J Surg Med. 2020;4(6):491-495.
DOI: 10.28982/josam.744784

Research article
Araştırma makalesi

Journal of Surgery and Medicine
e-ISSN=2602-2079

Assessment of preoperative risk scoring systems in geriatric and non-geriatric coronary bypass surgery patients

Koroner bypass cerrahisi uygulanan geriatrik ve geriatrik olmayan hastalarda preoperatif risk puanlama sistemlerinin değerlendirilmesi

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Ethics Committee Approval: Ethical approval of was obtained from Lokman Hekim University, Non-Interventional Clinical Research Ethics Committee (date: 20/05/2020, number: 53875521-050-E.249). All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.
Etik Kurul Onayı: Etik onay Lokman Hekim Üniversitesi, Girişimsel Olmayan Klinik Araştırma Etik Kurulu'ndan (tarih: 20/05/2020, sayı: 53875521-050-E.249) alınmıştır. İnsan katılımcıların katıldığı çalışmalardaki tüm prosedürler, 1964 Helsinki Deklarasyonu ve daha sonra yapılan değişiklikler uyarınca gerçekleştirilmiştir.

Conflict of Interest: No conflict of interest was declared by the authors.
Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Financial Disclosure: The authors declared that this study has received no financial support.
Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

Published: 6/30/2020
Yayın Tarihi: 30.06.2020

Abstract

Aim: The need to predict mortality in patients undergoing cardiac surgery has resulted in the development of numerous preoperative risk scoring systems, which are being successfully implemented in clinical practice. Although the criteria of scoring systems use patient age as a risk factor, their effectiveness should also be evaluated in the subgroups of these systems.

Methods: Our retrospective cohort study includes all patients who underwent isolated CABG surgery at Private Akay Hospital Cardiovascular Surgery Clinic between May 2012 and March 2014. Patients were subdivided into two cohorts as geriatric (≥65 years) and non-geriatric (<65 years) patients. In this study, intraoperative deaths and deaths within 30 days postoperatively were considered as mortality. We retrospectively evaluated demographic data, preoperative risk factors, preoperative treatments, postoperative data, postoperative complications, laboratory findings, and mortality and morbidity outcomes from patient files and the hospital database.

Results: The coherence between observed and EuroSCORE II-predicted mortality, logistic Euro-SCORE-predicted mortality and Parsonnet-predicted mortality were 93%, 94%, and 89%, respectively for patients aged 65 and older, and 78%, 77%, and 71%, respectively for patients aged below 65 years (P=0.01 for all).

Conclusion: In general, we observed that EuroSCORE II, Log EuroSCORE and Log Parsonnet scoring systems are more effective in predicting mortality among elderly coronary bypass surgery patients compared to younger patients.

Keywords: Preoperative risk scoring systems, Geriatric patient, Coronary bypass

Öz

Amaç: Kalp cerrahisi uygulanacak olan hastalarda mortaliteyi öngörmeye duyulan ihtiyacın sonunda birçok preoperatif risk skorlama sistemleri oluşturulmuştur. Günümüzde de bu preoperatif skorlama sistemleri başarıyla kullanılmaktadır. Skorlama sistemleri kriterlerinde hasta yaşını risk faktörü olarak kullansada, bu sistemlerin alt gruplarında da etkinliklerinin değerlendirilmesi gerekmektedir.

Yöntemler: Retrospektif kohort çalışmamızda Özel Akay Hastanesi Kalp ve Damar Cerrahisi Kliniği'nde Mayıs 2012 – Mart 2014 tarihleri arasında ardışık olarak CPB altında izole CABG operasyonu geçiren tüm hastalar çalışmaya dâhil edildi. Hastalar geriatrik (≥65 yaş) ve geriatrik olmayan (<65 yaş) hastalar olmak üzere iki gruba ayrıldı. Çalışmamızda meydana gelen intraoperative ve postoperatif 30 gün içinde olan ölümler mortalite olarak kabul edildi. Retrospektif olarak hastalara ait demografik veriler, preoperatif risk faktörleri, preoperatif tedaviler, postoperatif veriler, postoperatif komplikasyonlar, laboratuar bulguları, gözlenen mortalite ve morbidite kayıtları hasta dosyaları ve hastane veri tabanından elde edilmiştir.

