

Postoperative Results of Off-Pump Coronary By-pass Grafting in Elderly Patients: A Single Center Experience

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Abstract: *Aim:* We aimed to report our postoperative results in elderly patients that had off-pump coronary bypass grafting.

Method: Data of 173 patients with isolated coronary bypass 70 years of age or older were retrospectively evaluated. One month follow-up data were evaluated in all patients. After getting verbal informed consent a total of 91 patients were included in the quality of life assessment via EuroQoL form. The data of patients with age of 70-74 and 75 or older were compared.

Results: The mean ages of patients at age of 70-74 and ≥ 75 were 71.69 ± 0.16 and 76.81 ± 0.23 years; respectively. Eleven cases had in-hospital mortality (6% of 173 patients). The mean follow-up period for the group that were reached for EuroQoL assessment was $46,3 \pm 20,8$ months. The percent of cases among the whole study group that had participated in the quality of life questionnaire were in good condition in terms of mobility, self-care, usual activities, pain/discomfort, anxiety/depression were %75, %87, %81, %92 and %89; respectively.

Discussion: Off-pump coronary bypass operation may be safely used in elderly patients with high quality of life and low morbidity and mortality.

Key Words: Older age, Coronary bypass, Beating heart, Quality of life, EuroQoL.

BACKGROUND

A number of non-randomized studies have shown that off-pump coronary by-pass grafting (CABG) is as safe as on-pump surgery, and in experienced hands offers less early complications, particularly in those patients with significant co-morbidity. In high-risk groups, particularly in groups over 70 years of age, there is a reduction in the incidence of cerebral injury when an off-pump technique is employed [1]. However, randomized trials have not yet revealed a significant reduction in morbidity or mortality [1]. Zhang *et al.* in their very recent study suggested that off-pump CABG was a safe alternative to on-pump CABG in dialysis patients. By avoiding cardiopulmonary bypass, they had less perioperative blood utilization, myocardial infarction (MI), and hospital mortality [2]. In this study we aimed to report our results of one month follow-up of patients that had off-pump CABG at an age of 70 years or older. Also in cases that we were able to reach we evaluated the quality of life by using the EuroQoL score.

MATERIAL AND METHODS

The study was conducted at the Cardiovascular Surgery Department of Applied Research Center for Health of Uludağ University Medical Faculty in Bursa Turkey. The data of patients who were 70 years or older and had isolated CABG between October 1st of 2000 and January 31st of

2008 were collected. A total of 173 patients were included for evaluation of results of the one month follow-up and mortality data. There was in-hospital mortality in eleven patients. Among the remaining 162 patients in 33 cases we were not able to reach the patients of his/her relatives. Nine of the 129 cases had mortality in the late postoperative period that was evident by the hospital records and information gathered by the relatives of the patients. The diagnoses in these cases were; intracranial hemorrhage in one, mesentery embolism in one, gastrointestinal tract perforation in one, chronic renal failure in one, leukemia in one, heart failure in one and undetermined in three patients. We excluded 10 patients that had history of stroke prior to surgery ($n = 2$), and cases with NYHA functional class IV ($n = 8$). Among the remaining 110 patients 91 gave their verbal consent to participate in the questionnaire regarding the quality of life. To those patients we applied EuroQoL questionnaire by phone. Via EuroQoL we evaluated the mobility, self-care, usual activities, pain/discomfort and anxiety/depression of those 91 cases. We also asked the presence of angina pectoris and history of myocardial infarction. We accepted the mortality that had occurred in 30 days after the operation as in-hospital mortality. In case of MI we accepted a creatinin kinase myocardial band (CK-MB) serum level > 50 U/I and a presence of new Q wave in ECG as diagnostic criteria.

The EuroQoL questionnaire (Table 1) is composed of a five-item health status measure that includes mobility, self-care, usual activities, pain, discomfort, and anxiety and/or depression. Answers received a score ranging from 1 to 3 (depending on whether patients perceived no problems as 1, some problems as 2, or significant problems as 3) in that aspect of their health [3].

