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ORIGINAL ARTICLE

A survival after coronary artery bypass grafting surgery with ejection fraction below 30 percent

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Abstract

Introduction: Regarding the progress in surgeries, the mortality rate of coronary artery bypass grafting surgery is still low, despite advanced age and comorbidities. One of the independent causes of mortality rate is low ejection fraction (EF). This study aimed to assess mortality after coronary artery bypass grafting (CABG) operation in patients with ejection fraction under 30%. In the present study the experience of 20 patients with an EFbelow 30% and 20 patients with an EF above 30% was investigated in Birjand in which only three of the patients died within 2 years after the operation.

Methods: This crross-sectional descriptive study was conducted on 40 patients in Birjand Vali-e-aser Hospital. Out of the 40 cases, 20 patients had EF below 30% and 20 subjects had EF above 30 %. The files of all the cases undergoing heart surgery with an EF were obtained since 2015 to 2017, and then their demographic features, such as addresses and phone numbers were collected. Afterwards, they were called and their mortality was checked and the data were analyzed with independent-samples t-test. In addition, the ratios were examined in SPSS Software (version 22) and P-value considered higher than 0.05.

Results: From 2015 to 2017, the two groups, including 20 patients with EF<30% and 20 patients with EF>30%, undergone CABG surgery in Birjand University of Medical Science, 65% of which were men and 35 % were women with the age range of 64.7 for the cases with EF<30 and 62.5 for the subjects EF>30. One of the patients died with an EF above 30% and two subjects died with EF below 30%.

Conclusions: The mortality rate can be reduced with providing appropriate care despite the fact that an EF<30% is an independent cause of mortality and according to the results of the present study which showed three patients died after the CABG operation.

Key Words: Coronary artery bypass grafting surgery, Left ventricural, Survival, Ventricular dysfunction

Introduction

Coronary artery diseases are a cause of death in adults all over the world (1). It is predicted that these diseases will be the first cause of sudden death by 2020 (2). The acute case of coronary artery disease does not appropriately respond to drug treatment and surgery is still the best treatment (3). According to the available information, each year nearly 600,000 coronary artery bypass grafting (CABG) surgeries are performed in the world (4). Coronary artery

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bypass surgery is carried out with two methods, namely on-pump and off-pump. The results of coronary artery bypass graft surgeries are commonly good. This surgery is performed to entirely alleviate or treat the symptoms of angina for most patients. Although the sign of these diseases can relapse, it is likely that many patients do not have any symptoms for 10 to 15 years (5). Furthermore, it is declared that coronary artery bypass surgery does not improve patient's functionality; however, it increases their quality of life (6).

This surgery reduces the risk of heart attack and further helps promote their longevity (5). Generally, the mortality rate in patients with severe left ventricular dysfunction after the coronary artery bypass surgery is 2.7%-33% but there are many effective factors influencing the result of the surgery, including female gender, weak function of the left ventricular, diabetes, emergency surgery, arterial involvement, and ejection fraction (EF), which is assessed by Echocardiography (6,7). According to the available information, it is considered an EF of below 30% shows weak function of left ventricular (8). This is why some researchers described the coronary artery bypass surgery in these patients with high mortality risk after the operation. In this study, it was aimed to evaluate mortality rate after the surgery in subjects with EF below 30%.

Methods

This cross-sectional descriptive study was conducted on 40 patients in Birjand Vali-e-aser Hospital. The code of ethics was taken from the Ethics Committee affiliated with Birjand University of Medical Sciences (Code:Ir.bums.REC.1397.41). In the present study, the data were collected from 40 patients that 20 patients had EF below 30% and 20 cases had EF above 30% and the subjects underwent CABG surgery from 2014 to 2017. All the patients with equal conditions in the surgery room were operated utilizing the same technique and received the same care in the intensive care unit (ICU).

