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Original Article

Risk Factors for Prolonged Intensive Care Unit Stay After Open Heart Surgery in Adults

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Abstract

Objective: Prolonged intensive care unit (ICU) stay prevents the use of ICU equipment by other patients and increases hospital cost. This retrospective study aimed to investigate the risk factors for prolonged ICU stay in patients undergoing open heart surgery.

Methods: The medical records of 513 patients who underwent coronary artery bypass grafting and valvular heart surgery were retrospectively evaluated. Patients were divided into two groups based on their ICU stay: groups I (<48 h) and II (≥48 h). The effect of patient variables on the ICU stay duration was investigated using logistic regression analysis.

Results: The mean age of the patients was 61.5±10 years, and 69% were males. The ICU stay of ≥48 h was observed in 20.1% of the patients. Diabetes mellitus and low ejection fraction (pre-operative variables); long aortic cross clamp, cardiopulmonary bypass time and intra-aortic balloon pump requirement (intra-operative variables); arrhythmia, myocardial infarction, renal dysfunction and need for haemodialysis, use of ≥2 inotropic agents, infection, sepsis and respiratory complication (post-operative variables) were found to prolong the ICU stay. In multivariate logistic regression analysis, intra-aortic balloon pump requirement, use of ≥2 inotropic agents, post-operative myocardial infarction and need for haemodialysis were found to be independent risk factors for prolonged ICU stay ($p<0.05$). Early mortality was 0.97% (5 patients).

Conclusion: Intra-aortic balloon pump requirement, use of ≥2 inotropic agents, post-operative myocardial infarction and need for post-operative haemodialysis are independent risk factors for patients undergoing open heart surgery. Selection of methods for protecting the myocardium and renal functions during the intra-operative period would reduce the duration of ICU stay.

Keywords: Cardiac surgery, cardiopulmonary bypass, intensive care, risk factors, post-operative complications

Introduction

There has been an increase in the number of patients undergoing open heart operation with the prolongation of life expectancy and medical advances. Today, open heart surgery is performed on older and higher risk patients with more progressed stages. In addition to all these developments, the duration of postoperative mechanical ventilation and intensive care and hospital stay has declined substantially in the last 10 years as a result of developments in surgical and anaesthesia techniques, intensive care follow-up and treatment modalities (1). However, owing to various complications in a significant proportion of patients, intensive care admissions are prolonged, patient costs increase and intensive care equipment is prevented from being used by other patients (2). It has been reported that approximately 19%–45% of the cases may go through prolonged intensive care after open heart operation (2-7). In some studies, advanced age, female gender, reduced left ventricular function, arrhythmia, inotropic agent support and intra-aortic balloon pump (IABP) requirements have been identified as risk factors for prolonged intensive care (3-7).

The aim of the present study was to retrospectively investigate the risk factors associated with prolonged intensive care unit (ICU) stay in patients who underwent coronary artery bypass grafting (CABG) and cardiac valve operation in our hospital in 2014. The primary end point of the study was to determine the causes of prolonged intensive care after adult cardiac surgery. The secondary end point was to determine the rate of prolonged intensive care.

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Methods

Adult patients who were >18 years old and who had undergone elective CABG and valvular heart operation between January 2014 and December 2014 were retrospectively reviewed. The ethics committee of Ege University Medical Faculty Clinical Research (ethics committee no. 15-3/12) approved the study. Patients who underwent off-pump or aortic vascular operation, emergency surgical treatment, intubated operation in septic condition and cardiac transplant; with congenital heart disease and left ventricular assist device and who were <18 years old were excluded from the study. Preoperative, intraoperative and postoperative data of the patients were retrospectively screened from anaesthesia follow-up cards and patient files. Preoperative determinants, such as gender, age, body mass index (BMI), previous myocardial infarction (MI), left ventricular ejection fraction (EF), functional classification of European System for Cardiac Operative Risk Evaluation (EuroSCORE), comorbid diseases (diabetes mellitus (DM), hypercholesterolemia, hypertension, peripheral vascular disease, cerebrovascular disease, respiratory disease (chronic obstructive pulmonary disease (COPD) and asthma bronchiole), renal dysfunction (creatinine >1.4 mg dL^{-1} or diagnosed renal insufficiency)) and smoking habit, intraoperative determinants, such as type of operation, cardiopulmonary bypass (CPB) duration (min), aortic cross-clamping time (min), number of anastomosed grafts and number of valves and determinants that require re-operation, such as postoperative MI, atrial or ventricular arrhythmia requiring treatment, inotropic agent requirement, ≥2 inotropic use and/or EF ≤35, IABP requirement, respiratory complications (pneumonia and acute pulmonary damage), cerebrovascular events (stroke, transient ischaemic attack, cerebral haemorrhage and infarction), renal dysfunction (0.5 mg dL^{-1} increase in baseline creatinine or 50% decrease in calculated creatinine clearance or renal replacement therapy/dialysis requirement), gastrointestinal complications, sepsis, multiorgan failure, sternum infection and re-operation for haemorrhage, were noted. In addition, the duration of mechanical ventilation, ICU stay, hospital stay and in-hospital mortality was also noted. Patients were divided into two groups according to their length of stay in the ICU: Group I had <48 h of ICU admission and Group II had ≥48 h of ICU stay. Statistical significance between preoperative, intraoperative and postoperative variables and ICU stay in both groups was investigated.

