

Is the risk of isolated coronary artery bypass graft surgery in women aged above 75 years higher compared to men?

Yetmiş beş yaş üstü kadınlarda izole koroner arteriy baypas greft cerrahisi riski erkeklere göre gerçekten yüksek midir?

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Background: This study aims to investigate the possible differences of male and female patients aged above 75 years undergoing isolated coronary artery bypass graft surgery (CABG) and to define the risk factors.

Methods: Between January 2004 and January 2012, a total of 174 isolated on-pump CABG patients (121 males, 53 females; mean age 77.1 years; range 75 to 97 years) using cardiopulmonary bypass were retrospectively analyzed. The patients were divided into two groups according to their sex: Group 1 consisted of male patients, while group 2 consisted of female patients. Preoperative risk factors, intraoperative and postoperative data and early mortality rates of both groups were compared.

Results: The incidence of diabetes mellitus and EuroSCORE values were higher in females, while smoking rates were higher in males ($p=0.012$; $p<0.01$; $p<0.01$, respectively). The number of graft per patient and mediastinal drainage volume were higher in males, whereas the length of intensive care unit stay was longer in females ($p=0.039$; $p=0.041$; $p<0.01$, respectively). The left internal mammary artery graft utilization, need for inotropic support, intra-aortic balloon pump support, neurological complications, the incidence of atrial fibrillation and length of hospital stay were similar in both groups. There was no significant difference in the mortality rates between the groups [group 1, 1.7% ($n=2$); group 2, 3.8% ($n=2$)].

Conclusion: Although women aged above 75 years may have a higher incidence of diabetes mellitus, EuroSCORE values and length of intensive care unit stay compared to age-matched men, CABG operations can be done with similar mortality rates.

Keywords: Coronary artery bypass grafting; elderly; morbidity; mortality; sex.

Amaç: Bu çalışmada izole koroner arter baypas greft (KABG) cerrahisi yapılan 75 yaş üzeri kadın ve erkek hastalardaki muhtemel farklılıklar araştırıldı ve risk faktörleri belirlendi.

Çalışma planı: Ocak 2004 - Ocak 2012 tarihleri arasında kardiyopulmoner baypas ile izole koroner baypas greft (KABG) cerrahisi uygulanmış olan toplam 174 hasta (121 erkek, 53 kadın; ort. yaş 77.1 yıl; dağılım 75-97 yıl) retrospektif olarak incelendi. Hastalar cinsiyetlerine göre iki gruba ayrıldı: Grup 1 erkek hastalardan, grup 2 ise kadın hastalardan oluşuyordu. Her iki grubun ameliyat öncesi risk faktörleri, ameliyat sırası ve sonrası verileri ve erken dönem mortalite oranları karşılaştırıldı.

Bulgular: Diyabetes mellitus insidansı ve EuroSCORE değerleri kadınlarda daha yüksek iken, sigara içme oranı erkeklerde daha yüksek idi (sırasıyla $p=0.012$; $p<0.01$; $p<0.01$). Hasta başına düşen greft sayısı ve mediastinal drenaj hacmi erkeklerde daha yüksek iken, yoğun bakımda kalış süresi kadınlarda daha uzundu (sırasıyla, $p=0.039$; $p=0.041$; $p<0.01$). Sol internal mammaryan arter greft kullanımı, inotropik ilaç gereksinimi, intraaortik balon pompası desteği, nörolojik komplikasyonlar, atriyal fibrilasyon insidansı ve hastanede kalış süresi iki grupta da benzerdi. Grupların mortalite oranları arasında anlamlı bir fark bulunmadı [grup 1, 1.7% ($n=2$); grup 2, 3.8% ($n=2$)].

Sonuç: Yetmiş beş yaş üzeri kadın hastalarda, aynı yaş grubu erkeklere kıyasla, diyabetes mellitus insidansı, EuroSCORE değeri ve yoğun bakım ünitesinde kalış süresi daha yüksek olmasına rağmen, KABG cerrahisi benzer mortalite oranları ile yapılabilmektedir.

Anahtar sözcükler: Koroner arter baypas greftleme; yaşlı; morbidite; mortalite; cinsiyet.