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Table 1. EuroQoL Score Form

<i>Place a tick in one box in each group below, indicating which statements best describe your own health state</i>		
Mobility	Option	
I have no problems in walking about	<input type="checkbox"/>	1
I have some problems in walking about	<input type="checkbox"/>	2
I am confined to bed, unable to walk without help	<input type="checkbox"/>	3
Self-Care		
I have no problems with self-care	<input type="checkbox"/>	1
I have some problems washing or dressing myself	<input type="checkbox"/>	2
I am unable to wash or dress myself	<input type="checkbox"/>	3
Usual Activities		
I have no problems performing my usual activities	<input type="checkbox"/>	1
I have some problems with performing my usual activities	<input type="checkbox"/>	2
I am unable to perform my usual activities	<input type="checkbox"/>	3
Pain / Discomfort		
I have no pain or discomfort	<input type="checkbox"/>	1
I have moderate pain or discomfort	<input type="checkbox"/>	2
I have extreme pain and discomfort	<input type="checkbox"/>	3
Anxiety / Depression		
I am not anxious or depressed	<input type="checkbox"/>	1
I am moderately anxious or depressed	<input type="checkbox"/>	2
I am extremely anxious or depressed	<input type="checkbox"/>	3

OFF-PUMP CORONARY BYPASS OPERATION

Off-pump CABG was performed with the Medtronic Octopus II or III stabilizing device (Medtronic, Minneapolis, Minn) for coronary stabilization and deep pericardial traction sutures for cardiac displacement. Technical details of surgery for patients are described in the literature [4].

STATISTICAL ANALYSIS

Pearson Ki-Square Test and Mann-Whitney U test were the tests used in the statistical analyses with JMP 6.0 (SAS Institute, Cary, NC, USA) Software System. Statistical significance was assumed in case of a p value <0.05. The results are expressed as mean \pm standard deviation.

RESULTS

We divided the whole group into two according to their ages as patients having age of lower than 75 and patients 75 years of age or older. The mean ages of patients at age of 70-74 and ≥ 75 were 71.69 ± 0.16 and 76.81 ± 0.23 years; respectively. The preoperative demographical characteristics are given in Table 2. The mean follow-up period for the group that were reached for EuroQoL assessment was $46, 3 \pm 20, 8$ months. The number of female that were included in the EuroQoL assessment at age of 70-74 and ≥ 75 were 18 (%27) and 9 (%34); respectively. The postoperative data are given in Table 3. The data regarding the questionnaire for quality of life is given in Table 4. Eleven cases had in-hospital mortality (%6 of 173 patients). One of these

eleven patients died after discharge and the remaining died in hospital. The distribution of the cases and the in-hospital mortality rates per year are given in Table 5. There was angina in six and MI in five patients among the whole study group (n=173). The percent of cases among the whole study group that had participated in the quality of life questionnaire were in good condition in terms of mobility, self-care, usual activities, pain/discomfort, anxiety/depression was %75, %87, %81, %92 and %89; respectively. The mobility domain scores in patients at age of 70-74 and ≥ 75 were 1.30 ± 0.49 and 1.15 ± 0.36 respectively (p= 0.36). Self care was 1.15 ± 0.40 in patients at age of 70-74 years and 1.11 ± 0.32 in patients ≥ 75 years of age (p= 0.32). Usual activities also was not significantly different between the patients at age of 70-74 and ≥ 75 years of age [1.07 ± 0.44 and 1.15 ± 0.36 respectively (p= 0.21)]. Pain/Discomfort domain was 1.07 ± 0.26 in patients at age of 70-74 and 1.07 ± 0.27 in patients ≥ 75 years of age; (p =0.5). Anxiety/Depression scores in patients at age of 70-74 and ≥ 75 years were 1.12 ± 0.41 and 1.23 ± 0.58 ; respectively (p= 0.8).

DISCUSSION

Patients aged 70 years or older undergoing coronary artery bypass grafting with the use of a heart-lung machine (on-pump) are at a higher risk of mortality and morbidity than younger patients [5]. However elderly patients have an acceptable operative risk and the long-term functional results are satisfying [6, 7]. Traditionalists have raised concerns about off-pump CABG's effectiveness, durability, and func-