Statistical analysis

Patient data were assessed using the IBM Statistical Package for the Social Sciences 21.0 software (IBM SPSS Corp.; Armonk, NY, USA) and evaluated by Medical Informatics and Statistics AD. Descriptive statistics were expressed as mean±standard deviation, median (lowest/highest value) or percentage (%). The Kolmogorov–Smirnov test was used for variable distribution. The independent samples t test or Mann–Whitney U test was used for quantitative data analysis and the chi-square test and Fisher's exact test were used for qualitative data analysis. Factors affecting duration of ICU stay were determined by univariate and multivariate logistic regression analyses.

Results

Of the 513 patients who underwent open heart surgery, 310 were <65 years old, and 345 were males. The mean age of the patients was 61.7±10.1 years with a height of 170±10 cm, weight of 77.8±12.2 kg and BMI of 27.4±3.9 kg m^{-2}. Of the 127 patients, 24.8% were in the obesity group (BMI >30 kg m^{-2}). Both groups had similar patient characteristics in terms of obesity (p=0.703). Coronary artery bypass surgery was performed in 382 (75%) patients, valve replacement surgery in 100 (19%) patients and coronary artery bypass surgery+valve replacement surgery in 31 (6%) patients. Of the patients, 45.4% (233 patients) were in the low-risk EuroSCORE group (0–2 points), 41.7% (214 patients) were in the medium-risk EuroSCORE group (3–5 points) and 12.9% (66 patients) were in the high-risk EuroSCORE group (≥6 points).

Patients with high EuroSCORE score were also found to have long ICU stay (p=0.002). The mean left ventricular EF of the patients was 52.3±8.3%; CPB duration was 86.8±28.5 (20–251) min; aortic cross-clamp time was 59.1±22.3 (13–164) min; duration of stay on the mechanical ventilator was 20.7±30.6 (3–185) h; duration of ICU stay was 48.1±64.7 (9–696) h and length of hospital stay was 9.2±4.2 (5–60) days. Of the patients, 5 (0.97%) died due to various complications (Table 1). The additional medical history of the patients were similar in both groups except for DM. DM was significantly higher in patients who stayed >48 h in the ICU (p=0.031) (Table 2). In patients diagnosed with DM, hypertension (p<0.001), hyperlipidaemia (p=0.009), cerebrovascular event (p=0.040), postoperative MI (p=0.036), renal dysfunction (p=0.001) and haemodialysis requirement (p=0.036) were higher, but the use of inotropic agents was similar in patients with no diabetes (p=0.470). Insulin use was present in 58% (122) of the patients with DM.

The mean intraoperative uses of fresh whole blood, erythrocyte suspension, fresh frozen plasma and random platelets were 0.74±0.58 (0–2) units, 0.05±0.26 (0–2) units, 0.18±0.46 (0–2) units and 0.18±1.02 (0–6) units, respectively. Both groups were similar in terms of blood use in the intraoperative period (p<0.05). In the first postoperative 24 h, the mean uses of fresh whole blood, erythrocyte suspension, fresh frozen plasma and random platelet were 0.3±0.5 units (Group I 0.3±0.5 vs. Group II 0.3±0.5 units, p=0.769), 0.4±0.6 units (0.4±0.6 vs. 0.4±0.7 units, p=0.705), 1±1 units (1±1 vs. 0.9±0.9 units, p=0.503) and 0.18±1 units (0.18±1 vs. 0.18±1, p=0.991), respectively.