The data of the patients were collected using a self-made questionnaire, including demographic features (i.e., age, gender, high blood pressure, diabetes, and addiction), the use of intra-aortic balloon pump (IABP), cardiopulmonary bypass, implantable cardioverter defibrillator (ICD), renal failure before and after the operation, length of ICU stay and cardiac intensive care unit. The EF of all the cases was collected, and then the patients were called to check their mortality condition. Eventually, the data were analyzed with independent-samples t-test and the ratios were examined in SPSS Software (version 22). P-value considered higher than 0.05. Analysis of central distribution criteria and frequency tables were prepared in order to summarize and classify the data.

Results

From 2015 to 2017 two groups were considered, including 20 cases with EF below 30% and 20 patients with EF above 30% that underwent coronary artery bypass surgery in Birjand University of Medical Sciences, 65% of which were men and 35% were women. The age ranges were 64.7 (SD=6.89) and 62.5 (SD=11.02) for the patients with EF below 30% and for EF above 30%, respectively. Moreover, the number of patients' grafts with EF<30 was 3.65 (SD=1.14) and the cases with EF>30 was 3.60 (SD=0.60) (Table 1). Out of all subjects, 0.67% of the cases that died had addiction, high blood pressure, and diabetes. The length of ICU stay for Patients with on-pump method was 2.90 days (SD=0.78) and with off-pump method was 2.37 days (SD=0.76). On the other hand, the length of ward stay for patients with on-pump method was 4.80 days (SD=2.56) and with off-pump was 4.50 days (SD=1.92) (Table 3).

Table 1: Patients' age and graft

		Mean	Standard Deviation	T- statistic	P-value
Age	EF<30	64.70	6.89	0.76	0.45
	EF>30	62.50	11.02		
Graft	EF<30	3.65	1.14	0.17	0.86
	EF>30	3.60	0.60		

Table 2: The mortality of patients based on patients' Feature

	Death		Alive		Ratios Difference Test	P-value
	Number	Percent	Number	Percent		
Addiction	2	0.67	3	0.08	-3.25	<0.01
Blood pressure	2	0.67	18	0.49	-0.59	0.56
Diabetes	2	0.67	15	0.40	-0.87	0.39

Table 3: T-test for two independent variables, namely length of ICU and ward stay

	On-pump Off-pump	Mean	Standard deviation	T-test	P- value
Length of ICU stay (day)	on	2.90	0.78	2.11	0.03
	off	2.37	0.76		
Length of Ward stay (day)	on	4.80	2.56	0.46	0.64
	off	4.50	1.92		

Table 4: Ratios difference test of subjects' operation features

	EF<30		EF>30		Ratios difference test	P-value
	Number	Percent	Number	Percent		
Elective	12	60	15	75	-1.01	0.32
Urgent	8	40	5	25	1.09	0.32
Intra-aortic balloon pump	9	45	1	5	3.21	<0.01
Mortality	2	10	1	5	0.59	0.56

Table 5: The features of the patients based on gender

	Male		Female		Ratios difference Test	P-value
	Number	Percent	Number	Percent		
Diabetes	9	34.61	8	57.14	-1.37	0.18
High blood pressure	10	38.46	10	71.42	-2.04	0.04
Implantable cardioverter defibrillator	1	3.84	1	7.14	-0.45	0.66
Urgent	10	38.46	3	21.42	1.09	0.28
Elective	16	61.53	11	78.57	-1.14	0.28

Among the cases, 60% of the subjects with EF<30 and 75% with EF>30 had elective surgery. Furthermore, 40% of the subjects with EF<30 and 25% with EF>30 underwent urgent surgery and IABP was used for 45% of the patients with EF<30 and 5% of patients with EF>30 (Table 4). The ICD implantation was observed in 3.84% of males and 7.14% of female. In addition, 34.61% of males and 57.14% of females were diabetic.

Blood pressure was noticed in 38.50% of males and 71.42% of females had. Furthermore, 38.46% of males and 21.42% of females underwent urgent surgery. On the other hand, 61.53% of males and 78.57% of females had elective surgery (Table 5). None of the cases had renal failure before the operation and 2.5% suffered (i.e., one patient) from renal failure after the operation. Left Lima was grafted on all the patients and one of the patients died with EF above 30% and two subjects died with EF below 30%. One of the cases died within one month after the operation due to arrhythmia and another subject with EF above 30% after 2 years.