Table 2. Preoperative Demographical Characteristics

	Patients with Age of 70-74 (n=115)	Patients with Age of ≥75 (n=58)	P value
Age	71.69±0.16	76.81±0.23	<0.0001
Male/Female (n)	38/77	15/43	>0.05
BMI, Kg/m ²	27.00±0.33	26.78±0.46	>0.05
Hypertension, n (%)	84(%73)	37(%64)	>0.05
Smoking, n (%)	62(%54)	26(%45)	>0.05
Hyperlipidemia, n (%)	48(%42)	24(%41)	>0.05
Unstable Angina, n (%)	54(%46)	21(%36)	>0.05
NYHA Functional Class (1-4)	2.81±0.63	2.90±0.70	>0.05
EF <50	55(%48)	33(%57)	>0.05
Prior-MI, n (%)	34(%29)	16(%27)	>0.05
Peripheral Artery Disease, n (%)	12(%10)	12(%20)	>0.05
COPD, n (%)	30(%26)	11(%19)	>0.05
DM, n (%)	39(%34)	14 (%24)	>0.05
Renal Disease, n (%)	7(%6)	1(%2)	>0.05
Left Anterior Descending Artery Stenosis (n)	112	58	0.214
Right Coronary Stenosis (n)	99	52	0.506
Carotid Artery Disease, n (%)	18 (%16)	8 (%14)	>0.05
Operation (Urgent/Elective)	8/107	2/56	0.350
Preoperative Drugs			
Beta-Blocker (n)	33	14	0.524
Calcium Channel Blocker	34	15	0.609
Statin	37	13	0.181
ACE Inhibitors	17	8	0.861

BMI; body mass index, NYHA; New York Heart Association.

EF; ejection fraction, MI; myocardial infarction.

TIA; transient ischemic attack.

COPD; chronic obstructive pulmonary disease, DM; diabetes mellitus.

tional recovery compared with the conventional on-pump revascularization approach [8]. In a study Kapetanakis *et al.* demonstrated that both conventional and off-pump coronary artery bypass surgery groups had an overall improvement in function and quality of life at six months. His prospective study revealed that there was no statistically significant difference in the patient's expected postoperative quality of life with either surgical approach [9].

In our study the off-pump CABG patients had an in-hospital mortality of %6 which we think is comparable to the results of other reports. The patients that were 75 years or older had significantly higher mortality compared to the patients at age of 70-74 years in our study (Table 3). In a study by Baskett *et al.* the death rates in patients who underwent elective CABG at age of 70-74 and 75-79 were 3,8% and 6,6%; respectively [10]. In a study, Li *et al.* reported an observed mortality of 3.22% for the bypass graft surgery (CABG) with cardiopulmonary bypass (CCB) cohort and 2.62% for off-pump CABG (p<0.05) [11]. In his study the mean age of the patients operated with off-pump CABG was 67 ± 11 years. Octogenarians were found to have more renal

insufficiency as patient characteristics compared to non-octogenarians undergoing CABG [10]. In our study postoperative renal failure was more frequent in patients older than 75 years of age. Duration in the intensive care unit was longer in the group 75 years of age or older in our study compared to patients at age of 70-74 years old (2.48 ± 0.23 versus 2.01 ± 0.16) (p=0.03). In a recent study Markou *et al.* investigated quality of life by EuroQol domains in 568 patients that had primary isolated CABG majority of being operated on-pump (95.8%) [12]. In his study on the basis of their age, study group had been classified in three groups. He did not find significant difference in intensive care unit stay between the groups with age of less than 65 years, 65 to 74, and with 75 years of age or older.

Also in his study, for the different domains of the EuroQoL registration, there was a significant improvement for the five domains in group with less than 65 years of age. In group with an age of 65 to 74 years, there was only a significant improvement for the domains daily activities and pain. In group with patients with 75 years of age or older only daily activities improvement reached statistical significance.

Table 3. Postoperative Data

	Patients with Age of 70-74 (n=115)	Patients with Age of ≥75 (n=58)	P Value
Number of Distal Anastomoses	2.8±0.75	2.5±0.72	0.02
Duration of Surgical Procedure	217.31 ± 49.17	217.46 ± 46.63	0.961
Postoperative Laboratory			
Hb (g/dL)	10.27 ± 0.14	10.32 ± 0.19	0.836
Leucocyte Count (mm ³)	11582.9 ± 354.47	10895.0 ± 482.37	0.252
Thrombocyte	207.84 ± 7.80	195.18 ± 10.56	0.336
Creatinin Kinase	685.75± 92.48	700.01± 127.6	0.928
CK-MB	34.23 ±2.85	32.72± 3.97	0.758
Triglyceride	96.42 ± 64.32	59.55 ± 28.36	0.296
Post-operative MI (n)	5	0	0.861
Post-operative Renal Failure	4	10	0.0017
Gastrointestinal Bleeding	1	0	
Mesenteric Ischemia	1	1	NS
Postoperative Neurological Complications	7	8	0.0891
Mechanical Respiratory Support Duration (h)	8.13 ± 0.67	9.57 ± 0.94	0.215
Days in the ICU	2.01 ± 0.16	2.48 ± 0.23	0.033
Days in Hospital	8.48 ± 0.41	9.31 ± 0.58	0.252
Mortality (n, %)	4 (2.31%)	7 (4.05%)	0.028