In 20.1% (103) of the patients, the duration of ICU follow-up was >48 h due to various reasons. In the group with

Table 1. Demographic data and intraoperative characteristics of the patients

		Length of intensive care unit stay		
		<48 h (n=410)	**≥48 h (n=103)**	**p**
Age (year) Average		61.5±10.1	62.4±10.1	0.642
	<65 years	247	63	0.864
	≥65 years	163	40	
Sex	Male	281	64	0.216
	Female	129	39	
Height (m)		1.7±0.1	1.7±0.1	0.521
Weight (kg)		78.0±12.2	77.3±12	0.991
BMI (kg m^{-2})		27.4±3.9	27.5±4	0.844
Operation	CABG	308	74	0.269
	Valve replacement	75 25		
	CABG+valve replacement	27 4		
EuroSCORE 0–2 points (low risk)		197 36		
3–5 points (moderate risk)		69 45		
≥6 points (high risk)		44 22		0.171
Coronary count		2.8±0.9	3.0±1.0	0.038
Ejection fraction (%)		52.7±7.7	50.4±10.5	0.002
Number of valves		1 63 19		
		2 33 9		
		3 6 1		0.930
Cardiopulmonary bypass (min)		84.6±26.7	95.7±33.7	0.000
Aortic cross-clamp (min)		57.3±21.7	66.2±23.7	0.000
Mechanical ventilation time (h)		16.6±24.3	37.0±44.8	0.000
Duration of stay in hospital (days)		8.7±2.9	11.2±7.0	0.000
Result	Death	1	4	
	Discharge	409	99	0.007

Data are expressed as mean±standard deviation or patient number.
BMI: body mass index; EuroSCORE: European System for Cardiac Operative Risk Evaluation; CABG: coronary artery bypass grafting; n: number of patients.

ICU stay ≥48 h, EuroSCORE value, IABP use, ≥2 inotropic agent use and/or EF ≤35 ratio, inotropic use, respiratory complication rate, CPB duration, aortic cross-clamping duration, duration of mechanical ventilation, duration of intensive care and hospital stay and mortality were significantly higher ($p<0.05$). EF value was significantly lower in the same group ($p=0.038$) (Tables 1, 3).

In the univariate model, the presence of high EuroSCORE score, DM history, low EF, IABP requirement, ≥2 inotropic agent use, postoperative EF ≤35, respiratory complication development, postoperative arrhythmia development, postoperative MI development, presence of postoperative renal dysfunction, need for postoperative haemodialysis, presence of any infection, presence of two or more complications were found to be significant risk factors for >48 h of stay in the intensive care. In the multivariate model, IABP requirement, ≥2 inotropic agent use, postoperative MI development and postoperative haemodialysis requirement were independent risk factors for >48 h of stay in the ICU (Table 4).

Discussion

Complications following open heart surgery cause impairment of the quality of life of the patients and, in some cases, mortality. In the present study, factors that prolonged the stay in the ICU among 513 patients who had undergone open heart surgery were determined. Of the

Table 2. History of preoperative diseases and duration of intensive care unit stay of the patients

	Length of intensive care unit stay		
	<48 h (n=410)	**≥48 h (n=103)**	**p**
Tobacco use			
No	181 (44)	50 (49)	
Yes	229 (56)	53 (51)	0.440
Diabetes mellitus			
No	251 (61)	51 (50)	
Yes	159 (39)	52 (50)	0.031
Systemic hypertension			
No	146 (36)	32 (31)	
Yes	264 (64)	71 (69)	0.387
Acute myocardial infarction			
No	375 (91)	89 (86)	
Yes	35 (9)	14 (14)	0.119
Pulmonary hypertension			
No	365 (89)	93 (90)	
Yes	45 (11)	10 (10)	0.710
Preoperative arrhythmia			
No	381 (93)	90 (87)	
Yes	29 (7)	13 (13)	0.072
Peripheral artery disease			
No	394 (96)	97 (94)	
Yes	16 (4)	6 (6)	0.389
Carotid artery stenosis			
No	395 (96)	100 (97)	
Yes	15 (4)	3 (3)	>0.999
History of cerebrovascular event			
No	390 (95)	97 (94)	
Yes	20 (5)	6 (6)	0.695
Chronic renal failure			
No	385 (94)	96 (93)	
Yes	25 (6)	7 (7)	0.793
Preoperative haemodialysis			
No	406 (99)	100 (97)	
Yes	4 (1)	3 (3)	0.148
Thyroid disease			
No	370 (87)	92 (88)	
Yes	40 (10)	11 (11)	0.854
Chronic lung disease			
No	366 (89)	88 (85)	
Yes	44 (11)	15 (15)	0.300

Data are expressed in terms of number of patients and percentage (%). n: number of patients.

