Institutional report - Coronary

Quality of life one year after myocardial revascularization. Is preoperative quality of life important?

Luc Noyez*, Athanasios L.P. Markou, Fabiola C.F. van Breugel

Department of Thoracic and Cardiac Surgery-414, Heart Center, Radboud University Nijmegen, PO Box 9101, 6500 HB Nijmegen, The Netherlands

Abstract

Of 428 patients, mean age of 64.1 ± 9.2 (30–84 years), undergoing an isolated CABG, pre- and one-year- postoperatively angina level and quality of life (QOL) were registered. QOL was registered following the EuroQol-registration, five domains and a visual analogue scale (VAS). Based on the VAS, the group was divided into Group A, 168 patients with a VAS < 60 and Group B, 260 patients with a VAS ≥ 60. One-year postoperatively, 394 patients (92.%) indicated to be angina-free. The VAS of the total group was significantly higher one-year post-CABG, 75.3 vs. 61.7 ($P = 0.00$). Of group A, 88% of patients registered a higher VAS. In group B only 60.8% registered a higher and 26.9% a lower VAS. Multivariate analysis identified preoperative VAS < 60 and a preoperative mobility level > 1 as independent predictors for an increased QOL. Thus our conclusion is that relief of angina one year post-CABG is associated with an increased QOL, however, patients with a relatively poor preoperative QOL have a more beneficial QOL. But patients with a good preoperative QOL can lose a lot of QOL.
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Keywords: Myocardial revascularization; Angina; Quality of life; Follow-up

1. Introduction

Long-term survival and a better quality of life are the major indications for myocardial revascularization (CABG) [1]. Certainly in our aging patient population improvement of quality of life becomes more and more the primary indication [2,3]. Several studies have shown that CABG is associated with good functional relief from angina and improvement of quality of life (QOL) [4–6]. The aim of this study is to evaluate the influence of CABG on QOL at one year postoperative and the influence of the preoperative level of QOL.

2. Patients and methods

2.1. Patients

With the aid of our database, Coronary Surgery Database Radboud Hospital (CORRAD), a registry that stores medical – pre-, peri-, and postoperative – follow-up data, as well as data concerning quality of life, of all patients undergoing myocardial revascularization, we identified 428 patients operated on between January 2002 and December 2003, of which pre- and one-year follow-up registration of QOL was complete. The registration of QOL is on a voluntary basis. Table 1 presents the studied pre-, peri- and postoperative variables and their definitions.

2.2. QOL

For assessing quality of life (QOL) the EuroQol questionnaire was used [7]. The EuroQol questionnaire is a standardized, non-disease-specific instrument for describing and valuing health related quality of life. The EuroQol instrument measures five domains of quality of life. For each modality there are three options as is shown in Table 2. Patients are also asked to rate their current state of health on a Visual Analogue Scale (VAS), similar to a thermometer. The best state they can imagine is marked by 100 and the worst state marked by 0.

Based on this VAS our total study population was divided into two groups: Group A with a preoperative VAS < 60 (168 patients) and group B, with a VAS-score ≥ 60 (260 patients).

2.3. Surgical technique

Four hundred and one patients (93.6%) were operated on by the standard cardiopulmonary bypass technique, using St. Thomas' Hospital cardioplegia. Seventeen (6.4%) patients were operated 'off-pump'. The mean time on the extra-corporal circulation (ECC time) was 88.9 ± 32 min (range 27–260), and the mean duration of aortic cross-clamping (AoX-time) was 51 ± 19.2 min (range 11–140). For the total group, there was a mean of 1.9 ± 0.3 grafts (range 1–3), and a mean of 3.2 ± 1.0 (range 1–7) distal anastomoses. Three hundred and ninety-six patients (92.5%) received at least one arterial graft.

*Corresponding author. Tel.: +31-24-3613711; fax: +31-24-3540129.
E-mail address: l.noyez@thorax.umcn.nl (L. Noyez).

