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Frequency of Saphenous Vein Graft Harvest Site Wound Infection in Patients with Coronary Artery Bypass Grafting

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Abstract

Background: There is scarcity of data regarding great saphenous vein harvest site infection incidence after coronary artery bypass grafting in our geographic location, therefore we aimed to determine the exact burden of the disease so that appropriate strategies could be made if it comes out to be major public health problem.

Material and Methods: This Cross-sectional study was conducted at Cardiothoracic Surgery Department, Aga Khan University Hospital, Karachi, from April 2014 to October 2014 on 163 patients selected through Non- probability, consecutive sampling. All adult patients 18 years and above with coronary artery disease who underwent coronary artery bypass grafting. Data was analyzed using SPSS version 17. Chi-square test was applied to see the effect of age, gender, diabetes, smoking, hypertension, obesity, prolonged ICU stay, use of IABP, aortic cross clamp time and number of vein grafts harvested, on outcome variable (harvest site infection). P value of <0.05 was considered statistically significant.

Results: Harvest site infection was 1.5%. Variables studied i.e. age, gender, diabetes, hypertension, length of ICU stay, obesity, smoking; IABP, cardiopulmonary bypass time, aortic cross clamp time and number of vein grafts harvested had no statistical significant effect on the frequency of harvest site infection post coronary artery bypass grafting.

Conclusion: In our study, infection rate was reported 1.5% (2 patients) which is much lower as compared to the reported frequency in literature. This may be due to small sample size as compared to the studies in literature.

Keywords: Great saphenous vein; Coronary artery bypass grafting; CAD; CHD

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Abbreviations

HIS: Harvest Site Infection; CABG: Coronary Artery Bypass Grafting; CHD: Coronary Heart Disease; DALYs: Disability Adjusted Life Years; CAD: Coronary Artery Disease; LITA: Left Internal Thoracic Artery; CPB: Cardiopulmonary Bypass; CDC: Centers for Disease Control and Prevention; NHSN: National Healthcare Safety Network; DM: Diabetes Mellitus; HTN: Hypertension; EF: Ejection Fraction; SSI: Surgical Site Infection; IABP: Intra-Aortic Balloon Pump

Introduction

In the developed countries Coronary Heart Disease (CHD) is the single largest cause of death and is one of the leading causes of disease burden in developing countries as well. Surgical history of CABG dates back a century ago when Alexis Carrel anatomized a carotid artery segment between the descending aorta and the left coronary artery in a dog. The world's first CABG program started by Favaloro in 1967 by using reversed saphenous veins for aortocoronary grafting.

Great saphenous vein has been one of the most commonly used conduits in coronary artery bypass grafting because of easy harvest technique, ready availability, no concern of spasm and easy handling.

Major leg wound complications at the GSV harvest site can cause significant patient morbidity and results in prolonged hospital stay, increased hospital cost and additional surgical procedures with associated deformities and limb loss.

Most of the studies till now have been carried out to find out the risk factors for saphenous vein harvest site wound infection, its comparison with arterial graft harvest and endoscopic results of harvest. Although few studies have been done internationally to see the incidence of harvest

site infection following saphenous vein grafts like according to the study carried out in UK in 2001, comparing Harvest Site Infection (HSI) following saphenous vein graft and radial artery was 15% in case of saphenous vein grafts [1-15], while in another study done in Australia 2002, it was 17.8% [16], there is paucity of data regarding the frequency of wound infection on saphenous vein harvest site after CABG in our geographic location. Therefore we aimed to determine the frequency of saphenous vein graft harvest site wound infection in patients with coronary artery bypass grafting so that appropriate strategies could be made to combat the situation if it comes out to be the major public health problem.

Material and Methods

Study design

Cross sectional study.

Setting

Cardiothoracic surgery department, The Aga Khan University Hospital Karachi, Pakistan.

Duration of study

6 months after approval of synopsis.

Sampling technique

Non-probability consecutive sampling.

Inclusion criteria

All adult patients (male and female) 18 years and above with coronary artery disease who will undergo isolated coronary artery bypass grafting with saphenous vein conduits according to the 2010 ESC/EACTS guidelines on myocardial revascularization (http://heart.bmj.com) and diagnosed on the basis of angiography.

Exclusion criteria

1. Associated other cardiac pathology surgery.
2. Patients with skin diseases including allergy.
3. Patients with known peripheral arterial disease.
4. Pregnant females.
5. Patients with malignancy either primary or secondary.
6. Patients with bleeding disorders.

Sample size estimation

Assuming 15% as the expected frequency (P) of saphenous vein graft harvest site infection amongst CABG patients [15], confidence interval (1-α) = 95%, absolute precision (d) = 6%. Sample size is calculated as 163 patients by the following formula:

$$n = \frac{z^2_{1-\alpha/2} P(1-p)}{d^2}$$

Data collection

All patients who were included in the study as defined by selection criteria were enrolled in the study. Informed consent was taken from all patients who underwent isolated CABG. Data was recorded on proforma by primary resident (trainee), which included variables such as age, gender, weight, smoking, hypertension, diabetes mellitus, ejection fraction, IABP requirement, no of vein grafts harvested, aortic cross clamp time, cardiopulmonary bypass time, length of ICU stay. All patients were followed for wound infection based upon CDC criteria during hospital admission and upon clinical follow up to 1 month. Final outcome was assessed after 30 days. Approval from institutional ethical review committee was taken.