Table 4. EuroQoL Score Values of the Patients

	Patients with Age of 70-74 (n=65)	Patients with Age of ≥75 (n=26)	P Value
Mobility Score	1.30±0.49	1.15±0.36	0,36
1 (n)	46 (71%)	22 (85%)	
2 (n)	18 (28%)	4 (15%)	
3 (n)	1 (1%)	0	
Self-care Score	1.15±0.40	1.11±0.32	0,32
1 (n)	56 (86%)	23 (88%)	
2 (n)	8 (13%)	3 (12%)	
3 (n)	1 (1%)	0	
Usual Activities Score	1.07±0.44	1.15±0.36	0,21
1 (n)	52 (80%)	22 (85%)	
2 (n)	11 (17%)	4 (15%)	
3 (n)	2 (3%)	0	
Pain / Discomfort Score	1.07±0.26	1.07±0.27	0,5
1 (n)	60 (92%)	24 (92%)	
2 (n)	5 (8%)	2 (8%)	
3 (n)	0	0	
Anxiety / Depression Score	1.12±0.41	1.23±0.58	0,8
1 (n)	59 (91%)	22 (85%)	
2 (n)	4 (6%)	2 (7,5%)	
3 (n)	2 (3%)	2 (7,5%)	

Table 5. The Distribution of the Cases and Mortality Rates Per Year

Years	Number of Patients	Mortality % Per Year
2000	8	0
2001	1	0
2002	18	11,1
2003	41	14,3
2004	29	0
2005	31	3,2
2006	23	4,3
2007	3	0
2008	19	5,3

This seems to be consistent with Jarvinen who concluded that patients aged more than 75 are likely to derive less benefit from CABG in terms of certain aspects of quality of life [13]. Elderly patients undergoing revascularization have better health status at 4 years than do those in the same age group who do not undergo revascularization. These findings reported by Michelle *et al.* suggest that age should not deter against revascularization given the combined survival and quality-of-life benefits [14]. Both on-pump and off-pump patients improved in health-related quality of life scores after CABG surgery in a study conducted by Jensen *et al.* [15]. No clinically relevant difference between the groups could be demonstrated.

The evaluation of quality of life revealed that majority of elderly patients were in good condition after of-pump CABG (Table 4). The results of research of Merkouris *et al.* indicated that 12 months after surgery a high percentage of patients presented significant improvements in quality of life (80.4%). However, the findings of this study illustrated that despite great overall improvement, patients still experience severe emotional problems 12 months post-operatively including questions about self-esteem, self-confidence, and dependence on others [16]. Some researchers found that 15–37% of patients, regardless of age, present exacerbation of post-surgery quality of life after CABG surgery [17, 18]. However, older patients present many problems in the immediate postoperative period. According to Khatri and her colleagues, the elderly only experienced greater worry and depression in the immediate postoperative period (6 weeks post surgery) [19]. The Quality of life assessment in our study included the late term results. In long term, the improvement in angina and functional capacity probably would have caused a satisfactory result in perception of mood state.

The weakness of the study is the lack of a control group. Also, the quality of life assessment would be more valuable if it had been a prospective study. In this case we would also be able to show the improvement or deterioration in quality of life in case of having preoperative data. However we be-

lieve the mortality and morbidity data of the elderly patients with off-pump CABG will have value for our colleagues.

In conclusion, off-pump CABG has satisfactory results in patients with 70 years of age or older. Also perception of quality of life evaluated by EuroQoL questionnaire showed that majority of patients were in good condition in late post-operative period.