Bulgular: Altmış beş yaş üzerindeki hastalar için Euroscore 2 beklenen mortalitenin gerçekleşen mortaliteye göre uyum düzeyinin %93 olduğu, 65 yaş altındaki hastalar için Euroscore 2 beklenen mortalitenin gerçekleşen mortaliteye göre uyum düzeyinin %78 olduğu izlenmiştir (P=0,01). Altmış beş yaş üzerindeki hastalar için Logistic Euroscore (Log Euroscore) beklenen mortalitenin gerçekleşen mortaliteye göre uyum düzeyinin %94 olduğu, altmış beş yaş altındaki hastalar için Log Euroscore beklenen mortalitenin gerçekleşen mortaliteye göre uyum düzeyinin %77 olduğu izlenmiştir (P=0,01). Altmış beş yaş üzerindeki hastalar için Logistic Parsonnet (Log Parsonnet) beklenen mortalitenin gerçekleşen mortaliteye göre uyum düzeyinin %89 olduğu, altmış beş yaş altındaki hastalar için Log Pars beklenen mortalitenin gerçekleşen mortaliteye göre uyum düzeyinin %71 olduğu izlenmiştir (P=0,01).

Sonuç: Genel olarak bakıldığında Euroscore 2, Log Euruscore ve Log Parsonnet skorlarlama sistemlerinin koroner bypass olacak geriatrik hastalar üzerinde mortalitenin belirlenmesinde daha etkin sonuçlar verdiği görülmüştür.

Anahtar kelimeler: Preoperatif risk skorlama sistemleri, Geriatrik hasta, Koroner bypass

How to cite/Atıf için: Kartal H, Sicim H, Mungan U, Demirtaş E, Erol G, Öcal A, Koç M. Assessment of preoperative risk scoring systems in geriatric and non-geriatric coronary bypass surgery patients. J Surg Med. 2020;4(6):491-495.

Introduction

The assessment of surgical outcomes and quality has become particularly important in recent years. Various surgical techniques have been compared to reduce postoperative mortality and morbidity, especially in elderly patients [1]. This process was initially introduced for research purposes but has now become a source of data demanded by hospital administrations, families, insurance companies, government agencies, and even legal courts. For this reason, researchers have started developing scoring systems that aim to assess the difficulties of different types of surgeries.

Risk scoring systems allow the physician to preoperatively determine the postoperative mortality risk of the patient, inform the patients and their relatives accurately, determine cost and length of hospital stay, and retrospectively compare patients of different risk groups among themselves [2]. However, creating a perfectly accurate scoring system is problematic since patients have varying characteristics, and hence requires extensive patient data.

Approximately 19 different scoring systems have been developed in multiple countries depending on their own demagogic structures [3]. Logistic EuroSCORE, EuroSCORE II, and logistic Parsonnet scoring systems are the ones most used globally [4-6].

Elderly patients make up a significant portion of all cardiac surgeries. The gradually aging populations increase the prevalence of chronic diseases and acute disorders, and subsequently, the elderly constitute a major group of patients in many departments of hospitals, including cardiac surgery [7]. Cardiac surgery handles a considerable amount of elderly patients.

People over the age of sixty-five are considered the elderly population [8]. Increasing age itself is an important risk factor for surgical patients [9]; however, elderly people have medical conditions that can negatively affect surgical care and outcomes that need to be taken into consideration [10].

In addition, older patients are under the risk of being excluded from standard surgical treatments and clinical trials compared to younger age groups [11,12]. In western countries, the elderly constitute the fastest-growing demographic group, and the number of elderly individuals that require surgical intervention is also expected to increase in the coming years [13]. The average life expectancy has similarly increased in Turkey as well, which translates into an increased proportion of elderly patients that require treatment for cardiovascular diseases [14].

Age is used as a parameter in all three scoring systems. However, it is not known how effective the scoring systems are in the geriatric population.

In this study, we have evaluated the EuroSCORE II, Logistic EuroSCORE, and Logistic Parsonnet scores, all of which are used for preoperative risk scoring in coronary bypass surgery patients aged ≥65 years and <65 years. The main purpose of our evaluation to observe the effectiveness of these currently used preoperative risk scoring systems in geriatric patients.