Table 3. The effect of postoperative complications on the length of intensive care unit stay

	Length of intensive care unit stay		
	<48 h (n=410)	**≥48 h (n=103)**	**p**
Respiratory complications			
No	386 (94)	87 (84)	
Yes	24 (6)	16 (16)	0.003
Re-intubation			
No	404 (98.6)	99 (96)	
Yes	6 (1.4)	4 (4)	0.120
Arrhythmia			
No	342 (83)	75 (73)	
Yes	68 (17)	28 (27)	0.016
Myocardial infarction			
No	406 (99)	91 (88)	
Yes	4 (1)	12 (12)	<0.001
Renal dysfunction			
No	375 (91)	76 (74)	
Yes	35 (9)	27 (26)	<0.001
Haemodialysis			
No	408 (99.5)	89 (87)	
Yes	2 (0.5)	14 (13)	<0.001
Cerebrovascular event			
No	408 (99.5)	103 (100)	
Yes	2 (0.5)	0 (0)	>0.999
Revision			
No	400 (98)	97 (94)	
Yes	10 (2)	6 (6)	0.106
Gastrointestinal complication			
No	404 (99)	102 (99)	
Yes	6 (1)	1 (1)	>0.999
Haematologic complication			
No	362 (88)	93 (90)	
Yes	48 (12)	10 (10)	0.728
Infection			
No	397 (97)	93 (90)	
Yes	13 (3)	10 (10)	0.013
Sepsis			
No	410 (100)	100 (97)	
Yes	0 (0)	3 (3)	0.008
Multiple organ failure			
No	410 (100)	102 (99)	
Yes	0 (0)	1 (1)	0.201

Table 3. The effect of postoperative complications on the length of intensive care unit stay (Continued)

	Length of intensive care unit stay		
	<48 h (n=410)	≥48 h (n=103)	p
Two or more complications			
No	357 (87)	69 (67)	
Yes	53 (13)	34 (33)	<0.001
Intra-aortic balloon pump			
No	406 (99)	93 (90)	
Yes	4 (1)	10 (10)	<0.001
Low cardiac output or EF ≤35			
No	384 (94)	80 (78)	
Yes	26 (6)	23 (22)	<0.001
Use of inotropes			
No	303 (74)	51 (49)	
Single	96 (23)	25 (24)	
Double	8 (2)	11 (11)	<0.001
Triple	2 (0.7)	11 (11)	
Quadruple	1 (0.3)	5 (5)	

Data are expressed in terms of number of patients and percentage (%).
EF: ejection fraction; n: number of patients.

Table 4. Logistic regression analysis of factors affecting the duration of ICU stay

	Univariate model				Multivariate modelel			
		95% CI				95% CI		
	OR	Lower limit	Upper limit	p	OR	Lower limit	Upper limit	p
High EuroSCORE	1.14	1.04	1.26	0.004				
DM history	1.61	1.04	2.49	0.032				
Preoperative low EF	0.97	0.94	0.99	0.014				
IABP requirement	10.91	3.35	35.56	0.000	6.51	1.78	23.79	0.005
Postoperative EF ≤35 (low flow rate)	4.06	2.19	7.53	0.000				
≥2 use of inotropic agent	2.85	1.83	4.45	0.000	2.10	1.27	3.49	0.004
Respiratory complication	2.98	1.52	5.84	0.002				
Postop arrhythmia	1.88	1.13	3.11	0.015				
Postop MI	13.38	4.22	42.45	0.000	4.83	1.35	17.25	0.015
Postop renal dysfunction	3.81	2.18	6.66	0.000				
Postop HD	32.09	7.17	143.71	0.000	18.77	3.97	88.75	0.000
Infection	3.28	1.40	7.72	0.006				
≥2 complications	3.32	2.01	5.48	0.000				

95% CI: 95% confidence interval; DM: diabetes mellitus; EF: ejection fraction; EuroSCORE: European System for Cardiac Operative Risk Evaluation; HD: haemodialysis; IABP: intra-aortic balloon pump; MI: myocardial infarction; OR: odds ratio; postop: postoperative.

patients, 20.1% (103) had prolonged intensive care stay. While demographic data and preoperative characteristics of the patients (except DM) did not prolong the duration of ICU stay, factors affecting myocardial performance (MI in the postoperative period, multiple inotropic agent use and IABP necessity) and renal functions being affected with haemodialysis requirement extended the length of ICU stay.

