Original Article

Postoperative Mortality and Morbidity in Elderly Patients Undergoing Coronary Artery Bypass Graft Surgery

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Abstract

Background: *Elderly patients (>75 years) have constituted the fastest growing portion of the coronary artery bypass grafting (CABG) patient population over the last two decades. Of the goals that surgical care for the elderly pursues, cure may be an unfeasible one; nevertheless, palliation and comfort warrant sufficient importance.*
The present study sought to examine the postoperative course and events in elderly patients undergoing CABG with or without other procedures and to compare the results with those in younger patients.

Methods: *Demographic, mortality, morbidity, and resource utilization data were collected from the records of the patients undergoing CABG between January 2005 and July 2007 in Imam Khomeini Medical Center, Tehran, Iran.*

Results: *The mean time to extubation was 9.3 and 6.3 hours in the elderly and non-elderly patients, respectively ($p<0.01$). Blood transfusion was required in 87.8% of the elderly compared to 58.5% of the non-elderly subjects ($p<0.01$). The mean Intensive Care Unit stay was 2.1 days for the elderly and 1.4 days for the non-elderly patients ($p<0.001$). In-hospital mortality was 9% for the elderly patients vs. 2.8% for the younger group ($p<0.001$).*

Conclusion: *The elderly patients undergoing CABG had a significantly higher morbidity rate, with an increased incidence of postoperative renal failure, neurological complications, and in-hospital mortality.*

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Keywords: *Aged • Mortality • Morbidity • Coronary artery bypass*

Introduction

The provision of care for an increasing number of elderly persons, who are liable to be afflicted with a higher incidence of illnesses and complicated psychosocial sequels thereof, accounts for the extraordinary burden on traditional health care systems.

Geriatric medicine is an interdisciplinary approach to the management of sickness and disability and to health promotion and disease prevention in the elderly that involves gerontology (the study of normal aging and the process of growing old as differentiated from disease effects).

Aging is concomitant with a decline in the physiological function of all organ systems, although the magnitude of this deterioration varies among organs and individuals. Surgical care for the elderly may be unable to bring about a cure, but palliation and comfort are indubitably goals worth seeking.

Coronary artery bypass grafting (CABG) has long since proved its efficiency in alleviating the symptoms of angina, improving the quality of life, and increasing the longevity of coronary artery disease patients.[1] Elderly patients have comprised the fastest growing section of CABG

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patient population over the last two decades.[2] As was stated above, advanced age is associated with diminished physiological reserve and increased comorbidity, including diabetes, chronic obstructive pulmonary disease (COPD), and peripheral vascular disease.[3]

The evolution of CABG via cardiopulmonary bypass (CPB) ushered in continuous reductions in morbidity and mortality rates. Be that as it may, since CPB was allied with the induction of a pro–inflammatory state with several adverse consequences;[4] off-pump CABG has emerged as a less invasive technique of myocardial revascularization in more recent years.

It is deserving of note, however, that many authors have of late argued that because of the high risk that they pose, elderly patients can benefit from myocardial revascularization without CPB.[5-7] Indeed, several publications have reported the surgical results of off-pump CABG in this age group. Unfortunately, most of these reports are retrospective and non-randomized, precluding a rigorous demonstration of the usefulness of this technique.

We sought to examine time to extubation, packed RBC transfusion, Intensive Care Unit (ICU) length of stay, and preoperative and postoperative lengths of stay in an elderly group of patients undergoing CABG with or without other procedures and to compare the results with those in a younger group of patients. We also evaluated the differences in the postoperative morbidity and mortality rates between the two groups.

Methods

This retrospective study was conducted in 2095 patients, comprising 132 elderly and 1963 non-elderly persons, between January 2005 and July 2007 in Imam Khomeini Medical Center, Tehran, Iran. Extubation time, blood transfusion, ICU length of stay, renal dysfunction, neurological complication, myocardial infarction, supraventricular arrhythmia, and early mortality (in 30 days) were considered as the main variables. The demographic, mortality, morbidity, and resource utilization data of the patients were collected from the domestic database of the patients in our institution during the foregoing period.

For the analysis of the descriptive statistics and categorical variables, the Chi-square or Fisher exact test was used as appropriate. The level of statistical significance was set at a p-value <0.05. All the statistical analyses were performed with SPSS Software.

Results

In this study 132 out of the 2095 patients were elderly. The mortality rate was 9% in the elderly group and 2.8% in the non-elderly group.

The elderly patients had a significantly higher incidence of peripheral vascular disease, COPD, congestive heart ailure, and left main disease than did the non-elderly subjects. Moreover, by comparison with the younger group, the elderly patients weighed significantly less and had lower preoperative hematocrit. The clinical and demographic variables were correlated with age 75 years or older. Multivariate linear and logistic regression models were constructed to show the combined effects of age and comorbid conditions on the outcomes.

The results are summarized in Tables 1 to 6.