Materials and methods

This retrospective study was granted ethical approval by Lokman Hekim University, Non-Interventional Clinical Research Ethics Committee (date: 20/05/2020, number: 53875521-050-E.249).

We retrospectively evaluated demographic data, preoperative risk factors, preoperative treatments, postoperative data, postoperative complications, laboratory findings, and mortality and morbidity outcomes from patient files and the hospital database. All patients who underwent isolated coronary artery bypass grafting (CABG) under cardiopulmonary bypass (CPB) between May 2012 and March 2014 in Private Akay Hospital Cardiovascular Surgery Clinic were included in this study. Patients were subdivided into two cohorts as geriatric (≥65 years) and non-geriatric (<65 years) patients. In this study, intraoperative deaths and deaths within 30 days postoperatively were considered as mortality.

Scoring systems (EuroSCORE II, Log EuroSCORE and Log Parsonnet)

The most effective way of stratifying cardiac surgical patients according to operative risk is to use one of several available risk prediction algorithms that incorporate multiple variables to derive a risk score. One of the most widely used algorithms for this purpose in the Europe is the EuroSCORE [5,15]. EuroSCORE was developed to predict in-hospital mortality after cardiac surgery and published in 1999. As a result of progress in preoperative screening, surgical techniques and intensive care, the risk associated with cardiac surgery have gone down. The original EuroSCORE was felt no longer appropriate for risk stratification. The EuroSCORE II was developed based on a more current patient database and appears to reduce the overestimation of the calculated risk. This algorithm incorporates patient age, gender, mobility, severity of angina, urgency and variables reflecting comorbidities. The logistic model is a better risk predictor especially in high-risk patients and may be of interest to institutions engaged in the study and development of risk stratification. Another scoring system is log Parsonnet scoring system which is simple, additive and grades the severity of illness of patients into five groups. We stratified our all patients in this study according to the operative risk by using EuroSCORE II, Log EuroSCORE and Log Parsonnet perioperatively.

CABG surgical technique

All cases were operated under general anesthesia using the standard anesthesia protocol that is used in our clinic. In all patients, the operation was performed with a median sternotomy. In all CABG patients, cardiopulmonary bypass was achieved with an arterial cannula in the aorta and the two-stage venous cannulation of the right atrium. After cardiac arrest was achieved with antegrade and retrograde cold crystalloid cardioplegia and topical hypothermia following cross-clamp, the continuation of the arrest was done with intermittent retrograde cold blood cardioplegia. The operation was completed under moderate hypothermia (28 °C). In all CABG patients, the left internal mammary artery (LIMA) was used to bypass the left anterior descending artery. A saphenous vein graft was used to bypass other coronary arteries. Warm blood cardioplegia was given before unclamping the cross clamp.

Exclusion criteria

The study only includes patients that underwent isolated coronary bypass surgery. Patients that underwent a combination of CABG and other procedures (valve surgery, aneurysm repair, etc.) were excluded from the study. The cases where LIMA was not used were also excluded for sample standardization. Death after postoperative day 30 was not considered as postoperative mortality.

Statistical analysis

In the study, the patients' general and clinical characteristics and scores are presented as means, standard deviations, percentages, and frequencies. The demographic and clinical characteristics of the patients were analyzed according to age groups using the chi-square test. Independent samples t-test was used to determine the association between patients' scores and mortality outcomes. The paired sample t-test was used to determine the association between age groups and clinical scores. ROC (Receiver-Operating Characteristic) analysis was performed and ROC curves were generated to determine the agreement between scoring systems (EuroSCORE II, Log EuroSCORE and Log Parsonnet) predictions and actual mortality. The area under the receiver operating characteristic (AUROC) was calculated for comparison of the areas under ROC curves. Data were analyzed using SPSS for Windows version 19.0 (Statistical Package for the Social Sciences, Chicago, IL, USA) and α=0.05 was determined as the critical decision criterion.

Results

The survival outcomes were not different between the two groups. The mortality rates for patients aged <65 years and ≥65 years were 2.9% and 2.3%, respectively, which were similar (P=0.30).

The male-to-female ratios of the two groups were alike. The prevalence of diabetes mellitus (DM), hypertension (HT), family history (FH), hyperlipidemia (HL), and obesity were not different between the two groups (P=0.20, P=0.05, P=0.12, P=0.91, P=0.51, respectively).