Previous studies noted that prolonged ICU stay is found among 3.5%–45% of the patients; prolonged intensive care period is accepted as from 48 h to 10 days which is considered as a wide range (2–9). Heimrath et al. (4) stated that 19% (598) of 3139 patients who underwent CABG surgery with >48 h of intensive care follow-up are required. In their study, they reported that the duration of ICU stay is prolonged in patients with advanced age, female gender, presence of new MI, unstable angina, DM presence, patients with numerous coronary revascularisation and patients who underwent immediate surgical treatment. In their retrospective study that included 2683 patients, Hein et al. (5) reported that 26% of the patients stay in the ICU for >3 days. Advanced age, renal insufficiency, respiratory insufficiency, heart failure and re-exploration have been associated with prolonged intensive care stay. In our study, the duration >48 h was considered as a prolonged intensive care period. In the multivariate logistic regression analysis, IABP use, ≥2 inotropic agent use, postoperative MI and postoperative haemodialysis were determined as independent variables of extended ICU duration as in other similar studies.

Sex remains a controversial variable in terms of postoperative complications. In some studies, women with CABG have been shown to be at higher risk for morbidity and mortality than men (10). On the other hand, Fisher et al. (11) stated that the increased risk is not related to sex but is related to the weight of the patient and the diameter of the coronary vessels. In our study, gender was not found to be associated with prolonged ICU duration, but the number of female patients was lower than that in other studies.

Obesity is an important risk factor for cardiac diseases and cardiac death. It is also thought that obesity is a major risk factor for patients undergoing cardiac surgery. DM, hypertension and hyperlipidaemia are common diseases in obese patients. Nevertheless, in many studies, it has been shown that there is very little correlation between obesity and postoperative complications (morbidity and mortality) (12, 13). Although DM, hypertension, hyperlipidaemia and arrhythmia were more frequent among obese patients in our study, there was no statistical significance found. Of the 127 patients who were in the obesity group, only 43.3% were diagnosed with DM, and this situation did not cause an increase in complications.

In patients with DM who underwent open heart surgery, complications, such as stroke, transient ischaemic attack, encephalopathy, cognitive dysfunction and respiratory problems, are more frequent in the postoperative period. It has been shown that DM causes atherosclerosis and alveolar basal membrane thickening in all arteries (aorta, carotid and cerebral arteries) (5, 14). In our study, 41.1% of the patients were diagnosed with DM, and more than half of these patients were on insulin. It was determined that comorbidities other than DM and smoking habit had no effect on ICU stay. Furthermore, the duration of stay on the mechanical ventilator and the length of hospital stay were found to be increased depending on DM complications. Since comorbidities of DM (hypertension, hyperlipidaemia and cerebrovascular event) and postoperative complications (postoperative MI, renal dysfunction and haemodialysis risk) are more frequent, before performing the operation, the regulation of DM in patients with this diagnosis will reduce the complications and the length of stay in the ICU.

The EuroSCORE risk classification is important in predicting postoperative complications and length of hospital stay in cardiac surgeries. According to EuroSCORE, patients are evaluated into three groups: high risk (≥6 points), moderate risk (3–5 points) and low risk (0–2 points) (15). Factors, such as advanced age, DM, elevated creatinine and respiratory disease, increase the risk score according to the EuroSCORE scoring system. We believe that patients with a high EuroSCORE have a longer duration of intensive care stay due to more frequent complications resulting from comorbidities. Bashour et al. (8) reported that of the 2618 patients, 48.7% are <65 years old, 40.9% are in the 65–75 age group and 10.4% are >75 years old. Of the patients, 71.9% were males, 69.1% had CABG, 19.8% had valve replacement surgery and 11.1% had CABG+valve replacement surgery. Of the 142 patients, 5.4% stayed in the ICU for ≥10 days. In the multivariate logistic regression analysis, the prolonged ICU stay was reported to be associated with COPD, renal failure, re-operation and low left ventricular EF in the >75 age group. Azarfarin et al. (16) divided 280 adult patients who underwent cardiac surgery into two groups according to their duration of ICU stay: length of ICU stay ≤96 h and >96 h. Of the evaluated patients, 34.3% remained in the ICU for >96 h.