CONFLICT OF INTERESTS

None

REFERENCES

- [1] Pepper J. Controversies in off-pump coronary artery surgery. Clin Med Res 2005; 3:27-33.
- [2] Zhang L, Boyce SW, Hill PC, *et al.* Off-pump coronary artery bypass grafting improves in-hospital mortality in patients with dialysis-dependent renal failure. Cardiovasc Revasc Med 2009; 10: 12-6.
- [3] Russell LB, Gold MR, Siegel JE, Daniels N, Weinstein MC. Recommendations of the panel on cost-effectiveness in health and medicine. JAMA 1996; 276: 1253-8.
- [4] Puskas JD, Williams WH, Duke PG, *et al.* Off pump coronary artery bypass grafting provides complete revascularization with reduced myocardial injury, transfusion requirements, and length of stay: a prospective randomized comparison of two hundred unselected patients undergoing off-pump versus conventional coronary artery bypass grafting. J Thorac Cardiovasc Surg 2003; 125:797-808.
- [5] Bainbridge D, Martin J, Cheng D. Off pump coronary artery bypass graft surgery versus conventional coronary artery bypass graft surgery: a systematic review of the literature. Semin Cardiothorac Vasc Anesth 2005; 9:105-11.
- [6] Tsai T, Chaux A, Matloff JM, *et al.* Ten-year experience of cardiac surgery in patients aged 80 years and over. Ann Thorac Surg 1994; 58: 445-51.
- [7] DuCaillar C, Chaitman BR, Castonguay Y. Risks and benefits of aortocoronary bypass surgery in patients aged 65 years or more. Can Med Assoc J 1980; 122: 771-9.
- [8] Lytle BW. Minimally invasive cardiac surgery. J Thorac Cardiovasc Surg 1996; 111: 554-5.
- [9] Kapetanakis EI, Stamou SC, Petro KR, *et al.* Comparison of the quality of life after conventional versus off-pump coronary artery bypass surgery. J Card Surg 2008; 23: 120-5.
- [10] Baskett R, Buth K, Ghali W, *et al.* Outcomes in octogenarians undergoing coronary artery bypass grafting. CMAJ 2005; 172: 1183-6.
- [11] Li Z, Yeo KK, Parker JP, Mahendra G, Young JN, Amsterdam EA. Off-pump coronary artery bypass graft surgery in California, 2003 to 2005. Am Heart J 2008; 156: 1095-102.
- [12] Markou AL, van der Windt A, van Swieten HA, Noyez L. Changes in quality of life, physical activity, and symptomatic status one year after myocardial revascularization for stable angina. Eur J Cardiothorac Surg 2008; 34: 1009-15.
- [13] Järvinen O, Saarinen T, Julkunen J, Huhtala H, Tarkka MR. Changes in health-related quality of life and functional capacity following coronary artery bypass graft surgery. Eur J Cardiothorac Surg 2003; 24: 750-56.
- [14] Michelle M, Graham I MM, Norris CM, Galbraith PD, Knudtson ML, Ghali WA for the APPROACH Investigators. Quality of life after coronary revascularization in the elderly. Eur Heart J 2006; 27: 1690-8.
- [15] Jensen BØ, Hughes P, Rasmussen LS, Pedersen PU, Steinbrüchel DA. Health-related quality of life following off-pump versus on-pump coronary artery bypass grafting in elderly moderate to high-risk patients: a randomized trial. Eur J Cardiothorac Surg 2006; 30: 294-9.
- [16] Merkouris A, Apostolakis E, Pistolas D, Papagiannaki V, Diakomopoulou E, Patiraki E. Quality of life after coronary artery bypass graft surgery in the elderly. Eur J Cardiovasc Nurs 2009; 8:74-81.

- [17] Chocron S, Etievent JP, Viel JF, *et al.* Prospective study of quality of life before and after open heart operations. *Ann Thorac Surg* 1996; 61: 153-7.
- [18] Rumsfeld JS, MaWhinney S, McCarthy M Jr, *et al.* Health-related quality of life as a predictor of mortality following coronary artery bypass graft surgery. Participants of the Department of Veterans Affairs Cooperative Study Group on processes, structures, and outcomes of care in cardiac surgery. *JAMA* 1999; 281: 1298-303.
- [19] Khatri P, Babyak M, Clancy C, *et al.* Perception of cognitive function in older adults following coronary artery bypass surgery. *Health Psychol* 1999; 18: 301-6.

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