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ORIGINAL ARTICLE

Open Heart Surgery In Octogenarian Patients: A Comparison Of Two Eras

Seksen Yaş ve Üzeri Hastalarda Açık Kalp Cerrahisi: İki Farklı Dönemin Karşılaştırılması

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ABSTRACT

Aim: In this study, it was aimed to compare two different periods in terms of surgical results in octogenarian patients who underwent open heart surgery.
Material and Method: In the present study, 218 patients aged 80 and over who had undergone open heart surgery in our clinic between January 2013 and December 2020 (group 1:115 patients) and between January 2000 and December 2007 (group 2:103 patients) were included and divided into two groups. The study was designed retrospectively, and the operative and postoperative data were statistically compared between the two groups.
Results: There was no significant difference between groups in terms of mean age and gender distribution (p>0.05). Coronary artery bypass graft-beating heart prevalence in Group 2 (24.5%) was significantly higher than that in Group 1 (7.9%) (p:0.002; p<0.05). Aorta valve replacement rate in Group 1 (53.9%) was significantly higher than that in Group 2 (10.7%) (p:0.000; p<0.05). Mitral repair rate in Group 1 (7.1%) was significantly higher than that in Group 2 (1%) (p:0.037; p<0.05). The mean preop ejection fraction level of Group 1 was significantly higher than that in Group 2 (p:0.000; p<0.05). Left internal mammary artery prevalence in Group 2 (68%) was significantly higher than that in Group 1 (29.8%) (p:0.000; p<0.05). There was no statistically significant difference between groups in terms of bleeding revision, postoperative cerebrovascular event, and mortality. The most common cause of mortality was cardiac in origin.
Conclusion: Open heart surgery in octogenarian patients has high mortality and acceptable morbidity rates. With the increase in clinical experience and the development of repair and minimally invasive techniques, lower mortality rates can be achieved with the right patient selection and an appropriate surgical approach in the presence of comorbidities.

Keywords: Octogenarian, coronary bypass, aortic valve replacement, mitral valve replacement, aortic aneurysm

ÖZ

Amaç: Çalışmada, açık kalp cerrahisi geçiren seksen yaş ve üzeri hastalarda, ameliyat sonuçları açısından iki farklı dönemin karşılaştırılması amaçlandı.
Materyal ve Metod: Kliniğimizde Ocak 2013 - Aralık 2020 yılları (grup 1:115 hasta) ile Ocak 2000 - Aralık 2007 yılları (grup 2:103 hasta) arasında açık kalp cerrahisi geçirmiş 80 yaş ve üstü 218 hasta çalışmaya dahil edilmiş ve iki gruba ayrılmıştır. Çalışma retrospektif tasarlanmış olup, iki grup arası intraoperatif ve postoperatif veriler istatistiksel olarak karşılaştırılmıştır.
Bulgular: Gruplar arasında yaş ortalamaları ve cinsiyet dağılımları açısından istatistiksel olarak anlamlı bir farklılık bulunmamaktadır (p>0.05). Grup 2'de CABG-BH oranı (%24.5), Grup 1'den (%7.9) istatistiksel olarak anlamlı düzeyde yüksektir (p:0.002; p<0.05). Grup 1'de AVR oranı (%53.9), Grup 2'den (%10.7) istatistiksel olarak anlamlı düzeyde yüksektir (p:0.000; p<0.05). Grup 1'de mitral tamir oranı (%7.1), Grup 2'den (%1) istatistiksel olarak anlamlı düzeyde yüksektir (p:0.037; p<0.05). Grup 1'in preop ejeksiyon fraksiyonu (EF) düzeyi ortalaması, Grup 2'den istatistiksel olarak anlamlı düzeyde yüksektir (p:0.000; p<0.05). Grup 2'de lima oranı (%68), Grup 1'den (%29.8) istatistiksel olarak anlamlı düzeyde yüksektir (p:0.000; p<0.05). Kanama revizyonu, postoperatif serebrovaskuler olay ve mortalite açısından gruplararası istatistiksel anlamlı fark bulunmamıştır. En sık mortalite nedeni kardiyak nedenlerdir.
Sonuç: Seksen yaş ve üzeri hastalarda açık kalp cerrahisi, yüksek mortalite ve kabul edilebilir morbidite oranlarına sahiptir. Klinik deneyimin artması, tamir ve minimal invaziv tekniklerin gelişmesiyle birlikte, doğru hasta seçimi ve eşlik eden ek hastalıkların varlığında seçilecek uygun cerrahi yaklaşım ile daha düşük mortalite oranları sağlanabilir.

