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Coronary artery bypass grafting in South Asian patients: Impact of gender

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HIGHLIGHTS

- This paper gives an account of coronary artery bypass grafting (CABG) surgery performed in South Asian population with special attention to female gender.
- This is unique study as far as female patients are concerned in this part of the world.
- The female gender itself is a predictor of adverse outcome in terms of mortality.
- These results will help in preoperative counseling and suggests vigilant approach in perioperative care in female patients.
- It is heartening to note that the results are comparable to international standards.

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ABSTRACT

Background: Outcomes following Coronary artery bypass grafting (GABG) vary between genders, with females having a higher postoperative mortality than males. Most of the studies are on Caucasian or mixed population and it is postulated that Asian population and in particular women have higher morbidity and mortality. In this study we have compared outcomes of elective CABG in men and women of South Asian origin in terms of morbidity and mortality.

Methods: From January 2006 to December 2012, 1970 patients underwent isolated elective CABG at the Aga Khan University Hospital, Pakistan were selected. The prospectively collected data was analyzed retrospectively including univariate and multivariate analysis to find the association of morbidity and mortality.

Results: Among the study patients 1664 (85%) were male and 306 (15%) female. Hypertension and diabetes were the most common comorbid conditions seen preoperatively in female patients. Atrial fibrillation and sepsis were the most common postop complications seen in females. In hospital mortality was 3.9% in female underwent CABG as against 0.6% in male. Multivariate analysis showed older age, renal failure, dyslipidemia and prolonged cross clamp time as predictors of postoperative morbidity. Multivariate analysis showed female gender, age and renal failure as predictors of in hospital mortality.

Conclusions: Female gender is an independent risk factor for postoperative mortality following CABG however, female gender is not found to be independent risk factor for morbidity. The trend of higher mortality in female patients was comparable to most studies done on Caucasian patients.

1. Introduction

The outcomes following Coronary artery bypass grafting (CABG) have improved over the years and overall mortality in elective cases is around 1–2%. However when gender differentiation is used there is considerable evidence to suggest that outcome following CABG surgery vary between male and female. The evidence shows that women carry a higher operative mortality than men [1]. In fact they

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are at greater risk of complications and mortality whether the revascularisation is performed surgically or using percutaneous coronary intervention technique [2]. According to The Society of Thoracic Surgeons National Adult Cardiac Surgery Database as cited by Edwards et al. [3] females have an operative mortality of 3.54% compared to 2.15% for men. Investigations searching for potential causes for this difference have shown inconsistent results. Some research indicates female gender as an independent risk factor for operative mortality following CABG surgery [4] and as such several risk models which have been developed to assess operative mortality associated with CABG have included female gender as an important risk factor [5,6]. Others have stated that differences in outcomes between the two genders can be attributed to co-morbid conditions which are more prevalent in females [7] and that female gender itself has not been associated with increased mortality [7]. It has also been suggested that South Asian ethnicity per se is an independent predictor of a poorer outcome after CABG and in particular women have been found to have higher morbidity and mortality [8].

The aim of this study was to investigate the influence of female gender on outcomes in terms of morbidity and mortality after elective CABG surgery as compared to male patients.

2. Materials and methods

All patients undergoing isolated elective CABG procedure at the Aga Khan University Hospital, Pakistan between January 2006 and December 2012 were included in the study. Patients underwent emergency surgery, off pump CABG, redo CABG or other concurrent cardiac surgical procedures were excluded from the study. This was a retrospective review of data, which was prospectively collected in the cardiothoracic surgery computerized database using a standardized tools and definitions.

Our database consisting of patient demographics, pre-operative risk factors, operative information and short-term post-operative outcomes including morbidity and mortality. Patients were divided into two groups by gender. Demographics, pre-operative risk factors and short term outcomes were compared between these two groups.

