were done by purposive sampling method and all patients underwent elective coronary artery bypass graft in 2015. These

#### ORIGINAL RESEARCH ARTICLE

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group of patients again investigated through coronary computed tomography angiogram in 2020 for evaluation of saphenous vein patency and occlusion rate. Data was collected by using a standardized semi- structured questionnaire, face to face interview and hospital records. **Results:** After five years postoperative follow up through the coronary computed tomography angiographic assessment showed 91.92% patency rate of pedicled saphenous vein grafts compared to 85.56% patency rate of conventional saphenous vein grafts. Similarly, the proportion of study saphenous vein grafts with total occlusion were higher in conventional saphenous vein grafts than pedicled saphenous vein grafts, but that was not statistically significant [Group A: 08 venous grafts occluded out of 99 venous grafts (8.08%); Group B: 13 venous grafts occluded out of 90 venous grafts (14.44%),  $p= 0.209$ ]. **Conclusion:** This study was concluded that, pedicled saphenous vein has higher patency rate than conventional vein. It has also significantly slower progression of occlusion in pedicled vein grafts.

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## INTRODUCTION

Globally, cardiovascular disease is the number one cause of death and it remains so. An estimated 17.7 million people dies from cardiovascular disease every year which represents 31% of all global deaths. Of these deaths, 7.2 million are due to myocardial infarction [1]. About 80% of cardiovascular disease deaths take place in low and middle socioeconomic countries and occur almost equally in men and women. If current trends are allowed to continue, by 2030 an estimated 23.6 million people will die from cardiovascular disease [1]. Incidence of ischemic heart disease is increasing in Bangladesh. In 1975 the incidence of ischemic heart disease in Bangladesh was reported to be 3.3/1000 Malik et al., [2] & that in 1985 it was 14/1000 Amanullah et al [3]. In 2015, cardiovascular disease alone kills 2.56 lakh people in Bangladesh accounting for 30% of death caused by non-communicable disease [4]. Coronary artery bypass grafting (CABG) remains the most effective way of treatment for patients with advanced disease. Approximately one million people undergo CABG annually worldwide, depicting the epidemiologic impact of the procedure and its

influence on public health. Continuous efforts are employed to optimize the procedure of CABG. Long-term results depend highly on the appropriate conduit choice for bypass. Several groups support the use of multiple arterial grafts for improving long-term outcomes. Coronary artery bypass grafting effectively relieves signs and symptoms of myocardial ischemia [5]. Coronary artery bypass grafting (CABG) surgery aims to restore adequate blood supply to the ischemic heart and the success of the operation depends mainly upon the patency of the grafts. In the long-term, graft failure may lead to recurrent angina, myocardial infarction (MI), additional revascularization procedures or death. Total arterial grafting is advocated by some experts and may be superior in certain subsets of patients compared with conventional CABG using LIMA and saphenous vein grafts. However, clinical trials on total arterial grafting have shown mixed results regarding perioperative morbidities and long-term outcomes. We know that, the most commonly used vessel is the saphenous vein (SV) as a conduit for CABG. As a result, no spasm occurs making the distension of the vein graft unnecessary, thus further minimizing the

endothelial damage caused [5]. The aim of this study was to establish the patency rate of Pedicled saphenous vein and its impact on long term saphenous vein patency.

### **MATERIALS & METHODS**

**Study Design:** Comparative cross-sectional study.

**Study Population:** The study population was the patients who underwent CABG from January 2015 to December 2015 in National Heart Foundation Hospital & Research institute, Dhaka, Bangladesh.

**Place of Study:** Department of cardiac surgery, National Heart Foundation Hospital & Research institute, Mirpur -2, Dhaka-1000, was my study area.

**Study Period:** The period of study was from January 2019 to September 2020.

**Sample Size & Grouping:** Total number of 80 patients were evaluated in two groups (40 patients in each group).

- ◆ Group A: 40 Patients who underwent CABG with pedicled saphenous vein harvesting technique.
- ◆ Group B: 40 Patients who underwent CABG with Conventional saphenous vein harvesting technique.

### **Inclusion Criteria:**

- All patients (adult, irrespective of gender & who gave informed written consent under this study) in the group A and group B who will be initially selected purposively and asked for participate in a clinical and coronary computed tomography angiographic assessment.

### **Exclusion Criteria:**

- Allergic to contrast media.
- Impaired renal function.