Anahtar Kelimeler: seksen yaş ve üzeri, koroner arter bypass greftleme, aortik kapak replasmanı, mitral kapak replasmanı, aort anevrizması

Introduction

Cardiovascular diseases are quite common in the population aged 80 years and over (1). Despite intensive medical treatment, most of these patients remain symptomatic (2). With the increased average life expectancy, the rate of octogenarian patients to be candidates for cardiac surgery is increasing (3). There are studies indicating increased mortality and long hospital stay after cardiac surgery in this patient group. In addition to the developments in the knowledge and experience in open heart surgery, the increase in post-surgical intensive care experience contributes to positive postoperative results (4-6). Cardiac surgical mortality has been reported in recent years with rates close to those of younger patients (7). In this study, it was aimed to evaluate the operative data of two different periods in patients over 80 years of age who underwent cardiac surgery. In addition, it was aimed to compare mortality and morbidity rates and to compare our results with recent studies.

Material and method

After obtaining approval from the hospital's retrospective clinical studies ethics committee (approval code: 2021/14/539), the hospital file archive and electronic database were scanned. A total of 218 patients aged 80 years and older who underwent surgery between January 2013 and December 2020 and between January 2000 and December 2007 were included in the study. The patients were divided into two groups for two periods of eight years. One hundred and fifteen (52.8%) patients who were operated between 2013 and 2020 were defined as "Group 1". One hundred and three (47.2%) patients who were operated between 2000 and 2007 were defined as "Group 2". Demographic characteristics and preoperative and postoperative parameters of the patients were recorded (Table 1). The total number of open-heart surgeries performed during these periods was 13816 for group 1 and 12037 for group 2.

Statistical analysis

In the evaluation of the findings obtained in the study, IBM SPSS Statistics 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) program was used for statistical analysis. The suitability of the parameters to the normal distribution was evaluated by the Kolmogorov-Smirnov and Shapiro Wilks tests. Descriptive statistics are presented for the baseline characteristics of patients in the study. Means and SDs are presented for normal data, medians and interquartile ranges (IQR) for non-normal data, and proportions for categorical data. In the comparison of the quantitative data, Student's t-test was used for comparisons of normally distributed parameters between two groups. Mann Whitney U test was used for the comparisons between two groups of non-normally distributed parameters. The Chi-Square test, Fisher's Exact Chi-Square test, Yates Continuity Correction, and Fisher Freeman Halton Exact test were used to analyze the qualitative data. Any p value less than 0.05 was considered as significant.

Results

The study was conducted on a total of 218 patients: 121 (55.5%) men and 97 (44.5%) women, in an age range of 80 to 92 years. The mean age was 81.43±2.43 years. There was no statistically significant difference between groups in terms of mean age and gender distribution (p>0.05). The mean age was 81.56±2.48 years in Group 1 and 81.29±2.39 years in Group 2.

Coronary artery bypass graft-beating heart (CABG-BH) prevalence in Group 2 (24.5%) was statistically higher than that of Group 1 (7.9%) (p:0.002; p<0.05). Aortic valve replacement (AVR) rate in Group 1 (53.9%) was statistically higher than that of Group 2 (10.7%) (p:0.000; p<0.05). Mitral repair rate in Group 1 (7.1%) was statistically higher than that of Group 2 (1%) (p:0.037; p<0.05). CABG+AVR rate in Group 1 (28.1%) was statistically higher than that of Group 2 (5.8%) (p:0.000; p<0.05). The mean preoperative ejection fraction (EF) level of Group 1 was statistically higher than that in Group 2 (p:0.000; p<0.05) (Table 2). Left internal mammary artery (LIMA) rate in Group 2 (68%) was statistically higher than that of Group 1 (29.8%) (p:0.000; p<0.05).