Smoking rates were significantly higher in the group of patients aged <65 years (P=0.03), along with the prevalence of chronic obstructive pulmonary disease (COPD) (P=0.04).

The prevalence of extracardiac arteriopathy was significantly higher in patients aged ≥65 years (P=0.01). The prevalence of neurological dysfunction was similar between patients aged <65 years and ≥65 years (P=0.59), along with that of emergency operations, chronic renal failure (CRF), critical preoperative state, left ventricular (LV) aneurysm, incidence of postoperative intra-aortic balloon pump (IABP) and postoperative inotropic support (P=0.63, P=0.66, P=0.47, P=0.62, P=0.61, and P=0.08, respectively).

The mean age was 70.62 years for patients aged ≥65 years, 50.65 years for patients aged <65 years, and 55.70 years for all patients (Table 1). The results of all three scoring systems were significantly higher in patients aged ≥65 years (P=0.01 for all) (Table 2).

The length of hospital stays, duration of intubation, and length of ICU stays were alike between the two groups (P=0.43, P=0.49, P=0.68, respectively) (Table 3).

Table 1: The examination of the characteristics of the age groups

Group		Age group ≥65 years n	%	Age group <65 years n	%	*P*-value
Survival	Death	12	2.9%	28	2.3%	0.30
	Survived	396	97.1%	1175	97.7%	
Gender	Female	129	31.6%	451	37.5%	0.09
	Male	279	68.4%	752	62.5%	
Diabetes mellitus	Yes	90	22.1%	290	24.1%	0.20
	No	318	77.9%	913	75.9%	
Hypertension	Yes	197	48.3%	513	42.6%	0.05
	No	211	51.7%	690	57.4%	
Family History	Yes	159	39.0%	523	43.5%	0.12
	No	249	61.0%	680	56.5%	
Hyperlipidemia	Yes	205	50.2%	600	49.9%	0.91
	No	203	49.8%	603	50.1%	
Obesity	Yes	74	18.1%	238	19.8%	0.51
	No	334	81.9%	965	80.2%	
Smoking status	Yes	151	37.0%	519	43.1%	0.03
	No	257	63.0%	684	56.9%	
chronic obstructive pulmonary disease	Yes	34	8.3%	59	4.9%	0.04
	No	374	91.7%	1144	95.1%	
Extracardiac arteriopathy	Yes	35	8.6%	46	3.8%	0.01
	No	373	91.4%	1157	96.2%	
Neurological Dysfunction	Yes	9	2.2%	35	2.9%	0.59
	No	399	97.8%	1168	97.1%	
Reoperation	Yes	1	0.2%	9	0.7%	-
	No	407	99.8%	1194	99.3%	
Emergency Operation	Yes	11	2.7%	41	3.4%	0.63
	No	397	97.3%	1162	96.6%	
Chronic renal failure	Yes	11	2.7%	(17).	1.4%	0.66
	No	397	97.3%	1186	98.6%	
Active Endocarditis	Yes	0	0.0%	0	0.0%	-
	No	408	100.0%	1203	100.0%	
Critical Preoperative State	Yes	4	1.0%	20	1.7%	0.47
	No	404	99.0%	1183	98.3%	
Left Ventricle aneurysm	Yes	4	1.0%	17	1.4%	0.62
	No	404	99.0%	1186	98.6%	
Post-MI Ventricular Septal Defect	Yes	0	0.0%	1	0.1%	-
	No	408	100.0%	1202	99.9%	
Aortic Surgery	Yes	0	0.0%	0	0.0%	-
	No	408	100.0%	1203	100.0%	
Preoperative Intra-Aortic Balloon Pump	Yes	2	0.5%	3	0.2%	-
	No	406	99.5%	1200	99.8%	
Postoperative Intra-Aortic Balloon Pump	Yes	15	3.7%	17	1.4%	0.61
	No	393	96.3%	1186	98.6%	
Postop Inotropic Support	Yes	41	10.0%	85	7.1%	0.08
	No	367	90.0%	1118	92.9%	