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Coronary artery disease (CAD) ranks high as a mortality etiology in developed countries^[1] with an incidence rate of 33% in those aged 40 and older. In those who are at least 70 years old, this rate climbs to 76%.^[2,3] In addition, the growth in the number of older people in the general population, increased safety of coronary artery bypass graft (CABG) surgery, rise in the prevalence of CAD prevalence, and higher mortality rates after myocardial infarction (MI) have caused a surge in the frequency of CABG procedures in the patients aged 75 and older.^[4,5]

In the literature, various reasons have been put forth to explain why women have higher complication and mortality rates after CABG surgery than men, including smaller vessel diameters, later onset of CAD, more comorbidities, an increased rate of diabetes mellitus (DM), and a higher frequency of diastolic dysfunction.^[6,7] In this retrospective study, we aimed to determine the effect that gender has on the outcome after isolated CABG surgery in patients aged above 75 years by evaluating the early results in our clinic.

PATIENTS AND METHODS

The clinical data of a total of 174 patients (121 males, 53 females; mean age 77.1 years; range 75 to 97 years) aged above 75 years who underwent an isolated CABG procedure between January 2004 and January 2012 was investigated retrospectively. Those who had off-pump CABG surgery or a redo CABG operation were excluded from the study along with any patient who underwent surgery for a left ventricle aneurysm or who had a combined valve and CABG operation, or aortic surgery were also not included. The patients were grouped according to gender with group 1 containing the males and group 2 the females. Comparisons between the two groups were made regarding the following: the incidence of DM, hypertension (HT), and chronic obstructive pulmonary disease (COPD), low-density lipoprotein (LDL) levels, number of smokers, preoperative ejection fraction (EF), perioperative blood product infusion amount, intensive care unit (ICU) stay, aortic cross-clamp and cardiopulmonary bypass (CPB) duration, the need for inotropic support for CPB weaning, the need for intra-aortic balloon pump (IABP) support and insertion duration, if applicable, mediastinal drainage volume, the incidence of atrial fibrillation (AF), wound site infection rates, postoperative exploratory surgery, if needed, for any purpose, ventilator support duration, postoperative neurological complications, and mortality rates.

Surgical technique

After monitoring the cardiac rhythm and invasive blood pressure, general anesthesia was administered. A median sternotomy was then performed. Next, CPB was established via ascending aorta and right atrial cannulation with a two-stage venous cannula and the administration of intravenous heparin to ensure the proper amount of anticoagulation. The patient's body temperature was sustained at a level of mild hypothermia (a nasopharyngeal body temperature of approximately 32 °C), and the CPB flow rate of 2.4 lt/min/m² along with a blood pressure of over 60 mmHg was maintained. After aortic cross-clamping, an antegrade cardioplegic solution was administered through the needle in the aortic root, and an additional 250 ml of this solution was infused through the grafts after the completion of every distal anastomosis. Then a left internal mammary artery (LIMA) graft was anastomosed to the left anterior descending artery (LAD). In addition, a saphenous vein graft was used to bypass the lesions in the other coronary arteries.

Statistical analysis

The statistical analyses were done with the SPSS for Windows version 13.0 software program (SPSS Inc., Chicago, Illinois, USA). The Kolmogorov-Smirnov test was used to evaluate the distribution pattern of the continuous variables while the Mann-Whitney U and Wilcoxon tests were used to compare the groups. A chi-square test was also used to compare the categorical variables. A *p* value of <0.05 was considered to be statistically significant.

RESULTS

In our elderly participants, we found that DM (*p*=0.012) the European System for Cardiac Operative Risk Evaluation (euroSCORE) value (*p*<0.01, and ICU stay (*p*<0.01) were higher in group 2 (the females), whereas the number of smokers (*p*<0.01), graft count per patient (*p*=0.039), and mediastinal drainage volumes (*p*=0.041) were higher in group 1 (the males). However, there was no significant difference in the mortality rates between the two groups, although it was slightly higher in group 2 (*p*=0.757).

Table 1 displays the demographic data and perioperative risk factors of the two groups and shows that the average age of the groups was similar (*p*=0.960).