There was no statistically significant difference between groups in terms of other surgery types (p>0.05) (Table 3). There was no statistically significant difference between groups in terms of bleeding revision, postoperative cerebrovascular event (CVE), and mortality (Table 4). Cardiac factors were the most common cause of mortality in both groups.

Table 1: Comparison of preoperative parameters

	Group 1 n=115	%	Group 2 n=103	%	Total n=218	%	P
NYHA Class							
Class 1	2	1.7	0	0	2	0.9	[2]0.060
Class 2	85	73.9	63	61.2	148	67.9	
Class 3	25	21.7	37	35.9	62	28.4	
Class 4	3	2.6	3	2.9	6	2.8	
Emergency							
Elective	97	84.3	100	97.1	197	90.4	[3]0.003*
Emergent	18	15.7	3	2.9	21	9.6	
Hypertension	76	66.1	29	28.2	105	48.2	[4]0.000*
Renal Insufficiency	6	5.2	14	13.6	20	9.2	[3]0.057
COPD*	26	22.6	26	2525	52	23.9	[4]0.649
Diabetes	34	29.6	22	21.4	56	25.7	[4]0.166
Perioperative MI**	5	4.3	8	7.8	13	6.0	[3]0.437

*1Mann Whitney U Test, 2Fisher Freeman Halton Exact Test, 3Yates continuity correction, 4Chi-square test, *p<0.05*
**Chronic obstructive pulmonary disease*
*** Perioperative myocardial infarction*

Table 2: Comparison of preoperative parameters

	Group 1		Group 2		Total	
	Mean±SD (median)	**n**	**Mean±SD (median)**	**n**	**Mean±SD (median)**	**[1]p**
Pre-op Ejection Fraction	57,41±9,44 (60)	103	48,88±12,1 (50)	217	53,36±11,57 (55)	0,000*
Pre-op LVESD*	3,23±0,55 (3,2)	64	3,58±0,99 (3,5)	96	3,46±0,88 (3,4)	0,014*
Pre-op LVEDD**	4,95±0,42 (4,9)	63	5,04±0,96 (5)	95	5,01±0,82 (4,9)	0,297
PAP***	38,7±10,93 (35)	52	35,94±17,87 (40)	138	37,66±13,96 (40)	0,725
EuroSCORE	7,32±8,29 (2,8)	0	8,14±10,27 (5,9)	109	7,76±9.30 (4,5)	0,285

* Left Ventricular End-Sistolik Diameter
**Left Ventricular End-Diastolik Diameter
***Pulmonary Artery Pressure

Table 3: Evaluation of groups in terms of operation types

	Group 1	Group 2	Total	
	n (%)	n (%)	n (%)	p
CABG-BH	9 (%7,9)	25 (%24,5)	34 (%15,7)	[1]0,002*
CABG-on pump	45 (%39,5)	47 (%45,6)	92 (%42,4)	[2]0,359
AVR	62 (%53,9)	11 (%10,7)	73 (%33,5)	[1]0,000*
AVR+MVR	2 (%1,8)	2 (%1,9)	4 (%1,9)	[3]1,000
Mitral Repair	8 (%7,1)	1 (%1)	9 (%4,2)	[3]0,037*
MVR	7 (%6,1)	1 (%1)	8 (%3,7)	[3]0,068
CABG+AVR	32 (%28,1)	6 (%5,8)	38 (%17,5)	[1]0,000*
CABG+MVR	5 (%4,4)	4 (%3,9)	9 (%4,2)	[3]1,000
CABG+Mitral Repair	3 (%2,6)	2 (%1,9)	5 (%2,3)	[3]1,000
CABG+Carotid Endarterectomy	2 (%1,8)	3 (%2,9)	5 (%2,3)	[3]0,670
Ascending Aorta Separating Graft İmplantation	4 (%3,5)	(%0)	4 (%3,5)	-