Data analysis

Data was analyzed using SPSS version 17. Continuous variables of age, weight, cardiopulmonary bypass time, aortic cross clamp time, ejection fraction and ICU stay were expressed as mean ± SD. Categorical variables including gender, smoking, hypertension, Diabetes Mellitus, use of IABP, no of vein grafts harvested and presence of wound infection, were reported as frequency (percentage).

Effect modifiers and confounding factors i.e. age, gender, obesity, smoking, low ejection fraction, aortic cross clamp time and cardiopulmonary bypass time were explored by stratified analysis and chi-square test was applied to see the effect of these on outcome variable (harvest site infection). P value of <0.05 was considered statistically significant and it was calculated using Fischer's exact test.

Results

A total of 163 patients were enrolled as per inclusion and exclusion criteria. Descriptive statistics of patients is presented in Table 1.

All of patients were operated for isolated Coronary Artery Bypass Grafting (CABG) on Cardiopulmonary Bypass (CPB) by establishing an extracorporeal circulation. Mean age of patients was 56.90 ± 9.39. Majority of patients were male 83.2% (n=114). 54.7% (n=75) patients were diabetic while 71.5% (n=98) patients were hypertensive. 42.3% were smoker. Mean CPB time was 94.15 ± 58.21 min and mean aortic cross clamp time was 58.59 ± 22.56 min.

Six patients required Intraaortic Balloon Pump (IABP) which was inserted preoperatively because of the hemodynamic instability and low ejection fraction. Left Internal Mammary Artery (LIMA) was the only arterial conduit which was used in 100% of patients for distal anastomosis between LIMA and LAD. Great saphenous vein was harvested from leg to be used as venous conduit for remaining distal anastomosis. 53% of patients had two distal coronary anastomosis

Table 1: Mean analysis of variables.

Variable	Mean
Age of patients (years)	56.90 ± 9.39
Weight (kg)	72.65 ± 12.87
Height (cm)	164.96 ± 7.89
Ejection fraction (%)	48.76 ± 12.64
Cardiopulmonary bypass time (min)	99.60 ± 34.96
Aortic cross clamp time (min)	64.02 ± 25.78

Table 2: Distribution of venous conduits for distal anastomosis.

Venous conduits	Frequency	Percentage
1	21	15.3
2	73	53.3
3	38	27.7
4	5	3.6
Total	137	100

Table 3: Study participants according to gender.

Gender	Frequency	Percent
Male	114	83.2
Female	23	16.8
Total	137	100

Table 4: Smokers in study participants.

Smoking	Frequency	Percent
Yes	58	42.3
No	79	57.7
Total	137	100

Table 5: Diabetics in study participants.

Diabetes	Frequency	Percent
Yes	75	54.7
No	62	45.3
Total	137	100

Table 6: Hypertensives in study participants.

Hypertension	Frequency	Percent
Yes	98	71.5
No	39	28.5
Total	137	100

Table 7: Use of IABP.

Use of IABP	Frequency	Percent
Yes	6	4.4
No	131	95.6
Total	137	100

Table 8: Length of ICU stay >24 h.

Length of ICU stay	Frequency	Percent
Yes	12	8.8
No	125	91.2
Total	137	100

Table 9: Harvest site infection in study participants.

HSI	Frequency	Percent
No	135	98.5
Yes	2	1.5
Total	137	100

using venous conduits as shown in Table 2.

Discussion

It is estimated that 2% to 20% of Coronary Artery Bypass Grafting (CABG) procedures in the United States are complicated by Surgical Site Infections (SSI) at the sternal or conduit harvest site incisions [17-19]. Most attention has focused on deep chest infections and mediastinitis due to their potential for serious morbidity and mortality, although graft harvest site infections may actually be more common after CABG. Leg harvest site infections not only result in increased morbidity for patients, but also increase the length of hospital stay and hospital costs. Few studies have been published that have included an analysis of risk factors specifically for harvest site infection in CABG patients. The majority of the literature concerning SSI in CABG patients has focused either on sternal wound infections or has involved an analysis of all wound infections occurring after surgery (combining chest and harvest sites together). To identify patients at increased risk of HSI and to devise strategies to reduce its risk, it is important to determine specific risk factors for leg harvest site infections [20]. Risk factors for leg harvest site infection that have been identified in previous studies include obesity [8,21], female gender [22], diabetes [22], wound depth [23], continuous open incision method of harvesting the saphenous vein(s) [22], wound length [24], peripheral vascular disease [20]. Left ventricular end diastolic pressure greater than 15 mmHg [25], longer cross clamp time [26], postoperative placement of an intra-aortic balloon pump [20]. Postoperative treatment with nicardipine [27], lack of postoperative treatment with dobutamine or nitroglycerin [27], leg incision open more than 150 min [27-29].

