



Original Article

The effect of gender on short and long-term outcomes of coronary artery bypass grafting

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Abstract

Background: There is no consensus on the effect of gender on the outcomes after coronary artery bypass grafting (CABG). Thus, this study aimed to describe gender differences in CABG and evaluate the impact of gender on the short and long-term outcomes after CABG.

Methods: This study was conducted on 195 CABG patients. The patients were grouped according to gender into two groups: males (n= 142) and females (n= 53). Study endpoints were hospital outcomes (drainage, myocardial infarction (MI), neurological and renal complications, sternal wound infection, and mortality) and the long-term composite endpoint of recurrent angina, myocardial infarction, repeat revascularization, and mortality.

Results: Male patients were significantly younger than females ($P= 0.025$) and had a significantly lower Euro SCORE ($P<0.001$). The number of distal anastomoses was significantly more in males, and total arterial revascularization was more commonly used in males ($P= 0.002$ for both). Postoperative drainage was substantially higher in males than in females ($P<0.001$). There were no differences in other postoperative complications between groups. The median follow-up duration for males was 58 (47-67) months vs. 61 (48- 65) months for females. Recurrent angina occurred in ten males (7.04%) vs. five females (9.43%) (log-rank $P= 0.547$). MI during follow-up occurred in 3 males (2.11%) and none in females. Coronary reintervention occurred in three males (2.11%) vs. three females (5.66%) (log-rank $P= 0.614$). Five males had follow-up mortality (3.52%) vs. two females (3.77%) (Log-rank $P= 0.957$). The composite endpoint of death, MI, recurrent angina, and coronary reintervention occurred in 16 males (11.27%) vs. eight females (15.09%) (Log-rank $P= 0.464$).

Conclusions: This study revealed that there could be no difference in the outcomes of coronary artery bypass grafting between males and females.

KEYWORDS

Coronary artery bypass grafting; Survival; Coronary revascularization; Myocardial infarction

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Introduction

Coronary artery bypass grafting (CABG) remains the most common cardiac surgery procedure [1]. Several factors affect CABG outcomes, and the effect of gender was inconsistent in the literature [2,3]. In a propensity score analysis, Alam and associates reported that

the female gender was significantly associated with increased mortality after isolated CABG; however, it was associated with lower atrial fibrillation incidence [4]. On the other hand, Guru and colleagues reported no difference in survival between males and females; however, women were more susceptible to recurrent angina and



heart failure after CABG [2]. In a pooled analysis of 13,193 patients, Gaudino and colleagues reported worse outcomes in women after CABG in the first five years. This difference was not evident in patients above 75 years [5].

Coronary artery disease (CAD) pathophysiology differs between males and females [6]. CAD is not common in women under 60 years; however, it is associated with higher morbidity and mortality if it occurs in young women compared to men [7]. Thus, this study aimed to describe gender differences and evaluate the effect of gender on the outcomes after CABG.

Patients and Methods

Design

This retrospective cohort study was conducted between 2010 and 2022 on patients who underwent CABG. The study included patients who had isolated primary CABG (n= 195). We included emergency and elective CABG and on-pump or off-pump CABG. Patients with concomitant procedures, redo surgery, and minimally invasive CABG were excluded. The patients were grouped according to gender into two groups: males (n= 142) and females (n= 53).

The local ethics committee approved the study, and the patient's consent was waived.

Techniques:

Median sternotomy was performed in all patients, and the left internal mammary artery (LIMA) to the left anterior descending artery (LAD) was performed in all patients. The other conduits were chosen according to the surgeons' experience. Saphenous vein and radial artery harvesting were performed using an open approach. Aortocaval cannulation was performed in patients with on-pump CABG, and antegrade cardioplegia was used.

Outcomes:

The study outcomes were hospital outcomes defined as those occurring within 30 days of surgery or in the same hospital admission. These outcomes included bleeding, neurological complications, postoperative renal impairment, myocardial infarction (MI), sternal wound infections, the duration of mechanical ventilation, ICU and hospital stay, and hospital mortality. Long-term outcomes were MI, recurrent angina, the need for repeat coronary revascularization, and mortality.

