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The Validity of Euro Score in Patients who underwent off pump coronary artery bypass graft

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ABSTRACT

European score system has been used to predict the morbidity and mortality rate of the patients who underwent open heart surgery. This is an attempt to evaluate the validity of Euro SCORE in off-pump coronary artery bypass surgery at Afshar Heart Center. 367 consecutive patients who underwent primary or redo off-pump CABG in Afshar Heart Center during October 2010 to March 2011 were collected. The Euro SCORE forms were filled and incidence of post-operative morbidity and mortality were determined. The Patients were categorized into 4 groups of low-risk (logistic score: 0-1.99), medium-risk (logistic score: 2-10.99), high-risk (logistic score: 11-19.99) and severe risk (logistic score: 20-62.80). The mean patient age was 61.19±10.90 years including 66.8% male and 33.2% female. Overall average mortality rate was 4.4%. Hospital stay was 6.1±3.6 days. IABP was used in 3.8%. Major complications were renal failure, bleeding, arrhythmia, pulmonary emboli, CVA, respiratory failure and MI. Arrhythmia was the most common complication that was the cause of mortality. The mortality rates were 0%, 1.7%, 13.2%, and 38.9% in low, medium, high and severe-risk groups, respectively. Euro SCORE is valid in OPCAB to modify the risk stratification of the patients who underwent OPCAB.

Key words: Validity, Euroscore, off pump coronary artery bypass surgery

1. INTRODUCTION

European system for cardiac operative risk evaluation (EuroSCORE) was developed in Europe in the late 1990s (1, 2). This calculation system can evaluate perioperative morbidity and mortality in patients undergoing cardiac surgery. EuroSCORE has been widely accepted in Europe and other countries (3-5). In most of the countries EuroSCORE system was used for on-pump coronary artery bypass grafting (CABG) (6, 7). Many studies showed that off-pump coronary artery bypass grafting needs recovery times less than on-pump technique (1, 8) Nevertheless, we decided to evaluate our patients undergoing OPCAB with this risk calculation system. At Afshar Heart center the majority of the patients that need coronary artery bypass surgery underwent off-pump technique. This is the first research in Iran that uses EuroSCORE for evaluation of morbidity and mortality in OPCAB. In this study the outcomes including major complications and mortality with EuroSCORE in OPCAB patients were evaluated.

2. MATERIALS AND METHODS

From October 2009 to March 2010, 367 patients at Afshar Heart center who underwent primary or redo coronary artery bypass surgery with off-pump technique were enrolled in the study and EuroSCORE forms were calculated for each one (based on original EuroSCORE 1 criteria (1, 3)). In this center off-pump technique coronary artery bypass had 5 years history and all surgeons were expert. Exclusion criteria were operations except isolated CABG including valvular heart disease, septal defect and thoracic aorta surgery. Post-operative major complications including renal failure, post-operative bleeding, myocardial infarction, CVA, pulmonary emboli, arrhythmia (atrial fibrillation, supraventricular tachycardia, Ventricular tachycardia, Ventricular fibrillation and bradycardia), mediastinitis, respiratory failure (prolonged ventilator support for > 5 days, re-intubation or need for tracheostomy) and mortality were analyzed for all patients

(1).

3. RESULTS AND DISCUSSION

In this study all of the OPCAB patients were evaluated for morbidity and mortality with EuroSCORE system. 367 patients underwent CABG using off-pump technique including 66.8% male and 33.2% female. Mean age was 61.19+10.9 years (Table 1).

Table 1. Patient's demographics

	N	%
Patients Factors:		
Age (mean years ± S.D)	61.9±10.9	
Female Sex	122	33.2
Chronic Pulmonary Disease	25	6.8
Extra Cardiac Arteriopathy	4	1.1
Neurologic Dysfunction	4	1.1
Previous cardiac Surgery	4	1.1
Serum Cr>200 µmol/lit	18	4.9
Cardiac Factors:		
LV Dysfunction (EF: 35-50%)	110	30
LV Dysfunction (EF≤35%)	77	21
Recent Myocardial Infarction	76	20.7
Previous PCI	11	3
IABP	14	3.8
Other factors:		
Distal Anastomosis (mean ±S.D)	2.56±0.7	
Hospital stay	6.1±3.6	

S.D.: standard deviation, EuroSCORE: European system for cardiac operative Risk Evaluation.

Mortality rate was 4.4%. The mean hospital stay was 6.1+3.6 days. In alive patients major complications were renal failure (48.8%), arrhythmia (25.6%), post-operative bleeding (23.3%), mediastinitis (4.7%), pulmonary emboli (2.3%), and bradycardia (2.3%).

Major complications in expired patients were arrhythmia (37.3%), myocardial infarction (31.3%), post-operative bleeding (23.3%), pulmonary emboli (6.3%), CVA (6.3%), respiratory failure (6.3%). The most common cause of mortality was arrhythmia.