MI: Myocardial Infarct

Table 2: The examination of scores according to age groups

Measurement	Age group	n	Observed mortality rate	X (SD)	*P*-value
EuroSCORE II	≥65 years	408	2.9%	2.92 (3.01)	0.01
	<65 years	1203	2.3%	1.80 (2.11)	
Log EuroSCORE	≥65 years	408	2.9%	3.05 (3.00)	0.01
	<65 years	1203	2.3%	1.99 (2.15)	
Log Parsonnet	≥65 years	408	2.9%	3.58 (2.93)	0.01
	<65 years	1203	2.3%	2.5 (2.48)	

X: Mean, SD: Standard deviation, Log: Logistic

Table 3: The examination of the length of hospital stay according to age groups

Measurement	Age group	n	X (SD)	*P*-value
Length of Hospital Stay (days)	≥65 years	408	6.13 (1.90)	0.43
	<65 years	1203	6.24 (2.52)	
Duration of Intubation (minutes)	≥65 years	408	15.50 (21.97)	0.49
	<65 years	1203	14.65 (21.45)	
Length of ICU Stay	≥65 years	408	1.78 (2.07)	0.68
	<65 years	1203	1.72 (2.70)	
Age	≥65 years	408	70.62 (4.14)	-
	<65 years	1203	50.65 (7.65)	

EuroSCORE II, log EuroSCORE II and Log Parsonnet scores were significantly higher in patients who died from both groups compared to those who survived (P=0.01 for all) (Table 4). The coherence between observed and EuroSCORE II-predicted mortality for patients aged ≥65 years and <65 years were 93% (89% sensitivity and 75% specificity) and 75% (79% sensitivity, 70% specificity), respectively, which were significantly different (P=0.01). There was a prominent level of agreement between observed and EuroSCORE II-predicted mortality (P=0.01).

The coherence between observed and Log EuroSCORE-predicted mortality for patients aged ≥65 years and <65 years were 94% (90% sensitivity and 74% specificity) and 77% (79% sensitivity, 70% specificity), respectively, which were

significantly different (P=0.01). There was a prominent level of agreement between observed and Log EuroSCORE-predicted mortality (P=0.01).

The coherence between observed and Log Parsonnet-predicted mortality for patients aged ≥65 years and <65 years were 89% (82% sensitivity and 70% specificity) and 71% (71% sensitivity, 64% specificity), respectively, which were significantly different (P=0.01). There was a prominent level of agreement between observed and Log Parsonnet-predicted mortality (P=0.01) (Table 5, Figures 1 and 2).

Table 4: Scores and survival outcomes according to age groups

Age group	Score	Survival	n	X (SD)	*P*-value
≥65 years (n=408)	EuroSCORE II	Death	12	9.25 (3.92)	0.01
		Survived	396	2.72 (2.77)	
	Log EuroSCORE	Death	12	9.54 (3.71)	0.01
		Survived	396	2.85 (2.75)	
	Log Parsonnet	Death	12	8.51 (3.91)	0.01
		Survived	396	3.44 (2.76)	
Under 65 (n=1203)	EuroSCORE II	Death	28	3.88 (3.47)	0.01
		Survived	1175	1.75 (2.05)	
	Log EuroSCORE	Death	28	4.14 (3.64)	0.01
		Survived	1175	1.93 (2.08)	
	Log Parsonnet	Death	28	5.54 (5.22)	0.01
		Survived	1175	2.43 (2.33)	

Table 5: The evaluation of the effectiveness of scores according to age groups

ROC	Age ≥65 years (n=408)			Age <65 (n=1203)		
	EuroSCORE II	Log EuroSCORE	Log Parsonnet	EuroSCORE II	Log EuroSCORE	Log Parsonnet
Sensitivity	89%	90%	82%	79%	79%	71%
Specificity	75%	77%	70%	70%	70%	64%
Diagnostic accuracy	93%	94%	89%	78%	77%	71%
P-value	0.01	0.01	0.01	0.01	0.01	0.01

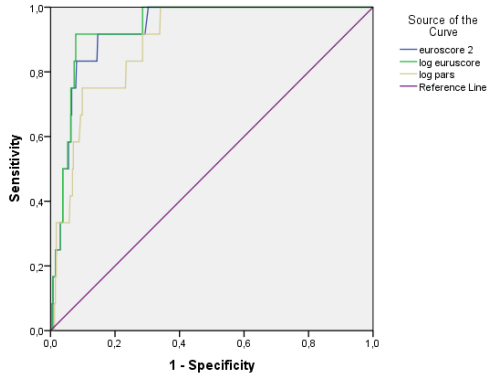

Figure 1: The evaluation of the effectiveness of scores according to age; ROC curve for patients aged ≥65 years