Table 1: Comparison of the baseline and operative characteristics between males and females who had coronary artery bypass grafting. Data were presented as median (IQR) or numbers (percentages)

	Male (n= 142)	Female (n= 53)	P-value
Age (year)	65 (59- 71)	69 (60- 75)	0.025
Diabetes mellitus	39 (27.46%)	17 (32.08%)	0.527
Peripheral arterial disease	29 (20.42%)	7 (13.21%)	0.248
Cerebrovascular disease	4 (2.82%)	2 (3.77%)	0.664
Previous myocardial infarction	74 (52.11%)	28 (52.83%)	0.929
Ejection fraction (%)	60 (50- 68)	57 (42- 67)	0.332
Stable angina	77 (54.23%)	22 (41.51%)	0.114
Unstable angina	65 (45.77%)	31 (58.49%)	0.114
Number of diseased vessels			
One	2 (1.41%)	4 (7.55%)	
Two	26 (18.31%)	10 (18.87%)	0.101
Three	114 (80.28%)	39 (73.58%)	
Left main disease	43 (30.28%)	12 (22.64%)	0.292
Logistic EuroSCORE	2.48 (1.54- 5.47)	4.2 (2.4- 8.17)	<0.001
Emergency surgery	15 (10.56%)	4 (7.55%)	0.527
Off-pump surgery	90 (63.38%)	37 (69.81%)	0.402
Number of distal anastomoses	3 (3- 4)	3 (2- 3)	0.002
Total arterial revascularization	127 (89.44%)	38 (71.70%)	0.002

Table 2: Comparison of the postoperative outcomes between coronary artery bypass grafting in males and female. Data were presented as median (IQR) or numbers (percentages)

	Male (n= 142)	Female (n= 53)	P-value
Drainage (ml/12 h)	428 (330- 600)	300 (230- 345)	<0.001
Mechanical ventilation (h)	8 (6- 14)	9 (7- 15)	0.192
ICU stay (h)	25 (20- 45)	26 (20- 47)	0.672
Graft spasm	2 (1.41%)	3 (5.66%)	0.125
Reoperation	10 (7.04%)	2 (3.77%)	0.518
Perioperative myocardial infarction	3 (2.11%)	1 (1.89%)	>0.99
Neurological complications	2 (1.41%)	0	>0.99
Renal impairment	16 (11.27%)	6 (11.32%)	0.992
Sternal wound infection	4 (2.82%)	1 (1.89%)	>0.99
Hospital stay (d)	9 (8- 11)	9 (8- 12)	0.675
Hospital mortality	1 (0.7%)	2 (3.77%)	0.180

The long-term outcomes were evaluated individually and as a composite endpoint. Follow-up data were retrieved from patients' electronic and paper charts.

Statistical analysis:

Data were presented as mean and standard deviation or median and interquartile range (for continuous data) and numbers and percentages (for binary and ordered data). Data were compared with the t-test or Mann-Whitney test (for continuous data) and the Chi-squared or Fisher exact test (for categorical data). Long-term data were compared with the log-rank test, and the Kaplan-Meier curve was plotted. Stata 17 was used to analyze data, and a P-value of less than 0.05 was considered statistically significant (Stata Corp- College Station- TX- USA).

Results

Preoperative and operative data:

Male patients who had CABG were significantly younger than females ($P= 0.025$), and they had a significantly lower Euro SCORE ($P<0.001$). There were no differences in diabetes mellitus, peripheral arterial disease, cerebrovascular disease, previous MI, symptoms, ejection fraction, left-main disease, and the number of diseased vessels between groups.