Table 1
Variables and definitions

Variable	Definition
Age (years)	Years
Sex	Male, Female
BMI	Body Mass Index
Diabetes	Diet-controlled, oral therapy or insulin dependent diabetes
Hypertension	Systolic blood pressure >160 mmHg, or diastolic pressure >100 mmHg. Or antihypertensive medication.
Hyperlipidemia	Total cholesterol >250 mg/dl or triglyceride level 200 mg/dl
Vascular disease	Peripheral -, abdominal vascular pathology or operation
Neurological disease	Cerebrovascular accidents and/or transient ischemic attack
Renal disease	Renal failure (creatinine $\geq$ 150 μmol/l) preoperative dialysis, renal transplantation
Pulmonary disease	Chronic obstructive pulmonary disease and/or history of previous lung disease
Gastrointestinal disease	Gastro-duodenal, colon, disease/operation
Preoperative myocardial infarction (MI)	History of myocardial infarction before the operation
Recent MI	Myocardial infarction <30 days before the operation
Rhythm	Preoperative sinus rhythm
Isolated main stenosis	Left main stenosis >70%
Reoperation	Previous cardiac surgery
Left ventricular function	Ejection Fraction: Good (>50%), Poor: (>30%, <50%), Bad (<30%)
ECC	Extra corporal circulation, duration in minutes
AoX	Aortic cross clamp, duration in minutes
Perioperative myocardial infarction (peri-MI)	A new Q wave and a CPK-MB% $\geq$ 10%
Reintervention	Reoperation for bleeding, tamponade
Hospital mortality	All mortality during postoperative hospital stay at the cardiac surgery center
Wound problems	Sternal dehiscence with refixation, mediastinitis
Neurological problems	Postoperative cerebrovascular accidents and/or transient ischemic attack
Renal problems	Postoperative renal failure (creatinine $\geq$ 150 μmol/l), dialysis
Pulmonary problems	Postoperative pulmonary infection

Table 2
EuroQol domains

Place a tick in one box in each group below, indicating which statements best describe your own health state.

|		Option
Mobility		
	I have no problems in walking about	1
	I have some problems in walking about	2
	I am confined to bed, unable to walk without help	3
Self-care		
	I have no problems with self-care	1
	I have some problems washing or dressing myself	2
	I am unable to wash or dress myself	3
Usual activities		
	I have no problems performing my usual activities	1
	I have some problems with performing my usual activities	2
	I am unable to perform my usual activities	3
Pain / discomfort		
	I have no pain or discomfort	1
	I have moderate pain or discomfort	2
	I have extreme pain and discomfort	3
Anxiety / depression		
	I am not anxious or depressed	1
	I am moderately anxious or depressed	2
	I am extremely anxious or depressed	3

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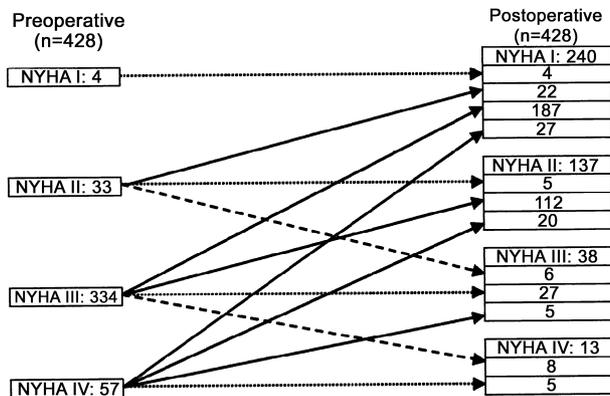
Fig. 1. Pre- and Post-operative NYHA class. ———: increase - - - - - : decrease ..... : equal.

2.4. Follow up

These data are the results of our yearly-organized follow-up, a written survey directly to the patients [8]. Besides survival/mortality, and non-fatal cardiac events, NYHA, QOL according to the same criteria as preoperative is registered.

2.5. Statistical analysis

Characteristics of patients are presented as percentage for dichotome variables, and as mean $\pm$ standard deviation (S.D.), and range for numerical variables. Differences in percentages were tested with the chi-squared test, and numerical variables were tested with the t-test. Logistical regression was used to assess the relationship between QOL and several preoperative variables. Statistical significance was assumed at $P \le 0.05$ ($P = 0.000$ means $P < 0.001$).

3. Results

Fig. 1 presents the distribution of the patients in the four NYHA groups and Fig. 2 over the different domains of the EuroQol registration. For the total group, the VAS-score was 61.7 ± 18.9 (5–100) with a median of 63 and a 25th, 50th, and 75th percentile, respectively, of 50, 63 and 75.

3.1. Preoperative data

The preoperative VAS-score is significantly different ($P = 0.00$) between Group A (42.2 ± 11.3) and B (74.2 ± 10.5). Analysis shows a significant difference in male-female ratio ($P = 0.001$). Other variables show no statistical differences (Table 3). For the different domains of the EuroQol registration, there are significant differences in patient-distribution with significantly more patients in the 'no-problems' group of each domain in Group B (Table 4).

3.2. Peroperative data

There is no significant difference between the number of grafts, distal anastomoses, ECC- and AoX time between the two groups. However, in Group A significantly fewer patients received an arterial graft ($P = 0.04$) and more

patients underwent an off-pump revascularisation ($P = 0.02$).

3.3. Postoperative and follow-up variables

No statistically significant differences are found in the postoperative registered morbidity variables, nor in postoperative stay on IC and hospital stay (Table 5).