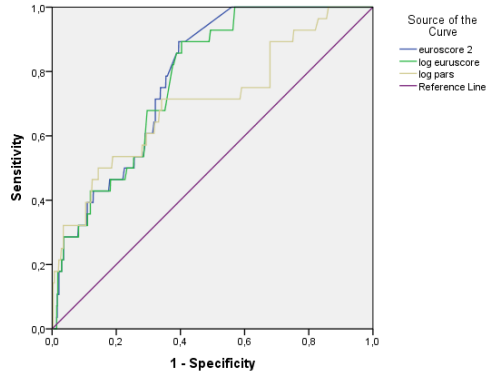

Figure 2: The evaluation of the effectiveness of scores according to age; ROC curve for patients aged <65 years

Discussion

In the last 50 years, the population over the age of sixty-five has tripled as a result of the global improvement in living standards and developments in medicine. This has not only increased the number of geriatric patients that need to be treated in clinics but also deepened the discussion regarding the surgical indications in this weak and vulnerable age group [16]. The increase in the population aged sixty-five and older that resulted from improved living standards and medical developments, which also reflected in the number of cardiac surgery operations required by this age group [2].

The costs and outcomes of open-heart surgery in elderly patients is of interest to researchers due to the higher mortality and complication rates and prolonged length of hospital stay associated with old age [17-20].

However, new medical systems may partially rationalize expensive treatments such as cardiac operations. With recent advances in myocardial protection and intensive care, the risks and costs associated with cardiac operations in elderly people may have reduced compared to the previous years [21].

Therefore, choosing the optimal intervention for each patient will always maintain its importance in terms of patient wellbeing and costs. Hence, predicting mortality outcomes before the intervention is critical for appropriate decision-making. In this regard, our study analyzes the preoperative risk scoring of coronary bypass surgery in the geriatric patient group in detail, and leads the physicians in making the correct surgical decision and, accordingly, helps accurately estimate treatment outcomes and hospital costs.

One study found that changes in organ functions, comorbidities, morbidity, and mortality increased in elderly patients compared to younger patients and that more than 50% of patients over seventy years of age had concomitant diseases, and 30-40% had 2 or more comorbidities [3].

In our study, it can be said that the demographic characteristics of our patients were largely homogeneous for the two groups, excluding extracardiac arteriopathy, COPD, and smoking. Furthermore, considering both the size and homogeneity of the sample, we believe that our results have increased predictive value and can correctly demonstrate the effects of the age parameter since they are minimally affected by differences in comorbidities.

Proper postoperative patient care in elderly patients requires careful preoperative evaluation, preoperative risk assessment, careful comorbidity assessment, optimal surgical technique, and correct surgical decision and anesthesia management [9].

Advances in perioperative treatments in the past decade have led to better outcomes for general cardiac surgery, and it has been suggested that better results can be achieved in select geriatric patients [22]. Accordingly, cardiac surgery in elderly patients can be performed with acceptable mortality rates, provided that the physician properly makes a multi-factor risk assessment and right treatment decisions [13].

The fact that the mortality rates were not significantly different for patients aged ≥65 years and <65 years that underwent coronary bypass surgery in our study indicate that the patients were selected adequately. By allowing us to compare the observed and predicted mortality results in these two sets of patients that underwent the same procedure, our results also become an index of care quality [23].

In our study, the duration of intubation, length of ICU stay, and length of hospital stay was not different for the two

groups. This finding suggests that, contrary to what is expected, old age alone does not result in morbidities such as prolonged intubation, prolonged intensive care stay, and prolonged hospital stay.

Although not evaluating the effectiveness of scoring systems, there are studies in the literature supporting our results which indicate geriatric patients significantly benefit from coronary artery bypass surgery with an increased quality of life and successful long-term outcomes despite higher mortality and morbidity rates compared to young patients [24].