Based on EuroSCORE the patients were categorized into 4 groups:

- Low risk: (logistic score: 0-1.99)
- Medium risk:(logistic score:2-10.99)
- High risk: (logistic score: 11-19.99)
- Severe risk:(logistic score:20- 62.99)

Statistical analyzes were presented as mean ± standard deviation or percentage. All data were analyzed by SPSS17 software. Patient's data were calculated with t-test, exact test and chi-square test. The correlation between each outcome and EuroSCORE was accessed by the correlation coefficient(r). If correlation was adequate with R-value above 0.60 and p-value <0.05 the receiver operating characteristic curve (ROC curve) and the area under the curve was calculated (1, 4). Under the ROC curve an area of 1.0 indicates complete discrimination and an area of 0.50 indicates complete absence of discrimination. If area under ROC curve is > 0.8 it means powerful discrimination of the model and if area under ROC curve is > 0.7 it is acceptable for our purpose (Figure 1 and Table 2).

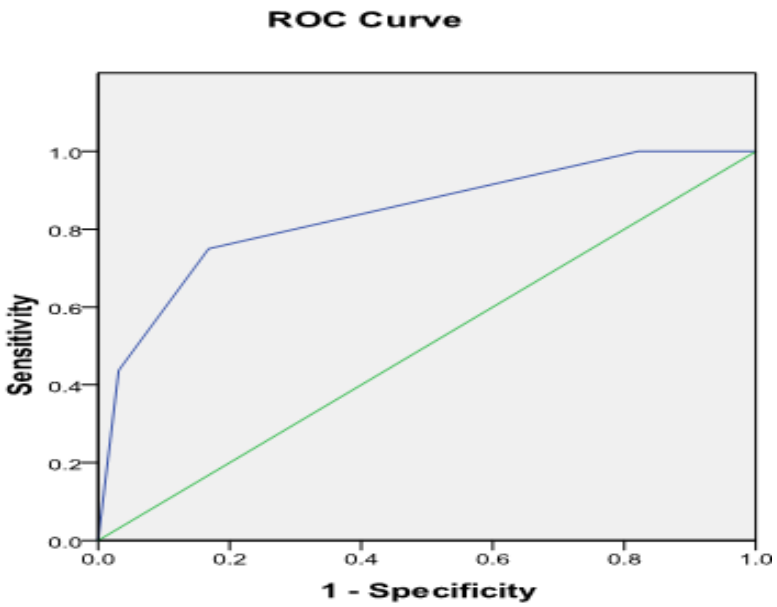

Figure 1. ROC Curve

Table 2. Correlation score Gamma (r) between each complication and EuroSCORE. The area under the receiver operating characteristics (ROC curve) was calculated if there was appropriate correlation

	Off-pump Iran		
	r	p-value	ROC
Death	0.683	0.001	0.822
Major Complication	0.517	0.001	0.739
Renal Failure	0.530	0.001	0.747
Mediastinitis	0.358	0.402	-
Bleeding	0.270	0.165	-

EuroSCORE,European system for cardiac operative Risk Evaluation.

In this study we used IABP for 14 patients preoperatively (preoperative in 3 cases, intra operative in 3 cases and post-operative in 8 cases). The distribution number of diseased vessels in all cases were MVD (7.1%), 2VD (23.14%), 3VD (63%) and 3VD+LMCA (6.5%). The mean number of distal anastomosis was 2.56+0.7 (Table1). The mean number standard of EuroSCORE was 5.15+2.7 with CI (Confidence Interval) 95% and the mean number of logistic score of EuroSCORE was 6.24+7.56 with CI 95%. Logistic score number can predict mortality rate. Pearson correlation between standard EuroSCORE and logistic was r=0.867 that had p-value=0.000 that suggests a good relationship between them (Figure 2 and Table 3, Table 4).

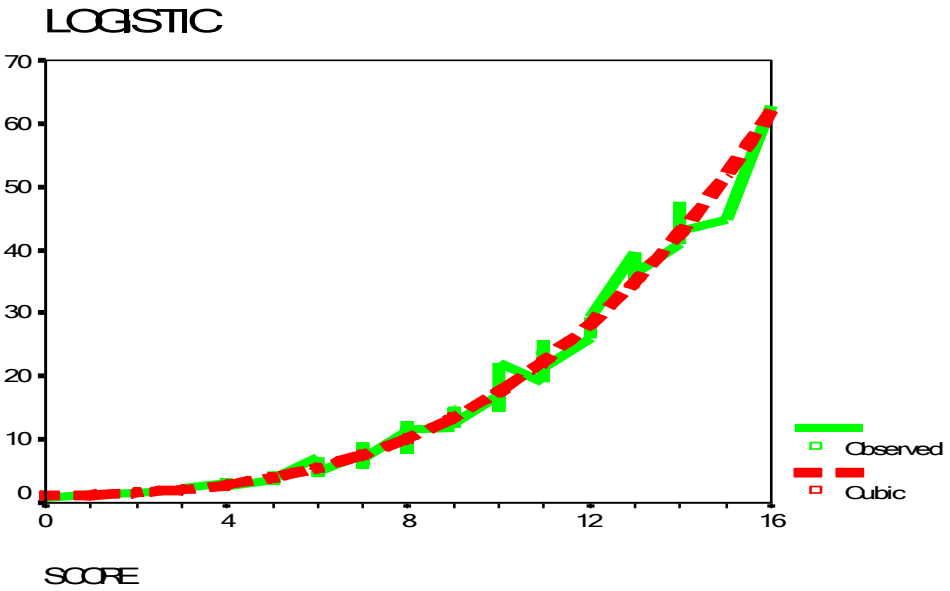

Figure 2. Correlation between standard EuroSCORE and logistic

Relationship between these variables is evaluated with cure fit in SPSS17 software and the result of this cure is:

Logistic= 1.1 + 0.14 (St. Sc.) + 0.21 (St. Sc.)^2 + 0.013 (St. Sc.)^3

St. Sc. : Standard Score

For this model R-Square equals to 0.984 that indicates logistic score can cover prediction mortality rate.

Table 3. Comparison of characteristics factors and cardiac factors between Afshar heart center and H.Hirose article

	Afshar		Hirose		P Value
	N=367		N=1162		
	n	%	n	%	
Patients Factor:					
Age (mean±SD)	61.19 ±10.9		66.5 ±9.7		0.000t
Female Sex	122	33.2	256	22	0.001c
Serum Cr>200 µ mol/lit	18	4.9	61	5.2	0.795c
Neurologic Dysfunction	4	1.1	152	13.1	*
Extra Cardiac Arteriopathy	4	1.1	96	8.3	*
Chronic Obsteractive Pulmonary disease	25	6.8	59	4.5	0.204c
Previous Cardiac Surgery	4	1.1	31	2.7	*
Cardiac Factors:					
Recent MI	79	20.7	39	3.4	0.001c
Operative Factors:					
EuroSCORE	5	2.7	3.5 ±	2.3	<0.05t
Distal Anastomosis	2.56 ±	0.7	3.5 ±	1.4	0.000t

*: not available for measurement; t: t-test; C: Chi-Square test

The results of this study were also compared to H. Hirose article published in Interactive Cardiovascular and thoracic surgery journal in December 2009 (7).

Table 4. Estimated value calculated mortality by Standard analyses

Standard of ES	N	Mortality	%
0-2	63	0	0
3-7	233	4	1.7
8-10	53	5	9.4
11-16	18	7	38.9
Total	367	16	4.4

ROC= 0.838 P-Value= 0.000 Exact-test

According to standard number of EuroSCORE the data were distributed to 4 groups. Analyses show that the higher number of EuroSCORE accompanied by higher mortality rate. Patients who underwent OPCAB demonstrated that incidence of morbidity and mortality directly correlated with number of EuroSCORE. EuroSCORE system was being used for on-pump CABG in other countries. Studies demonstrated that EuroSCORE system was useful for on-pump technique (2). This study indicates that the correlation is enough to predict mortality with off-pump technique. This study demonstrates that mortality rate in patients with a logistic of EuroSCORE below 10 is low and it is high in patients with logistic score higher than 20 (Table 5).

Table 5. Estimated value calculated mortality by Logistic analyses

Logistic of ES	n	Mortality	%
0-1.99	72	0	0
2-10.99	239	4	1.7
11-19.99	38	5	13.2
20-62.8	18	7	38.9
Total	367	16	4.4

ROC=0.854 P-Value=0.000 Exact-test

Logistic number of EuroSCORE can predict mortality rate in OPCAB better than standard number of EuroSCORE. This study showed that the incidence of renal failure was higher than other complications. The second common complication was post-operative bleeding (Table5). Other complications were arrhythmia, mediastinitis, pulmonary emboli and bradycardia. Incidence of Pulmonary emboli and bradycardia were lower than other complications. The data indicated that higher EuroSCORE patients have greater risks of post-operative renal failure. The data demonstrated that incidence of intra-aortic balloon pump insertion is higher in patients with higher number of EuroSCORE. In this study mediastinitis was occurred in 4.7% that appears to be due to diabetes. Post-operative myocardial infarction was the cause of mortality that could be related to technical method rather than patient's risk factor. But these complications were not related to EuroSCORE. In Comparison to ROC analyses the discriminately power of EuroSCORE for prediction of mortality rate in OPCAB is useful. Previously, EuroSCORE was established for on-pump technique (6, 7). However, this system has been used for prediction of mortality rate in OPCAB in some countries (9, 10). As a result EuroSCORE system was evaluated for off-pump technique. The analysis suggested that it is useful for prediction of morbidity and mortality rate for OPCAB patients. We found that patients undergoing OPCAB can discharge earlier from hospital that seems to be due to the lower rate of major complications in off-pump technique. the patients in this study stayed in hospital for 6.1±3.6 days. Patients with major complications and higher EuroSCORE stayed more in hospital.

4. CONCLUSION

Based on this study EuroSCORE can predict mortality and major post-operative complications in patients who underwent OPCAB and comparable with the use of EuroSCORE in on-pump technique. Despite other studies that use EuroSCORE for on-pump technique it appears that this system could be used for off-pump technique and it is powerful for prediction of mortality in OPCAB, as well.

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AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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