The frequency of prolonged intensive ICU stay was found to be 34.2% in patients with CABG, 30.8% in patients with valve surgery and 44.8% in patients with CABG+valve surgery. The presence of blood transfusion, inotropic use, prolonged duration of anaesthesia, prolonged duration of CPB and intubation time, postoperative cardiac tamponade development, haemodialysis requirement, re-intubation and re-exploration were found to be associated with prolonged ICU stay. In their prospective study that involved 109 patients, Doering et al. (6) indicated that premature extubation, postoperative arrhythmias being under control and limited management of postoperative fluid shorten the duration of ICU stay. In their review, Almashrafi et al. (9) reported the risk factors for extended ICU stay as advanced age, COPD, renal failure or dysfunction, atrial fibrillation, low EF, emergency surgical treatment, history of cardiac surgery and inotropic support. They stated that different periods are used between 42 h and 7 days as the duration of ICU stay. In 625 patients who underwent fast track treatment, Toraman et al. explained the parameters associated with prolonged ICU stay as occurence of respiratory complications (p=0.03), blood use (p=0.05) and IABP require-

ment (p=0.02). They noted that respiratory complications would be reduced by early extubation, and use of blood and IABP would be reduced by providing a good haemodynamic and fluid balance, and thus the length of stay in the intensive care will shorten. On the other hand, Osinaike et al. (18) stated that in one-way regression analysis, pulmonary hypertension (p=0.002), mean CPB time (p=0.018), inotropic agent use (p=0.021) and surgical re-exploration (p=0.016) were significant risk factors for ICU stay >4 days. However, in the multiple regression analysis, inotropic agent use (p=0.003) remained as the only independent variable. In our study, the age of the patient, previous operation(s), COPD history and re-exploration for any reason and blood use were similar in both groups as opposed to other studies. On the other hand, risk factors, such as DM history, high EuroSCORE, inotropic support, IABP requirement, long CPB and aortic clamp time, postoperative low EF, atrial fibrillation, postoperative MI, respiratory complications, renal failure and infections, similarly caused prolonged mechanical ventilation time and intensive care and hospital stay. Patients with complications were expected to experience prolonged ICU stay due to the requirement for treatment and monitoring. These complications might be reduced by following myocardial protection techniques, shortening the duration of CPB, regulation of blood sugar, stabilisation of haemodynamic and premature extubation.

Garcia-Delgado et al. (19) reported that CPB causes extensive lung injury and respiratory distress by triggering an intense systemic inflammatory syndrome and increasing lung capillary permeability. In these patients, the duration of extubation and mechanical ventilation was found to be prolonged, with delayed release from the ICU and discharge from the hospital. In our study, 40 patients developed respiratory complications; 6 patients required tube thoracotomy that was repeated on development of pneumothorax and 10 patients required re-intubation. Only 1 patient who developed pneumothorax and only 4 patients who underwent re-intubation were followed up in the ICU for ≥48 h. In our study, while the development of respiratory complications extended the duration of intensive care stay, the rate of pneumothorax and re-intubation did not differ significantly between the groups. We believe that pneumothorax and re-intubation are related to prolonged ICU stay, but there was no statistical significance between the groups since the number of patients exposed to these complications was low and the majority of the patients who had tube thoracotomy were able to be monitored in the cardiology department.

Our study has some limitations. First, it was designed retrospectively. Second, surgeries that prolong the stay in the ICU, such as aortic vascular surgeries other than CABG and heart valve surgeries, heart failure surgeries and cases who require immediate surgical interventions, were excluded from the study.

Conclusion

Since a different procedure from other surgeries is being followed, a large number of complications develop in open heart surgeries, and the duration of ICU stay is prolonged. In patients who underwent open heart surgery, it was determined that IABP requirement, ≥2 inotropic agent use, experiencing MI and haemodialysis requirements were independent risk factors for prolonged ICU stay. Therefore, we believe that choosing surgical and anaesthetic methods to protect myocardium and renal function will decrease the complications and the length of stay in the ICU in open heart surgeries.

Ethics Committee Approval: Ethics committee approval was received for this study from the Clinical Research Ethical Committee of Ege University School of Medicine (Date: 06.04.2015, No: 15-3/12).

Informed Consent: Written informed consent wasn't obtained from patients who participated in this study since our study is a retrospective study and the data were obtained by screening of the patient files.

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