Table 1. Patients' preoperative characteristics

Variable	Elderly	Non-elderly
Mean age (y)	75±5	58±12
Gender		
Male	71(53.7%)	1155 (55.1%)
Female	61(46.3%)	940 (44.9%)
NYHA (1/2/3/4)	19/63/50/0	146/981/836/0
Diseased coronary artery	3±0.7	3±0.5
Associated condition	MR^{++}: 46	MR^{++}: 186
	MR^{+++}: 18	MR^{+++}: 377
	TR^{++}: 3	TR^{++}: 31
	TR^{+++}: 2	TR^{+++}: 9
EF > 50%	27(20.4%)	478(22.8%)
EF 30-50%	53(40.1%)	934(44.6%)
EF <30%	52(39.5%)	683(32.6%)

NYHA, New York heart association classification; EF, Ejection fraction

Table 2. Type of accomplished procedures

Procedure	Number
CABG alone	1623(77.4%)
MVR+CABG	48(2.29%)
MVr+CABG	309(14.7%)
MVR+TVr+CABG	14(0.66%)
MVr+TVr+CABG	22(1.05%)
Bentall+CABG	23(1.09%)
AVR+MVR+CABG	44(2.1%)
AVR+CABG	52(2.48%)

CABG, Coronary artery bypass grafting; MVR, Mitral valve replacement; MVr, Mitral valve repair; TVr, Tricuspid valve repair; AVR, Aortic valve replacement

Table 3. Associated procedures in elderly and non-elderly patients

Procedure	Elderly	Non-elderly
MVR	2(1.5%)	46(2.34%)
MVr	26(19.6%)	283(14.4%)
MVR + TVr	1(0.75%)	13(0.66%)
MVr + TVr	2(1.5%)	20(1.01%)
Bentall	4(3%)	19(0.96%)
AVR + MVR	5(3.7%)	39(1.98%)
AVR	7(5.3%)	45(2.29%)

MVR, Mitral valve replacement; MVr, Mitral valve repair; TVr, Tricuspid valve repair; AVR, Aortic valve replacement

Table 4. Preoperative variables in elderly and non-elderly patients

Variable	Elderly	Non-elderly	P value
Smoking	34(25.7%)	486(24.7%)	0.31
Systemic hypertension	72(54.5%)	950(48.3%)	0.23
Diabetes mellitus	40(30.3%)	556(28.3%)	0.26
Old myocardial infarction	19(14.3%)	204(10.3%)	0.07
Renal dysfunction	4(3%)	55(2.8%)	0.08
Left main disease	24(18.1%)	165(8.4%)	<0.01
Congestive heart failure	21(15.9%)	169(8.6%)	<0.01
Chronic obstructive pulmonary disease	25(18.9%)	235(11.9%)	0.03
Peripheral vascular disease	18(13.6%)	167(8.5%)	<0.01

Table 5. Postoperative variables in elderly and non-elderly patients

Variable	Elderly	Non-elderly	P value
Extubation time (h)	9.3	6.3	<0.01
Blood transfusion	87.8%	58.5%	<0.01
ICU length of stay (d)	2.1	1.4	<0.01
Postoperative length of stay (d)	6.8	3.4	<0.01
Renal dysfunction	24.4%	10.5%	<0.01
Neurological complication	9.8%	2.6%	<0.01
Myocardial infarction	6%	4.6%	0.08
Supraventricular arrhythmia	18.9%	15.9%	0.32
Early mortality (in 30 days)	9%	2.8%	<0.01

ICU, Intensive care unit

Table 6. Associated procedures with CABG

Procedure	elderly	non-elderly	P value
MVR	2(1.5%)	46(2.34%)	>0.05
MVr	26(19.6%)	283(14.4%)	>0.05
MVR+TVr	1(0.75%)	13(0.66%)	>0.05
MVr+TVr	2(1.5%)	20(1.01%)	>0.05
Bentall	4(3%)	19(0.9%)	<0.05
AVR+MVR	5(3.7%)	39(1.9%)	>0.05
AVR	7(5.3%)	45(2.29%)	>0.05

CABG, Coronary artery bypass grafting; MVR, Mitral valve replacement; MVr, Mitral valve repair; TVr, Tricuspid valve repair; AVR, Aortic valve replacement

Discussion

The last two decades have seen a rapid rise in the number of elderly patients candidated for CABG.[2] Diminished physiological reserve and increased comorbidity seem to be part and parcel of advanced age. The elderly comprise only 12% of the population of the United States of America, yet they account for over 40% of over-the-counter drug users and 30% of the health budget. Certainly, many other countries around the globe are no strangers to this scenario as the elderly are prone to a significantly higher incidence of peripheral vascular disease, COPD, congestive heart failure, and left main disease.[3]

The elderly patients recruited in the present study weighed significantly less and had lower preoperative hematocrit than did the younger group. As Table4 demonstrates, the respective extubation time in the elderly and non-elderly groups was 9.3 and 6.3 hours. In addition, 87.8% of the elderly, as opposed to 58.5% of the non-elderly persons, required blood transfusion. Whereas the elderly patients stayed in the ICU for 2.1 days, the younger patients spent an average of 1.4 days there. Hospital length of stay was 6.8 days for the elderly patients compared to 3.4 days for the non-elderly ones. Renal dysfunction was observed in 24.4% and 10.5% of the elderly and non-elderly groups, respectively. From the total study population, 9.8% of the elderly and 2.6% of the non-elderly patients developed neurological complications during their course of admission. Early in-hospital mortality was seen in 9% of the elderly, while it was observed in only 2.8% of the non-elderly subjects. Statistical analysis also showed a meaningful difference between these variables, which was discussed above.The results of the present study demonstrated that in the elderly patients, the mean time from the end of surgery to endotracheal extubation, need to blood transfusion, mean ICU length of stay, mean postoperative length of stay, postoperative renal failure, and neurological complications were clearly higher than those in the non-elderly group. Furthermore, early hospital mortality rate was significantly higher in the elderly group.

The most salient limitation of the present study is its retrospective design; further prospective multicenter studies are, therefore, required to shed more light on this particular topic in the future.

Conclusion

In conclusion, age 75 years or older was significantly associated with an adverse outcome and was an independent predictor of increased postoperative mortality and morbidity after CABG. Given the higher morbidity and mortality rates among the elderly, it seems advisable that non-surgical procedures or less invasive ones such as off-pump CABG be considered for this age group in fragile health. Opting for surgery in this age group should not be made liberally, and the overall condition of this group of patients should be balanced with indications for surgery, which are noted in academic textbooks.

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