1Yates continuity correction, 2Chi-square test, 3Fisher's Exact test *p<0.05

Table 4: Comparison of postoperative parameters

	Group 1		Group 2		Total		
	n	%	n	%	n	%	p
Bleeding revision							
Yes	4	3,5	3	2,9	7	3,2	[1]1,000
No	111	96,5	100	97,1	211	96,8	
Late MI							
Yes	19	22,1	-	-	19	22,1	-
No	67	77,9	-	-	67	77,9	
Atrial Fibrilation							
Yes	17	14,9	-	-	17	14,9	-
No	97	85,1	-	-	97	85,1	
Postoperative cerebrovascular disease							
Yes	4	4,9	6	5,8	10	5,4	[1]1,000
No	78	95,1	97	94,2	175	94,6	
Mortality							
Yes	22	19,1	24	23,3	46	21,1	[2]0,451
No	93	80,0	79	76,7	172	78,9	
Cause of Mortality							
Lung infection	0	0	1	4,2	1	2,2	[3]0,213
Arrhythmia	1	4,5	0	0	1	2,2	
Cardiac event	13	59,1	19	79,2	32	69,6	
Cardiopulmonary event	2	9,1	0	0	2	4,3	
Neurological event	1	4,5	1	4,2	2	4,3	
Pulmonary event	5	22,7	2	8,3	7	15,2	
Sepsis	0	0	1	4,2	1	2,2	
İntraaortic **Balloon Pump**							
Yes	13	11,3	13	100	26	20,3	[1]0,000*
No	102	88,7	0	0	102	79,7	
Postoperative Rhythm							
AF	3	2,6	13	46,4	16	11,2	[3]0,000*
Complete Av Block	1	0,9	2	7,1	3	2,1	
Normal Sinus Rhythm	79	68,7	0	0	79	55,2	
PACE	12	10,4	0	0	12	8,4	
SR+LBBB	1	0,0	0	0	1	0,7	

1Fisher's Exact Test, 2Chi-square test, 3Fisher Freeman Halton Exact Test, *p<0.05

Discussion

In developed countries, life expectancy is increasing, and it was reported that the elderly population has been increasing proportionally (8). According to 2020 data in Turkey, the elderly population increased by 22.5% in the previous five years. According to 2020 data, Turkey ranked 66th in 167 countries in terms of elderly population (9). As the elderly population increases, the incidence of cardiovascular disease increases, and thus, probability of undergoing cardiovascular surgery will increase (10). With the development of cardiac invasive interventions and treatments, the fact that patients who had myocardial infarction before the age of 80 could reach over the age of 80 caused an increase in the elderly population (11). Therefore, considering the increase in the number of cardiac surgery centers and the elderly population in Turkey, it is expected that cardiac surgeons will be treating this patient group more frequently.

When the literature was examined in terms of hospital mortality in patients aged 80 years and over, Kohl et al. (12) reported 11% and Kirsch et al. (13) reported 16.2%. Although there was no statistical difference between the periods in our study, it was found as 19.1% in group 1 and 23.3% in group 2. There are studies in the literature showing the relationship between EuroSCORE and prognosis (14). In our study, the mean EuroSCORE was 7.32 in group 1 and 8.14 in group 2. We think that this and similar assessment outcomes are useful in determining the risk of surgery.

Biological aging may differ in patients. Therefore, surgical approach and medical treatment should be tailored to the patient (15). It should be noted that chronological age and physiological age may not always be parallel and this factor should be taken into account when making the surgical decision (16). In the literature, severe decrease in functional capacity (New York Heart Association class IV) has been reported as a factor increasing early mortality (12). Therefore, in the patient group aged 80 and over, surgery should be decided before functional capacity reaches NYHA class IV (15). In our study, the mortality rate in Class 2 (14.2%) was significantly lower than those of Class 3 (37.8%) and Class 4 (33.3%).