**Study procedure:** All relevant data were collected from each respondent by use of

interview schedule, measured parameters and investigations in a predesigned format. All patients, who underwent CABG in department of cardiac surgery in NHF & RI within the year of 2015 was taken for study population. Patient who were fulfill the inclusion criteria and willing to enroll in study was included in my study after receiving the proper consent. Patients who underwent CABG using pedicled saphenous vein & conventional saphenous vein as a conduit will be my group A and group B. Venous graft patency rate was assessed by coronary CT angiogram who underwent CABG in 2015 and it was done at dept. of Radiology and Imaging, NHFH & RI. Detailed history, clinical examination and relevant investigation reports of all patients were recorded in the data collection sheet during the procedure.

According to schedule, patients were taken to the operating room for coronary CT angiogram. Confidentiality of the subjects was maintained by giving assurance to the respondents that the information given by them were not disclosed and be used only for study purpose. Data collection form was filled during my study period and collected at the end of the study period.

**Data Analysis:** Statistical analysis was conducted using Statistical Package for Social Science (SPSS) version 23.0 for windows software. Continuous variables were shown as mean +/- SD or mean rank and categorical variables were given as frequency (percent). Comparisons between groups were made with Student's t-test & Chi-Square test. The results were presented in tables. Observations were recorded as statistically significant if a p-value is  $\leq 0.05$ .

## RESULTS

**Table-1:** Comparison of demographic characteristics (N=80)

Attributes	Group		p value*
	Group A (n=40)	Group B (n=40)	
Age (in years)			
Mean± SD	59.38±7.43	58.70±8.27	0.702 <sup>ns</sup>
Range	43-68	36-70	
Sex			
Male	33 (82.5%)	34 (85%)	0.762 <sup>ns</sup>
Female	7 (17.5%)	6 (15%)	

Student's t-test was presented as mean ± SD. Chi-square test ( $\chi^2$ ) was used to measure the level of significance, \*p>0.05 was considered not to be significant, n= number of subjects s= significant, ns= not significant.

Among the study population mean age

in group A was 59.38±7.43 years and in group B was 58.70±8.27years. The difference in age between two groups was not statistically significant (p=0.702). There was no statistical significance of gender in between the two study groups (p=0.762).

**Table-2:** Comparison of preoperative clinical features (N=80)

Attributes	Group		p value*
	Group A (n=40)	Group B (n=40)	
Chest pain			
Yes	30 (75%)	29 (72.5%)	0.799 <sup>ns</sup>
No	10 (25%)	11 (27.5%)	
Dyspnea			
Yes	16 (40%)	21 (52.5%)	0.262 <sup>ns</sup>
No	24 (60%)	19 (47.5%)	
Palpitation			
Yes	12 (30%)	14 (35%)	0.633 <sup>ns</sup>
No	28 (70%)	26 (65%)	

Table 2 shows the distribution of data obtained by preoperative clinical features. The comparison of the presence of Chest pain

(p=0.799), Dyspnea (p=0.262), Palpitation (p=0.633) in group A and B patients were statistically not significant (p>0.05).

**Table-3:** Comparison of preoperative venous grafts number and distribution of distal venous grafts (N=80)

Attributes	Group		p value*
	Group A (n=40)	Group B (n=40)	
Number of venous grafts	3.65±0.74	3.58±0.55	0.607 <sup>ns</sup>

Location of distal venous anastomosis			
Diagonal	28 (72.5%)	22 (55%)	0.170 <sup>ns</sup>
OM	37 (92.5%)	33 (82.5%)	0.181 <sup>ns</sup>
PDA	32 (80%)	33 (82.5%)	0.778 <sup>ns</sup>
PLV	2 (5%)	2 (5%)	1.00 <sup>ns</sup>

Table 3 shows the number of venous grafts of group A was  $3.65 \pm 0.74$  & group B was  $3.58 \pm 0.55$  where the finding was statistically not significant ( $p=0.607$ ). Location of distal venous anastomosis. RSVG to Diagonal was given in group A 28/40(72.5%) and group B 22/40(55%) which was statically not significant ( $p = 0.170$ ), RSVG to OM was given in group A 37/40

(92.5%) and group B 33/40 (82.5%) which was statically not significant ( $p=0.181$ ), RSVG to PDA was given in group A 32/40 (80%) and group B 33/40 (82.5%) which was statically not significant( $p=0.778$ ). RSVG to PLV was given in group A 2/40 (5%) and group B 2/40 (5%) which was statically not significant ( $p=1.00$ ).