Our results indicate that all three scoring systems more accurately predicted mortality rates in patients aged ≥65 years compared to patients aged <65 years. In addition, the effectiveness evaluations and ROC analysis indicate that all three scoring systems are more reliable in patients aged ≥65 years compared to patients aged <65 years. Therefore, EuroSCORE II, Logistic EuroSCORE, and Logistic Parsonnet scores more effectively predict mortality in coronary bypass surgery patients over the age of sixty-five compared to those under the age of sixty-five. In addition, the effectiveness results of the three scoring systems were not statistically different. Hence, all three scoring systems are equally effective in assessing patients aged ≥65 years.

Another conclusion from our study is that the scoring systems are adequately effective in both age groups. This shows us that these scoring systems maintain their effectiveness.

Limitations

Our retrospective cohort study was a single center study. Multicenter studies are needed for further assesment of the scoring systems (EuroSCORE II, Log EuroSCORE and Log Parsonnet). However, number of patients in the study was valuable factor even if it was a single-center study. The other limitation reducing the number of patients in our study was that the data for patients before 2012 were not included in the study, because scoring systems had not been developed yet.

Conclusion

EuroSCORE II, logistic EuroSCORE, and logistic Parsonnet systems, all of which are preoperative risk scoring systems that are currently used in coronary bypass surgery, give more accurate results in geriatric patients compared to non-geriatric patients. Future studies can help better understand the effects of patient age, gender, and physiological changes caused by chronic diseases on organs and systems and help divide preoperative risk scoring systems into sub-scales to increase practical accuracy.