It was reported that the decrease in left ventricular functions in patients aged 80 and over increased mortality in all patients who underwent open heart surgery (16). Therefore, patients aged 80 years and older should be referred for surgery before left ventricular function impairment occurs. In the presence of left ventricular dysfunction, intraoperative combined (antegrade and retrograde) cardioplegia is recommended (17). In our study group, when cardiopulmonary bypass was used in patients with left ventricular dysfunction, combined myocardial protection was preferred.

In the literature, it was reported that mitral valve surgery in patients aged 80 years and over progressed with increased mortality and prolonged intensive care stay (18). If mitral valve surgery is to be performed in these patients, the importance of avoiding complex

cardiac interventions in order to keep the time of cross-clamp and cardiopulmonary bypass short, in addition to the good general condition of the patients, is emphasized (13). In our previous study, we found high mortality rates in isolated or combined mitral valve interventions with ischemic heart disease, and this is consistent with the literature (19). In this study, the statistical findings between periods were similar. In the surgical treatment of mitral regurgitation, it is known that the short and long-term results of valve repair are better than replacement (20). In our study, an increase in mitral repair was observed in recent years when an intergroup evaluation was made. Due to the deterioration of tissue quality and excess calcification, the patient to be repaired should be selected correctly and long operation periods should be avoided if combined surgery is to be performed.

If coronary bypass is to be performed in octogenarian patients, there are studies recommending off-pump coronary bypass in order to minimize the cardiopulmonary bypass time (21). In a meta-analysis comparing on-pump and off-pump coronary bypass in octogenarian patients, off-pump coronary bypass is recommended more than on-pump coronary bypass due to low hospital mortality and reduced stroke and shorter hospital stay (22). However, especially with the increase in interventional cardiological approaches, the octogenarian patient group to be performed off-pump may have decreased. We think that the decrease in the number of patients who underwent off-pump in group 1 in our study may be related to this.

Culliford et al. (23) reported mortality after isolated aortic valve replacement as 5.7% and as 19.4% in cases combined with coronary bypass. In our study, there was no statistically significant difference between groups in mortality rates according to the presence of AVR. Statistically three times higher mortality rates were found in patients who underwent coronary bypass with combined AVR than in patients who underwent isolated AVR. Aortic valve replacement (AVR) rate in Group 1 (53.9%) was statistically higher than Group 2. We think that the reason for this is the technological developments in recent years. The development of interventional methods may have reduced the rate of AVR, especially in elderly patients.

There was no statistically significant difference between groups in terms of postoperative complications. However, there are studies reporting that neurological complications, prolonged intensive care unit stay, and renal failure requiring dialysis are approximately three times higher in this patient group compared to the younger population (24). Therefore, a multidisciplinary approach is important. The close relationship between clinical results and patient condition should be noted.

Life expectancy in women is significantly longer than men (13). In some studies in the literature, female gender has been reported as a risk factor increasing mortality for the application of AVR or combined procedures (25,26). Narrow aortic root, narrower coronary artery diameter than men, and a more fragile tissue structure can be considered as risk factors (19). In our study, there was no statistically significant difference between mortality rates in terms of gender.

In conclusion, mortality and morbidity in the patient group aged 80 and over were associated with multiple factors. Considering that physiological functions will decrease with increased age, the operation should not be delayed. It is clear that this patient group will present to hospitals more frequently with the increase in the average life expectancy. For this reason, clinical condition and patient-specific comorbid factors should be decisive instead of age in patient selection. Cardiac surgical interventions in patients aged 80 and over can be performed with acceptable morbidity rates, despite high mortality rates.

Limitations

Our study was designed retrospectively. The surgery decision was made according to the clinical conditions and comorbid diseases of the patients, but the frailty index was not calculated. There is a temporal interruption between the two groups due to the inability to access patient data. For this reason, two homogeneous periods were created.

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