In males, distal anastomoses were significantly higher, and total arterial revascularization was more commonly used compared to females. (Table 1)

Postoperative outcomes:

Postoperative drainage was significantly higher in males than females ($P<0.001$). There were no differences in the duration of mechanical ventilation, ICU, and hospital stay between groups. Other complications, including neurological, renal, infection, and hospital mortality, did not differ between groups. (Table 2)

Follow-up:

The median follow-up duration for males was 58 (47- 67) months vs. 61 (48- 65) months for females. Recurrent angina occurred in ten males (7.04%) vs. five females (9.43%) (log-rank $P= 0.547$). MI during follow-up occurred in 3 males (2.11%) and none in females. Coronary reintervention occurred in 3 (2.11%) vs. three females (5.66%) (log-rank $P= 0.614$). Five males had follow-up mortality (3.52%) vs. two females (3.77%) (Log-rank $P= 0.957$). The composite endpoint of death, MI, recurrent angina, and coronary reintervention occurred in 16 males (11.27%) vs. eight females (15.09%) (Log-rank $P= 0.464$). (Figure 1)

Discussion

In this study, we compared the outcomes of CABG between males and females. The preoperative variables were comparable between both genders, apart from the age and EuroSCORE, which were lower in males. This difference could be attributed to the late onset of coronary artery disease in women because endogenous estrogen is a protective agent before menopause [8]. Coronary artery disease has different

characteristics in young women compared to men; women have a high prevalence of coronary dissection spasm and myocardial bridge; additionally, acute coronary syndromes in women are associated with higher mortality [9]. The young age in males could be a contributing factor in choosing total arterial revascularization for them, with significantly more distal anastomoses [10–12]. Gaudino and associates reported that women undergoing CABG were older and had higher EuroSCORE and comorbidities. Similar to our study, they reported significantly higher use of arterial grafts and the number of distal anastomoses [5].

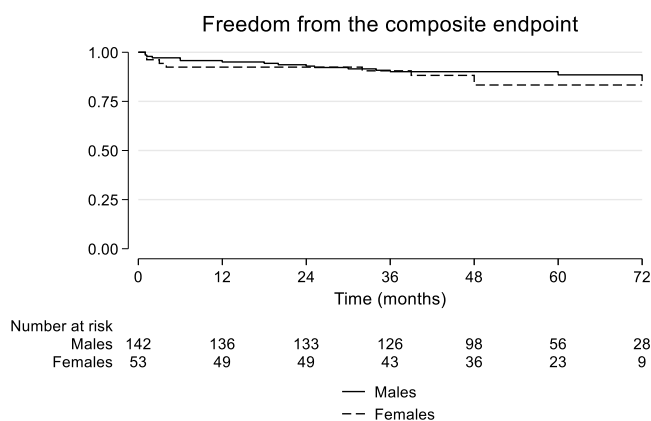


Figure 1: The freedom from the composite endpoint (recurrent angina, myocardial infarction, coronary revascularization, and death) between males and females

We did not report a difference in hospital outcomes between both genders, apart from the amount of drainage. The increased drainage in males could be attributed to the increased use of arterial grafts and the number of distal anastomoses [13,14]. A study found a higher operative mortality rate in young women than in men [15]. Women have small coronaries and are prone to vessel spasms and postoperative MI [16,17]. Our study did not report a difference in coronary spasm and MI postoperatively between both genders. Similarly, this study did not report a difference in mortality after isolated CABG between both groups. This finding was contrary to Alam and associates, who reported higher mortality in females in matched and unmatched cohorts [18]. Similar to this study, Matyal and coworkers found no differences in postoperative outcomes between genders [19].

The composite endpoint of angina, MI, repeated revascularization, and mortality did not differ between groups; however, it was non-significantly higher in females. There was no difference in the individual components of the composite endpoints, but MI and mortality were higher in men. Sabzi and associates compared the short and long-term outcomes after off-pump CABG and coronary endarterectomy between men and women. They reported no significant difference, while the risk in women tended to be higher [20]. Arif and colleagues found no differences in survival between both genders; however, the female gender was a risk factor for mortality after age 70 [21]. This finding contradicts Gaudino and associates, who reported no gender difference after age 75 [5]. They reported a higher incidence of MI and repeated revascularization in women but no difference in mortality.

Study limitations

The study was limited by design with its inherent selection bias. Moreover, the number of patients included could have affected the significance level. The study did not look into the mechanism that could lead to similarities or differences in the outcomes between men and women. Further studies are required to investigate the mechanism of differences and possible strategies to improve the outcomes.

Conclusion

This study revealed that there could be no difference in the outcomes of coronary artery bypass grafting between males and females.

Conflict of interest: Authors declare no conflict of interest.

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