Table 2 shows the perioperative and postoperative characteristics of the group, and we identified similar results in the following categories: (i) aortic

Table 1. Demographic data and perioperative risk factors for the two groups

	Group 1 (n=121)				Group 2 (n=53)				p
	n	%	Median	Min.-max.	n	%	Median	Min.-max.	
Age			77	75-89			76	75-97	0.960
Low-density lipoprotein (mg/dl)			105	50-199			104	50-195	0.843
Ejection fraction			50	25-79			50	31-68	0.641
euroSCORE			5	4-9			6	5-9	<0.01
Diabetes mellitus	30	24.8			24	45.3			0.012
Hypertension	74	61.2			27	50.9			0.276
Chronic obstructive pulmonary disease	15	12.4			7	13.2			1.000
Number of smokers	90	74.4			12	22.6			<0.01
Have relatives with ACAD	27	22.3			11	20.8			0.976
Single-vessel disease	15	12.4			12	22.6			0.136
Double-vessel disease	36	29.8			16	30.2			1.000
Triple-vessel disease	68	56.2			25	47.2			0.350
Left main coronary artery disease	7	5.8			3	5.7			1.000

Min.: Minimum; Max.: Maximum; euroSCORE: European System for Cardiac Operative Risk Evaluation; ACAD: Atherosclerotic coronary artery disease.

cross-clamp times, (ii) CPB duration, (iii) postoperative extubation times, (iv) LIMA graft utilization, (v) the need for inotropic agents, (vi) blood product transfusion amounts, (vii) the need for postoperative revisional surgery, (viii) IABP utilization, and (ix) in-hospital stay duration. In addition, the postoperative neurological complication distribution of groups 1 and 2 was as follows: stroke 2.5% and 3.8%, delirium 6.6% and 13.2%, and sleep disorders 14.9% and 15.1%, respectively, and p values of 1.000, 0.257, and 1.000 for the three complications, respectively.

Table 3 presents the postoperative morbidity data of the two groups. The incidence of AF was 14.9% in group 1 and 22.6% in group 2 (p=0.303). Furthermore, we found that surgical wound site infection was more

common in the females (13.2%) than the males (4.1%), but this did not occur at a statistically significant level (p=0.064) (Table 3).

DISCUSSION

In developed countries, the number of older people in the general population increases as life expectancy rates increase, which has led to a corresponding rise in the incidence of cardiovascular disease and number of cardiovascular surgery candidates.^[8] The difference in the male and female patient outcomes for those who undergo CABG surgery has been a matter for debate over the last few decades.^[8] Hence, many studies have been conducted regarding the connection between gender and mortality and morbidity rates after this

Table 2. Perioperative and postoperative data of the two groups

	Group 1 (n=121)				Group 2 (n=53)				p
	n	%	Median	Min.-max.	n	%	Median	Min.-max.	
Graft count			3	1-5			2	1-4	0.039
Cross-clamp duration (minutes)			34	16-73			31	7-57	0.232
CPB duration (minutes)			69	11-155			67	15-175	0.878
Extubation time (hours)			6	3-12			7	3-16	0.555
Drainage (ml)			400	150-1700			350	150-1750	0.041
Blood transfusion (U)			2	0-5			2	0-6	0.355
Intensive care unit stay (days)			1	1-15			2	1-3	<0.01
In-hospital stay (days)			5	4-20			5	4-14	0.067
Left internal mammary artery	96	79.3			37	69.8			0.242
Inotropic agent necessity	63	52.1			34	64.2			0.190
Revisional surgery	4	3.3			2	3.8			1.000
Intra-aortic balloon pump	3	2.5			2	3.8			1.000
Exitus	2	1.7			2	3.8			0.757

Min.: Minimum; Max.: Maximum; CPB: Cardiopulmonary bypass.