In our study, frequency of HSI was 1.5% (2 patients) and we found no statistical significant effect of gender, smoking, diabetes, hypertension, use of IABP, no of vein grafts harvested and prolonged length of ICU stay (more than 24 h), obesity, aortic cross clamp time on HSI. This may be due to small sample size as compared to studies in the literature.

Strengths

This is the first prospective study in the region observing frequency of harvest site infection after isolated CABG patients.

Limitation

Because of the small sample size, this study cannot predict the effect of variables on harvest site infection as it was designed only to measure the frequency of HSI in study population. But as the literature supports the effect of these variables on HSI therefore large sample size is needed to observe the effect of these variables on HSI in our region.

Table 10: Frequency of HSI-Overall and by Gender.

		HSI						P-value
		Yes		No		Total		
		Count	Row N%	Count	Row N%	Count	Row N%	
Gender	Male	2	1.80%	112	98.20%	114	100.00%	1
	Female	0	0.00%	23	100.00%	23	100.00%	
	All	2	1.50%	135	98.50%	137	100.00%	

Table 11: Frequency of HSI in diabetics.

		HSI						p- value
		Yes		No		Total		
		Count	Row N%	Count	Row N%	Count	Row N%	
Diabetes	Yes	1	1.30%	74	98.70%	75	100.00%	1
	No	1	1.60%	61	98.40%	62	100.00%	

Table 12: Frequency of HSI in Hypertensives.

		HSI						P- value
		Yes		No		Total		
		Count	Row N%	Count	Row N%	Count	Row N%	
Hypertension	Yes	2	2.00%	96	98.00%	98	100.00%	1
	No	0	0.00%	39	100.00%	39	100.00%	

Table 13: Frequency of HSI in smokers.

		HSI						P -value
		Yes		No		Total		
		Count	Row N%	Count	Row N%	Count	Row N%	
Smoking	Yes	0	0.00%	58	100.00%	58	100.00%	0.508
	No	2	2.50%	77	97.50%	79	100.00%	

Table 14: Frequency of HSI with use of IABP.

		HSI						P-value
		Yes		No		Total		
		Count	Row N%	Count	Row N%	Count	Row N%	
Use of IABP	Yes	0	0.00%	6	100.00%	6	100.00%	1
	No	2	1.50%	129	98.50%	131	100.00%	

Table 15: Frequency of HSI with length of ICU stay >24 h.

		HSI						p-value
		Yes		No		Total		
		Count	Row N%	Count	Row N%	Count	Row N%	
length of ICU stay >24 h	Yes	1	8.30%	11	91.70%	12	100.00%	0.168
	No	1	0.80%	124	99.20%	125	100.00%	

Table 16: Frequency of HSI according to age.

			HSI		Total	P value
			Yes	No		
Age groups	<60 years	Count	0	81	81	0.165
		% of Total	0.00%	59.10%	59.10%	
	60 years or older	Count	2	54	56	
		% of Total	1.50%	39.40%	40.90%	
Total		Count	2	135	137	
		% of Total	1.50%	98.50%	100.00%	

Table 17: Frequency of HSI in obese.

			HSI		Total	P value
			Yes	No		
Obesity	Yes	Count	2	112	114	1
		% of Total	1.50%	81.80%	83.20%	
	No	Count	0	23	23	
		% of Total	0.00%	16.80%	16.80%	
Total		Count	2	135	137	
		% of Total	1.50%	98.50%	100.00%	

- Obesity is defined as BMI of 30 or higher
- Body Mass Index (BMI) is a person's weight in kilograms divided by the square of height in meters.

Table 18: Frequency of HSI according to CPB time.

			HSI		Total	P value
			Yes	No		
CPB Time	=<99	Count	1	65	66	1
		% of Total	0.70%	47.40%	48.20%	
	100 or above	Count	1	70	71	
		% of Total	0.70%	51.10%	51.80%	
Total		Count	2	135	137	
		% of Total	1.50%	98.50%	100.00%	

Table 19: Frequency of HSI according to cross clamp time.

			HSI		Total	P value
			Yes	No		
Cross clamp time	<60	Count	1	61	62	
		% of Total	0.70%	44.50%	45.30%	1
	60 or above	Count	1	74	75	
		% of Total	0.70%	54.00%	54.70%	
Total		Count	2	135	137	
		% of Total	1.50%	98.50%	100.00%	

Table 20: Number of vein grafts harvested.

			HSI		Total
			No	Yes	
Number of vein grafts harvested	1	Count	21	0	21
		% within Number of vein grafts harvested	100.00%	0.00%	100.00%
	2	Count	71	2	73
		% within Number of vein grafts harvested	97.30%	2.70%	100.00%
	3	Count	38	0	38
		% within Number of vein grafts harvested	100.00%	0.00%	100.00%
	4	Count	5	0	5
		% within Number of vein grafts harvested	100.00%	0.00%	100.00%

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