References

1. Şahin M, El H, Mert FTİ. Comparison of three different sternal closure techniques after cardiac surgery in elderly patients. J Surg Med, 2018;2(3):205-9.
2. Türkan K. Kalp Cerrahisi Geçirecek Yaşlı Hastalarda Preoperatif Değerlendirme. GKDA Derg 2014;20(3):162-6.
3. Silvay G, Castillo JG, Chikwe J, Flynn B, Filsoufi F. Cardiac anesthesia and surgery in geriatric patients. Semin Cardiothorac Vasc Anesth. 2008 Mar;12(1):18-28. doi: 10.1177/1089253208316446. Epub 2008 Apr 7. PMID: 18397906.
4. Roques F, Michel P, Goldstone AR, Nashef SA. The logistic EuroSCORE. Eur Heart J. 2003 May;24(9):881-2. doi: 10.1016/s0195-668x(02)00799-6. PMID: 12727160
5. Nashef SA, Roques F, Michel P, Gauducheau E, Lemeshow S, Salamon R. European system for cardiac operative risk evaluation (EuroSCORE). Eur J Cardiothorac Surg. 1999 Jul;16(1):9-13. doi: 10.1016/s1010-7940(99)00134-7. PMID: 10456395.
6. Parsonnet V, Dean D, Bernstein AD. A method of uniform stratification of risk for evaluating the results of surgery in acquired adult heart disease. Circulation. 1989 Jun;79(6 Pt 2):I3-12. Erratum in: Circulation 1990 Sep;82(3):1078. PMID: 2720942.
7. Kowalczuk-Wieteska A, Parys M, Majchrzyk I, Zembala M, Zembala M. Can the Vulnerable Elders-13 Survey (VES-13) scale replace the EuroSCORE scale in predicting complications in patients over 60 years of age undergoing cardiac surgery? Postepy Kardiol Interwencyjnej. 2019;15(2):211-7. doi: 10.5114/aic.2019.86014. Epub 2019 Jun 26. PMID: 31497054; PMCID: PMC6727232.
8. Çelik, F, Tüfek A, Yıldırım ZB, Karaman H, Baykan H, Kavak GÖ, et al. İleri derece yaşlı hastada mini doz bupivakain ile spinal anestezi. J Clin Exp Invest. 2014;1(3):214-5.
9. Turrentine FE, Wang H, Simpson VB, Jones RS. Surgical risk factors, morbidity, and mortality in elderly patients. J Am Coll Surg. 2006 Dec;203(6):865-77. doi: 10.1016/j.jamcollsurg.2006.08.026. PMID: 17116555.
10. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987;40(5):373-83. doi: 10.1016/0021-9681(87)90171-8. PMID: 3558716.
11. Wanebo HJ, Cole B, Chung M, Vezeridis M, Schepps B, Fulton J, et al. Is surgical management compromised in elderly patients with breast cancer? Ann Surg. 1997 May;225(5):579-86; discussion 586-9. doi: 10.1097/00000658-199705000-00014. PMID: 9193185; PMCID: PMC1190799.
12. Bugeja G, Kumar A, Banerjee AK. Exclusion of elderly people from clinical research: a descriptive study of published reports. BMJ. 1997 Oct 25;315(7115):1059. doi: 10.1136/bmj.315.7115.1059. PMID: 9366735; PMCID: PMC2127695.
13. Speziale G, Nasso G, Barattoni MC, Esposito G, Popoff G, Argano V, et al. Short-term and long-term results of cardiac surgery in elderly and very elderly patients. J Thorac Cardiovasc Surg. 2011 Mar;141(3):725-31, 731.e1. doi: 10.1016/j.jtcvs.2010.05.010. Epub 2010 Jun 19. PMID: 20646718.
14. Yorgancioğlu et al. İleri yaş grubunda koroner bypass deneyimi. 5. Ulusal Göğüs Kalp ve Damar Cerrahisi Kongresi, 20-24 Ekim 1998 Antalya
15. Roques F, Nashef SA, Michel P, Gauducheau E, de Vincentiis C, Baudet E, et al. Risk factors and outcome in European cardiac surgery: analysis of the EuroSCORE multinational database of 19030 patients. Eur J Cardiothorac Surg. 1999 Jun;15(6):816-22; discussion 822-3. doi: 10.1016/s1010-7940(99)00106-2. PMID: 10431864.
16. Mullany CJ, Mock MB, Brooks MM, Kelsey SF, Keller NM, Sutton-Tyrrell K, et al. Effect of age in the Bypass Angioplasty Revascularization Investigation (BARI) randomized trial. Ann Thorac Surg. 1999 Feb;67(2):396-403. doi: 10.1016/s0003-4975(98)01191-6. PMID: 10197660.
17. Kouchoukos NT, Oberman A, Kirklin JW, Russell RO Jr, Karp RB, Pacifico AD, et al. Coronary bypass surgery: analysis of factors affecting hospital mortality. Circulation. 1980 Aug;62(2 Pt 2):I84-9. PMID: 6967378.
18. Brawley RK, Merrill W, Gott VL, Donahoo JS, Watkins L Jr, Gardner TJ. Unstable angina pectoris. Factors influencing operative risk. Ann Surg. 1980 Jun;191(6):745-50. doi: 10.1097/00000658-198006000-00013. PMID: 6966911; PMCID: PMC1344788.
19. Cosgrove DM, Loop FD, Lytle BW, Baillot R, Gill CC, Golding LA, et al. Primary myocardial revascularization. Trends in surgical mortality. J Thorac Cardiovasc Surg. 1984 Nov;88(5 Pt 1):673-84. PMID: 6492837.
20. Edmunds LH Jr, Stephenson LW, Edie RN, Ratcliffe MB. Open-heart surgery in octogenarians. N Engl J Med. 1988 Jul 21;319(3):131-6. doi: 10.1056/NEJM198807213190302. PMID: 3386692.
21. Katz NM, Hannan RL, Hopkins RA, Wallace RB. Cardiac operations in patients aged 70 years and over: mortality, length of stay, and hospital charge. Ann Thorac Surg. 1995 Jul;60(1):96-100; discussion 100-1. PMID: 7598628.
22. Alexander KP, Anstrom KJ, Muhlbaier LH, Grosswald RD, Smith PK, Jones RH, et al. Outcomes of cardiac surgery in patients > or = 80 years: results from the National Cardiovascular Network. J Am Coll Cardiol. 2000 Mar 1;35(3):731-8. doi: 10.1016/s0735-1097(99)00606-3. PMID: 10716477.
23. Parsonnet V. Risk stratification in cardiac surgery: is it worthwhile? J Card Surg. 1995 Nov;10(6):690-8. doi: 10.1111/j.1540-8191.1995.tb00659.x. PMID: 8574027.
24. Akins CW, Daggett WM, Vlahakes GJ, Hilgenberg AD, Torchiana DF, Madsen JC, et al. Cardiac operations in patients 80 years old and older. Ann Thorac Surg. 1997 Sep;64(3):606-14; discussion 614-5. doi: 10.1016/s0003-4975(97)00615-2. PMID: 9307446.

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