Table 3. Postoperative morbidity data of the two groups

	Group 1 (n=121)		Group 2 (n=53)		p
	n	%	n	%	
Sleep disorders	18	14.9	8	15.1	1.000
Delirium	8	6.6	7	13.2	0.257
Stroke	3	2.5	2	3.8	1.000
Atrial fibrillation	18	14.9	12	22.6	0.303
Superficial wound site infection	5	4.1	7	13.2	0.064
Deep wound site infection	0		0		
Sternal dehiscence	0		0		

type of surgery. Some of these results have shown that gender has some impact on the mortality risk and benefits after CABG surgery,^[6,7] but there is a common sense among the clinicians that females have a higher mortality risk while receiving lower benefits after the surgery. In addition, the preoperative EuroSCORE values, incidence of DM and length of ICU stays were higher for the female patients in our study, which is similar to previous data that has been reported in the literature.^[6,7]

Operative risk scoring systems help to determine or evaluate the operative mortality and morbidity rates according to the patients' known risk factors.^[9] Findik et al.^[10] evaluated the most widely used risk scoring systems [EuroSCORE, Cleveland Clinic, and CABDEAL (creatinine, age, body mass index, diabetes, emergency surgery, abnormality on ECG, lung disease)] in study comprised of 501 CABG patients and reported that the EuroSCORE was the most suitable system to determine the mortality rates for the Turkish population. Hence, we also chose to use this system in our study.

Some clinicians hesitate to refer female patients for CABG surgery while others resolutely refuse to do this.^[11,12] This delayed referral can cause disease progression, an increase in operative risks, a decrease in long-term benefits, and a higher number of comorbidities.^[8] Therefore, it is important to establish a consensus regarding when to refer female patients for CABG surgery. Furthermore, a careful physical examination and detailed anamnesis along with biochemical and radiological examinations and tests may help to determine the physiological reserves of the patients and determine the optimal conditions for the operation.^[13]

King et al.^[14] suggested that the recovery level after CABG surgery may be related to the social roles of males and females in the community. Similarly, Vaccarino et al.^[15] reported that female patients may feel more psychological and emotional pressure because of

the responsibilities they bear in the family. They also stated that this could cause a delay in reestablishing the preoperative social role of the female patient after surgery.

Samalavicius et al.^[16] found no significant differences in the incidence of stroke between male and female patients, although the rate was quite high for the women. In correlation with the literature, we found higher rates of cognitive function disorder and stroke in the females in our study, but these were not statistically significant ($p=0.242$).

Using LIMA grafts lowers the mortality rates in both male and female patients.^[12,17] Some studies have documented that LIMA graft usage is less frequent in females. In addition, there seems to be a relatively high correlation between this type of graft and postoperative angina.^[8] Our findings indicated a high rate of LIMA graft usage in group 1, but the difference between the two groups was not statistically significant ($p=0.242$).

Smoking is a common health problem Turkey as it is in many countries. In addition, a study by Göksedef et al.^[18] also indicated that it is primarily a male habit, and our findings agreed with theirs.

A controversy exists regarding the mortality rates of females after CABG surgery. Some studies have found no differences,^[19,20] but others have concluded that there are dissimilarities.^[21-24] We hope that our results will provide some clarity to this issue as we found no statistically significant differences in the early mortality rates of the males and females in our study, though the rates were slightly higher for the women. It is interesting that the study by Kaya et al.,^[25] which was comprised of 230 patients (189 males and 41 females), found no differences in the mortality rates between the genders in the patients under the age of 45. In addition, they also reported similar mortality rates between all of the males and females in their study. Furthermore, they determined that the smoking rates and graft count per patient were higher

in the male group in their study, which is parallel to our findings. However, DM was more common in our elderly female patients than theirs. Moreover, the same authors reported that postoperative AF was more prevalent in their female patient group, but we think that might have been due to the concomitant mitral valve interventions that were performed. Our study group differed in that it was made up solely of isolated CABG patients.

One possible limitation of our study is that it was retrospective in nature; therefore, more studies featuring long-term results are needed to provide additional valuable data on this topic.

Conclusion

The frequency of the commonly known risk factors associated with coronary heart disease increases as patients get older and can also fluctuate according to the gender and lifestyle of the patients. It is also possible that the patient's geographic location might have an influence. As a result, the postoperative mortality and morbidity rates vary for each patient, but operative risk scoring systems may help to get a more objective profile of the patients before surgery. Moreover, although the risk factors and comorbidities differ between males and females, the mortality rate for patients aged 75 and older who undergo CABG surgery did not vary according to gender in our study. While female patients in that age group may cost health care centers more money since it is likely that they will have longer ICU stays than men, clinicians should not hesitate to refer them at the same rate as male patients for CABG surgery since they have the same postoperative mortality rate.

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