Sex Difference in Mid-Term Patency of Arterial and Venous Grafts after Coronary Artery Bypass Graft Surgery in Asymptomatic Patients

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Abstract

Background: The aim of this study was to compare the sex difference in patency rates of left internal thoracic artery (LITA), radial artery (RA), and saphenous vein (SV) grafts in asymptomatic patients after coronary artery bypass graft surgery (CABG) after 2-5 years follow up period.

Method: We assessed thirty patients with three-vessel coronary artery disease including 104 LITA, RA, and SV grafts concomitantly used for isolated elective CABG surgery. The primary end point was rates of graft patency in both men and women. After 2-5 years follow-up, graft patency was assessed by 128-slice, dual-source CT coronary angiography.

Result: There were 21 men and 9 women in this study. A total of 104 grafts, including 30 LITA, 44 SV, and 30 RA grafts, were studied. Total graft patency rate was 84/104 (80.8%). Graft patency rate in men was 64/78 (82.1%) and in women was 20/26 (76.9%; p=0.774). LITA graft patency rates were 20/21(95.2%) in men and 8/9 (88.9%) in women (p=1.000). Patency rates in RA were 21/22 (95.5%) and 4/8 (50%; p=0.016), and patency in SV were 22/34 (64.7%) in men and 9/10 (90%) in women (p=0.251), respectively.

Conclusion: This study revealed that in asymptomatic patients who underwent CABG surgery 2-5 years ago there is a statistically significant lower RA patency rate in women compared with men. We didn't find any difference in LITA or SV grafts patency rates between men and women in mid-term follow up.

Keywords: Coronary Artery Bypass Graft; Radial artery; Saphenous vein; Graft patency; CT- angiography

Introduction

There are a lot of reports on the influence of gender on coronary artery bypass graft (CABG) surgery outcomes (1-5). Some evidence has previously shown that women are at higher risk of postoperative complications than men, particularly in the perioperative period (1, 2). Various explanations exist for this difference. Poorer clinical outcome in women versus men after CABG may be to some extent related to higher exposure to risk factors in women (2). Some studies showed women who underwent CABG, compared with men were older (3), have higher rates of comorbid conditions, smaller coronary arteries, more acute and unstable presentation, and less frequent usage of the in-

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ternal thoracic artery (ITA) (2, 3).

However, one of major determinants of worse outcome after CABG is mid-term and long-term graft patency. Generally arterial conduits have higher patency rate than saphenous vein (SV) grafts (6). Several clinical reports support the lower LITA, radial artery (RA) and SV graft patency rates in the women compared with men (7-9).

Most previous studies conducted on comparing graft patency rates between both sex were performed on symptomatic patients (10, 11) using invasive diagnostic modalities such as coronary angiography. In this study we sought to compare women and men regarding mid-term (2-5 years) patency rates in all conduit grafts following CABG surgery in asymptomatic patients using a noninvasive diagnostic tool, CT coronary angiography.

Methods

After the approval of the study protocol by the institutional Ethics Committee, and obtaining written informed consent from all the patients, the study was conducted. We enrolled 30 asymptomatic adult patients who had previously undergone CABG by a single surgeon between 2 and 5 years previously. All the patients had three-vessel coronary artery disease and underwent CABG surgery using the LITA, RA, and SV graft conduits. There were a total of 104 RA, LITA, and SV grafts. At 53.5 (24-97) months follow-up, graft patency was assessed via 128-slice, dual-source CT coronary angiography.

The patients' background and clinical parameters, including left ventricular ejection fraction (LVEF) and cardiovascular risk factors (cigarette smoking, hypertension, hyperlipidemia, and positive family history of coronary artery disease) were recorded. All the surgical operations were performed by a single surgeon (the first author) 2-5 years previously. The standard surgical methods were used for the RA and SV harvest and dissection of the LITA (12, 13). Harvest of the RA was made from the antecubital fossa to the wrist in the non-dominant arm, and the SV harvest was done in the usual method.

All data were collected and analyzed using the statistical package SPSS ver. 18.0 for Windows. The continuous variables are presented as mean ± SD (standard deviation), and the categorical variables are summarized by raw numbers and percentages. The continuous variables were compared between women and men using the independent samples t-test. The categorical variables were, on the other hand, compared in both sex using the chi-square test (with continuity correction) or the Fisher exact test, as required. A p value ≤ 0.05 was considered statistically significant.

Results

From the 30 patients enrolled into the study, a total of 104 grafts, comprising 30 (28.8%) LITA, 44 (42.4%) SV, and 30 (28.8%) RA grafts, were evaluated. Background and clinical characteristic of patients according to sex distribution were summarized in Table 1. Severity of target vessel stenosis in pre-operative angiography and number of risk factors in men and women were demonstrated in Table 2. As shown in Tables 1 and 2, men and women were comparative to each other except lower mean LVEF in men and higher number of cardiovascular risk factors in women.

Cumulative graft patency rates were 28/30 (93.3%) in the LITA, 25/30 (83.3%) in the RA, and 31/44 (70.5%) in the SV grafts, respectively. Among these grafts, 78 (75%) were used in the men and 26 (25%) were used in the women. The average age of the patients was 59.15 years (48-83 years). The average follow-up period (from CABG to restudy by CT-angiography) was 4.46 years (2-8).