The short term outcomes analyzed consisted of the following:

a. In hospital or 30 days mortality – defined as death during hospital stay or within 30 days after discharge.
b. Stroke – defined as a new central neurological deficit persisting for more than 24 hours.
c. Deep sternal wound infection – involving muscle and bone – demonstrated during surgical exploration and either positive cultures or requiring treatment with antibiotics.
d. Reopening for any cause.
e. Sepsis – defined as inflammation and evidence/suspicion of microbial process ± organ dysfunction/hypotension.
f. Atrial fibrillation – absence of p waves and irregular rhythm documented on ECG.

3. Surgical strategy

All of the surgeons used a standard operating strategy. After induction of anaesthesia, a median sternotomy approach was used. The conduits were harvested and CPB was established using right atrial and aortic cannulae, following systemic heparinisation (300u/kg). Myocardial protection was achieved with moderate hypothermia (28–32 °C) and blood cardioplegia given anterogradely via the aortic root. This was enhanced with topical cooling. Distal coronary anastomoses were performed on a still heart. After completion of the grafting on coronaries and rewarming, the aortic cross-clamp was removed and the proximal ends of the vein grafts were anastomosed to the aorta under a partially occluding clamp. In selected cases a single clamp technique was used for both distal and proximal anastomoses. Once the reperfusion was established through the grafts, the heart was gradually weaned from the heart lung machine and subsequent chest closure was carried out.

4. Statistical analysis

Statistical analysis of data was performed using SPSS version 20. Results were expressed as mean ± standard deviation (SD) with ranges for all continuous variables and numbers (percentages) for categorical data. Group comparison was performed by using *t*-test for continuous variable and Pearson Chi-Square test for categorical variable wherever appropriate. Univariate and multivariate logistic regression analysis was carried out to investigate predictors of postoperative morbidity and mortality. A p-value <0.05 was considered statistically significant.

5. Results

Between January 2006 and December 2012, 2923 patients underwent elective CABG. One thousand nine hundred and seventy patients fulfilled the inclusion criteria, out of which 306 (15%) were female and 1664 (85%) were male. Mean age of male patients was 57.2 (±SD) 9.51 and for female patients it was 58.8 (±SD) 8.37, ($p = 0.005$). Females were more likely to suffer from diabetes and hypertension compared to men (Table 1). There was no statistically significant difference in the preoperative ejection fraction or the number of vessels involved between the male and female patients (Table 1).

Intra-operative variables are presented in Table 1. Use of internal mammary artery graft, and mean bypass time did not show any statistically significant difference between males and females, however mean cross clamp time was significantly low in females, ($p = 0.036$).

Early postoperative outcomes are documented in Table 2. Overall in hospital mortality was significantly higher for females (3.9%) than males (0.6%), ($p < 0.001$).

Of the post-operative morbidity in this cohort of patients, atrial

Table 1
Preoperative and intraoperative characteristics of patients by gender, n = 1970.

Pre-operative variable	Male 1664 (85%)	Female 306 (15%)	P
Comorbid factors			
Age, mean (±SD)	57.2 (±9.5)	58.8 (±8.4)	0.005
-Age <60 years	981 (59.0)	160 (52.3)	0.030
-Age ≥60 years	683 (41.0)	146 (47.7)	–
Diabetes Mellitus	790 (47.5)	180 (58.8)	<0.001
Hypertension	1141 (68.6)	250 (81.7)	<0.001
Dyslipidemia	882 (53.0)	163 (53.3)	0.932
Renal Insufficiency	123 (7.4)	26 (8.5)	0.502
Ejection fraction			
>50%	909 (54.6)	188 (61.4)	0.084
30-50%	574 (34.5)	88 (28.8)	–
<30%	181 (10.9)	30 (9.8)	–
Vessels involved			
Single	12 (0.7)	2 (0.7)	0.955
Two	192 (11.5)	37 (12.1)	–
Three	1460 (87.7)	267 (87.3)	–
Left main vessel disease ≥50%	242 (14.5)	34 (11.1)	0.127
Intraoperative variables			
Use of LIMA	1608 (96.6)	298 (97.4)	0.600
Cross clamp time (min)	61.2 (±21.6)	58.4 (±19.3)	0.036
Bypass time (min)	98.9 (±29.3)	100.5 (±58.4)	0.475