**Table 4:** Comparison of patency rate of venous grafts (N=80)

Attributes	Group		P value*
	Group A (n=40)	Group B (n=40)	
Patency rate of venous Graft (%)			
Diagonal	$53.75 \pm 15.01$	$34.32 \pm 12.18$	$<0.001^s$
OM	$61.76 \pm 12.32$	$46.52 \pm 14.82$	$<0.001^s$
PDA	$51.56 \pm 15.37$	$25.61 \pm 19.03$	$<0.001^s$
PLV	$37.50 \pm 10.61$	$27.50 \pm 3.54$	0.333 <sup>ns</sup>

Table 4 shows patency rate of venous graft on coronary CT angiogram after 5 years follow up. RSVG to Diagonal patency rate in group A was  $53.75 \pm 15.01$  % and group B was  $34.32 \pm 12.18$  % which was statically significant ( $p= <0.001$ ), RSVG to OM patency rate in group A was  $61.76 \pm 12.32$  % and group B was  $46.52 \pm 14.82$  % which was statically

significant ( $p=<0.001$ ), RSVG to PDA patency rate in group A was  $51.56 \pm 15.37$  % and group B was  $25.61 \pm 19.03$  % which was statically significant ( $p=<0.001$ ). RSVG to PLV patency rate in group A was  $37.50 \pm 10.61$  % and group B was  $27.50 \pm 3.54$  % which was statically not significant ( $p= 0.333$ ).

**Table 5:** Comparison of occlusion rate of venous graft (N=80)

Attributes	Group		P value*
	Group A (n=40)	Group B (n=40)	
Total venous graft (no.)	99	90	
Venous graft occlusion (no.)	08 (8.08%)	13 (14.44%)	0.209 <sup>ns</sup>

Table 5 shows that occlusion rate of venous graft on Coronary CT angiogram after 5 years follow up were no statistically

significant differences in findings between two groups ( $p=0.209$ ). But in venous graft occlusion was higher in group B comparison

with group A. Occlusion rate of venous graft in group A was 8 grafts out of total 99 grafts (8.08%) and occlusion rate of group B was 13 grafts out of total 90 grafts (14.44%).

## DISCUSSION

The Pedicled SV harvesting technique, in which the saphenous vein is harvested with a pedicled of surrounding tissue, maintains an entire intact vein wall, which protects against spasm, thereby obviating the need for high-pressure distension. This leads to preservation of endothelial nitric oxide synthase, not only of the luminal endothelium, but also of the media and adventitia, resulting in increased thrombo resistance, superior vaso-relaxation and abolition of vasospasm [6]. Although the pedicled SV harvesting technique has been used in practice for more than 15 years, the evidence for this method is limited to studies with a small number of patients that have demonstrated improved angiographic patency [7]. The main message of this study is that the technique of harvesting the SV for CABG plays a crucial role in the long term patency rate of vein grafts [8]. The demographic variables of the participating patients were recorded and analyzed. The mean age for group A was  $59.38 \pm 7.43$  years and group B was  $58.70 \pm 8.27$  years respectively, the difference was statistically not significant ( $p=0.702$ ). The age range of the patients of this study was from 36 years to 70 years. A similar study carried out by Janiec *et al.*, [7] showed long term clinical outcomes after coronary artery bypass grafting with pedicled saphenous vein grafts and relation to age was statistically not significant ( $p=0.788$ ) where their study revealed that Group A (pedicled saphenous vein) was  $60.44 \pm 5.43$  years and group B (Conventional pedicled vein) was  $57.70 \pm 6.30$  years [7]. In group A, more than half of the population were male 33 (82.5%) and rest of all were female 7 (17.5%). In group B, same as group A. Male and female patients were 34 (85%) and 6 (15%) respectively in group B. The distribution of gender between two groups