Total graft patency rate was 84/104 (80.8%). Graft patency rate in men was 64/78 (82.1%) and women 20/26 (76.9%; p=0.774). LITA graft patency rates were 20/21(95.2%) in men and 8/9 (88.9%) in women (p=1.000). The patency rate of the RA graft was lower in the females [4/8 (50%)] than in the males [21/22 (95.5%)], (p = 0.016). and patency in SV were 22/34 (64.7%) in men and 9/10 (90%) in women (p=0.251), respectively.

Discussion

Unlike previous investigations, which studied the RA and SV graft patency rates in symptomatic patients using angiography (6, 10, 11) the present study compared the mid-term results of the RA and SV patency in asymptomatic patients by using a noninvasive diagnostic tool, namely CT angiography. This study revealed that in the asymptomatic patients, the RA grafts had an acceptable patency rate at 2-5 years' follow-up.

Long term outcomes of CABG surgery are influenced by the complex interaction of patient-related and procedure-related factors. Main patient-related factors include distribution of the CAD, the extent and severity of coronary ath-

erosclerosis, age, gender, overall health status, severity of atherosclerotic changes, severity of co-existing morbidities and occurrence of operative complications and patency of aorto-coronary graft conduits (14).

Tan and colleagues reported comparable results in women and men in one-year occlusion rates of vein and LITA grafts (2). However, Hartman and Coelho showed the significantly lower patency rates in conduits grafts in women compared with men (9, 11). Mannacio et al. reported older women have lower conduit patency rate compared with men after CABG operation. This finding in part may be due to impaired expression of messenger RNA for eNOS and decreased eNOS levels in internal thoracic artery endothelial cells from women after menopause undergoing CABG (4). So, Bartens et al. found that the tendency of RA graft failure in diabetics and the higher patency associated with angiotensin inhibition might both associate to endothelial modulation of the muscular tone of the graft (5). Hiramoto et al. showed that women undergoing lower extremity bypass (LEB) for severe peripheral artery disease have a different inflammatory response compared with men. Increased baseline levels of CRP and fibrinogen are associated with lower vein graft patency in women but not in men. These findings indicate an important correlation between gender and inflammatory response in the healing response of vein grafts for LEB (15).

We noticed a statistically significant difference in the RA grafts when comparing both sexes, with a lower RA graft patency rate in the women. The same result was observed by Lawton (7), Schwann (8), and Hartman (9) because of the smaller size of the RA in women. Also, Desai and coworkers demonstrated patients who undergoing CABG benefit from RA-coronary artery bypass conduits compared with SV conduits, and this effect is especially strong in women (16). In other study Khot et al. reported in symptomatic patients after CABG, radial artery grafts have lower patency rates than left internal mammary artery and saphenous vein grafts. The researcher suggested selective use of the radial artery, particularly in women (17).

Conclusions

In this study we found that after mid-term (2-5 years) follow-up period, in asymptomatic patients who previously underwent CABG, women have lower patency rates in RA but not in LITA or SV grafts. Furthermore, the RA graft function was poor in the patients with multiple CAD risk factors as well as in those with moderate target vessel stenosis.

Limitations

Owing to economic constraints, we were able to perform

Table 1. Background and clinical characteristic of patients according to sex distribution.

	Male n=78	Female n=26	p
Age (year)	59.9±7.7	56.9±4.6	0.065
Age>70 years	8 (10.3%)	0 (0%)	0.202
Diabetes Mellitus	13 (16.7%)	5 (19.2%)	0.090
Hypertension	15 (19.2%)	7 (26.9%)	0.307
Hyperlipidemia	23 (29.4%)	11 (42.3%)	0.932
LVEF* (%)	45.0±7.4	50.0±4.2	0.002
LVEF<30%	7 (9.0%)	0 (0%)	0.259
Underling dis.	3 (3.8%)	0 (0%)	0.735
Target vessel run off	75 (96.2%)	26 (100%)	0.735
Follow up period (month)	54.4±17.7	50.7±27.4	0.430
Graft patency rate	64 (82.1%)	20 (76.9%)	0.774

**LVEF= Left ventricular ejection fraction*

the costly modality of CT angiography only on 30 patients free of charge. It seems that some of the statistically non-significant results such as that SV graft patency rates between men and women might be related to this limited sample size. This study was funded by Rajaie Cardiovascular, Medical and Research Center, Iran University of Medical Sciences, Tehran, Iran.

Table 2. Severity of target vessel stenosis in pre-operative angiography and number of risk factors in men and women.

	Male n = 78	Female n = 26
Target vessel stenosis*:	0 (0%)	1 (3.8%)
Mild Moderate	6 (7.7%)	4 (15.4%)
Severe	72 (92.3%)	21 (80.8%)
No. of risk factors**: 0	26 (33.3%)	3 (11.5%)
1	34 (43.6%)	0 (0%)
2	18 (23.1%)	23 (88.5%)

** p = 0.106*
***p < 0001*

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