Discussion

There is no specific definition about left ventricular dysfunction; however, the most common was considered that is EF below 30% (8). Based on the literature, the survival rate for these patients is from 59% to 72% (7, 9, 10). Edward et al. (2006) considered 10 risk factors one of which was EF. The score possible for each variable ranges from 0-5 with EF below 20% equal to 4, EF range from 20 % to 29% equal to 3, and EF range from 30% to 39% equal to 2 (11).

In a study performed by Soliman Hamed, survival rate in patients with EF below 35% was about 79% within one year after the operation. On the other hand, cases with EF above 50% had a survival rate of about 95.1%. Furthermore, in the mentioned study it was declared that low EF percent is a risk factor both in early and delayed mortality after CABG (12). Nonetheless, the results of this study stated the survival rate was 90%, and undergoing CABG surgery for patients with EF below 30% is useful and it is not an effective risk factor regarding the mortality after the operation.

Moreover, this was in line with the results of a study carried out by Mohammad zadeh Jouryabi et al. 2017 (13). Torabian et al. reported that diabetes and high blood pressure were more in females; however, based on the findings of this study only high blood pressure is further in females. In addition, in the present study, the rates of elective and non-elective surgery were independent in gender that was in contrast with the results of the mentioned study. On the other hand, in that study there was no relation between age and survival after CABG surgery that was in line with the results of the present study (14).

Carmelo et al. declared that female gender was

associated with the need for surgery that is similar to the results of this study (P=0.000) (15). Simon Maltais et al. demonstrated that the average age was not significant that it is in line with the findings of the present study (P=0.454) (16). Kazim et al. reported in patients with EF below 30% the use of IABP is significant (P= 0.000); however, there was no difference between the number of patients' graft with EF below 30% and EF above 30% (P= 0.957) that are comparable with this study (P=0.863). Based on this, P-value was considered 0.004 for the former and it was observed 0.786 for the latter. In addition, the time of the surgery were known as risk factors unrelated to mortality rate after the surgery (8).

According to the literature, it is pointed out that the age, certain serum, comorbidity of valve disease, time of the pump, and length of hospitalization were related to mortality rate after the operation. Furthermore, no difference was observed in the survival of 32 patients in the group with no improvement in left ventricular ejection fraction (from 0.24±0.05 to 0.23±0.06) and the group with improvement (from 0.24±0.05 to 0.39±0.10) (17). The results of this study were in line with Z.G. Zhu et al. revealed that the patients undergoing on-pump CABG surgery had longer length of hospital stay compared with the cases undergoing off-pump CABG surgery (P=0.001) (18).

In the present study, renal failure in patients was 2.5%, which was less than that in a study by Maltais S et al. (16). Moreover, according to our results addiction was related with mortality after CABG surgery (0.002). In the present study, it was showed that the cause of the death in one of the patients was arrhythmia, which is in line with the results of a study performed by Hasanzadeh revealed that the highest morbidity rate after coronary artery disease was due to atrial fibrillation (19). The limitations of the present study were the small sample size and lack of knowledge about patients' lifestyles, specially anxiety as a remarkable factor influencing the outcome of coronary bypass graft and eventually the quality of life (20).

Conclusions

In spite of the fact that EF below 30% is an independent factor in mortality rate and suitable care can minimize mortality after coronary artery bypass. Moreover, in order to investigate the effects of length of time after the operation and observation of some variables, such as hospital care after the surgery, surgical technique, surgeon himself, and patient self-care training, it is recommended that future studies should be carried out in a few more hospitals. It is worth mentioning that the mortality rate of 10% in patients with EF below 30% and 5% in patients with EF above 30% in the present investigation is quite acceptable by the world standards.

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Author's contribution

Dr. Ahmad Amouzeshi performed the data analysis. Dr. Malihe Zangouie carried out the data collection and wrote the manuscript. Dr. BibiFateme Shakhsemampour conducted the search of references in the article.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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