were statistically not significant ( $p=0.762$ ). Preoperative clinical feature of both groups was statistically not significant. In group A, Chest pain was present in 30 patients out of total 40 patients (75%) & absent 10 patients out of total 40 patients (25%) and in group B, chest pain was present in 24 patients out of total 40 patients (72.5%) & absent 11 patients out of total 40 patients (27.5%), where  $p=0.799$ . In group A, Dyspnea was present in 16 patients out of total 40 patients (40%) & absent 24 patients out of total 40 patients (60%) and in group B, Dyspnea was present in 21 patients out of total 40 patients (52.5%) & absent 19 patients out of total 40 patients (47.5%), where  $p=0.262$ . In group A, Palpitation was present in 12 patients out of total 40 patients (30%) & absent 28 patients out of total 40 patients (70%) and in group B, Palpitation was present in 14 patients out of total 40 patients (35%) & absent 26 patients out of total 40 patients (65%), where  $p=0.633$ . The number of venous grafts of group A was  $3.65 \pm 0.74$  & group B was  $3.58 \pm 0.55$  where the finding was statistically not significant ( $p=0.607$ ). Samano *et al.*, [8] published similar findings in their study. They showed the number of venous grafts of group A was  $3.45 \pm 1.44$  & group B was  $3.38 \pm 5.85$  where the finding was statistically not significant ( $p=0.665$ ) [8]. Statistically there was no significant difference in location of distal venous anastomosis in two groups. RSVG to Diagonal was given in group A 28 patients out of total 40 patients (72.5%) and group B 22 patients out of total 40 patients (55%) which was statically insignificant ( $p=0.170$ ), RSVG to OM was given in group A 37 patients out of total 40 patients (92.5%) and group B 33 patients out of total 40 patients (82.5%) which was statically not significant ( $p=0.181$ ), RSVG to PDA was given in group A 32 patients out of total 40 patients (80%) and group B 33 patients out of total 40 patients (82.5%) which is statically insignificant ( $p=0.778$ ). RSVG to PLV was given in group A 2 patients out of

total 40 patients (5%) and group B 2 patients out of total 40 patients (5%) which is statically not significant ( $p=1.00$ ). The findings corresponded with Samano et al [8] in their published reports by Samano et al[8]. Patency rate of venous grafts on coronary CT angiogram after 5 years follow up has revealed significant difference statically. Four locations of distal venous graft patency were analyzed in this study (such as Diagonal, OM, PDA & PLV). At first, RSVG to Diagonal patency rate in group A was  $53.75\pm 15.01\%$  and group B was  $34.32\pm 12.18\%$  which was statically significant ( $p=0.001$ ). where Deb et al showed in their study Diagonal patency in group A was  $58.48 \pm 44.02\%$  & Group B was  $47.29\pm 10.23\%$  ( $p=0.014$ ). Secondly, RSVG to OM patency rate in group A was  $61.76\pm 12.32\%$  and group B was  $46.52\pm 14.82\%$  which was statically significant ( $p=0.001$ ). Samano et al [8] showed in their study OM patency in group A was  $64.28 \pm 12.02\%$  & Group B was  $56.25\pm 20.43\%$  ( $p=0.009$ ). Thirdly, RSVG to PDA patency rate in group A was  $51.56\pm 15.37\%$  and group B was  $25.61\pm 19.03\%$  which was statically significant ( $p=0.001$ ). Samano et al [8] showed in their study PDA grafts patency in group A was  $62.18 \pm 22.12\%$  & Group B was  $48.55\pm 30.03\%$  ( $p=0.040$ ). Lastly, RSVG to PLV patency rate in group A was  $37.50\pm 10.61\%$  and group B was  $27.50\pm 3.54\%$  which was statically insignificant ( $p=0.333$ ). The above findings were corresponded with Samano et al [8] & Deb et al [9] in their published reports. The occlusion rate of venous graft on Coronary CT angiogram after 5 years follow up were higher in group B (conventional saphenous vein) than group A (pedicled saphenous vein) but that was not statistically significant ( $p=0.209$ ). Group A shows 8 venous grafts was occluded out of total 99 grafts (8.08%) and Group B shows 13 venous grafts was occluded out of total 90 grafts (14.44%). These findings were found similar by Deb et al., in their study they showed that, there were higher occlusion rate

in Group B (conventional saphenous vein) 16 venous grafts was occluded out of total 107 grafts (15%) and Group A (pedicled saphenous vein) 8 venous grafts was occluded out of total 107 grafts (7.8%) ( $p=0.11$ ) [9].

### CONCLUSION

This study found that, pedicled saphenous vein harvesting technique has better patency rate than conventional saphenous vein conduits for coronary artery bypass surgery.

### LIMITATIONS

Small sample size for this study is an obvious limitation.

- Coronary angiogram is more appropriate than coronary CT angiogram. But coronary angiogram is costly and it is an interventional procedure. So, patients were not agreed to do it.
- If we will examine the patients after two years or three years after operation rather than directly five years interval then we may get a better result.

### RECOMMENDATIONS

According to the above study I recommends that,

- We should practice pedicled saphenous vein harvesting technique in our practical field because it has better patency rate than conventional saphenous vein harvesting technique.
- Yearly routine follow up of post CABG patients should be done to see the patency rate of venous graft.
- We should convey the information about the benefits to use of pedicled saphenous vein harvesting technique among the surgeons and patients.

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