At one-year postoperative, the VAS-score of the total group increased significantly to 75.2 ± 17.9 with a median of 80 and a range between 10–100 ($P = 0.000$). The VAS-score of both groups increased, however, only for Group A was it significant ($P = 0.00$), also the difference of increase is significantly higher in Group A (26.7) vs. Group B (5.1) ($P = 0.00$). The difference between the two groups (69.2 vs. 79.2) however, remained significant ($P = 0.00$). In Group A, 88.1% of the patients indicated a better QOL vs. 60.8% of Group B ($P = 0.00$).

For the five domains, there is an increase in the number of patients to a higher level (Fig. 2). However, the difference between the two groups remained significant for mobility, usual activities, pain/discomfort and self-care, but not for anxiety/depression ($P = 0.06$) (Table 4).

Despite three hundred and ninety-four patients (92.3%) indicated to be free from angina in their normal life situation, more detailed information shows that, in 373
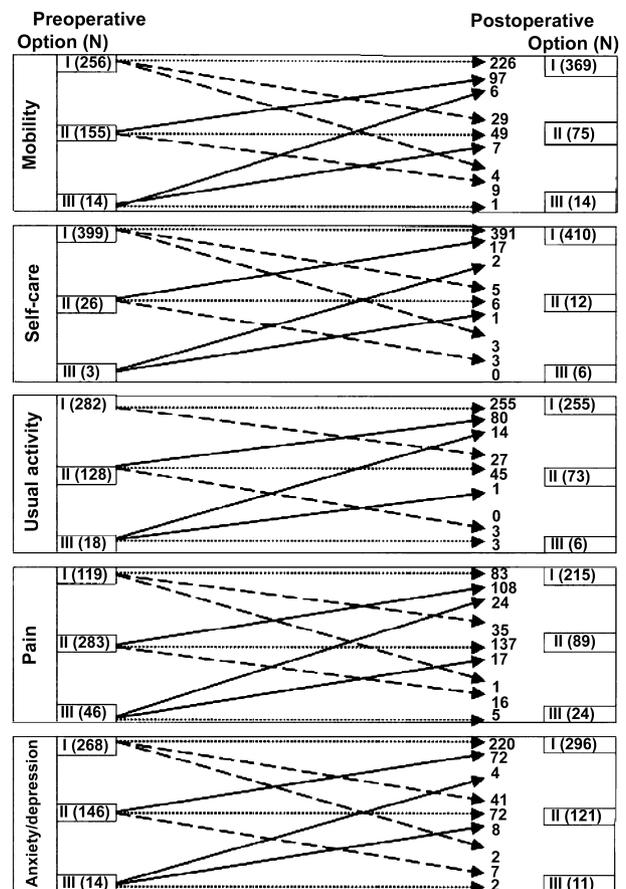

Fig. 2. Pre- and post-operative Qol registration of the five domains. ———: increase - - - - - : decrease ..... : equal.

Table 3
Preoperative variables group A: VAS <60, group B: VAS: ≥60

Variable	Group A n=168(%)	Group B n=260(%)	P-value
Pre-VAS	42.4±11.3	74.2±10.5	0.000
Age, mean±S.D.	64.4±9.6	63.9±8.9	0.66
Sex:			0.001
Male	122 (72.6)	223 (85.8)	
Female	46 (27.4)	37 (14.23)	
BMI, mean±S.D.	27.6±4.1	27±3.6	0.25
Family	111 (66.19)	168 (64.6)	0.75
Preoperative history:			
Diabetes	27 (16.1)	54 (20.8)	0.22
Hypertension	106 (63.1)	150 (57.7)	0.26
Hyperlipidemia	116 (69.0)	168 (64.6)	0.34
Vascular disease	25 (14.9)	29 (11.2)	0.25
Neurological disease	14 (8.3)	23 (8.8)	0.85
Renal disease	3 (1.8)	6 (2.3)	0.71
Pulmonary disease	22 (13.1)	23 (8.8)	0.16
Gastroenteral disease	22 (13.1)	26 (10)	0.32
MI	75 (44.6)	122 (46.9)	0.64
No-sinus rhythm	2 (1.2)	7 (2.7)	0.29
Extent of coronary disease:			0.10
Single vessel	13 (7.7)	7 (2.7)	
Double vessel	35 (20.8)	55 (121.2)	
Triple vessel	117 (69.6)	195 (75)	
Isolated main stenosis	4 (1.8)	3 (1.2)	
Main stem stenosis	32 (19)	51 (19.6)	0.88
Re-operations	10 (6)	10 (3.8)	0.31
NYHA:			0.68
I	1 (0.6)	3 (1.2	
II	12 (7.1)	21 (8.1)	
III	129 (76.8)	205 (78.8)	
IV	26 (15.5)	31 (11.9)	
LV function:			0.55
Good	161 (95.4)	252 (96.9)	
Moderate	6 (3.6)	8 (3.1)	
Bad	1 (0.6)	0	

BMI, body mass index.
MI, myocardial infarction; NYHA, New York Heart Association; LV, left ventricular.

patients (87.1%) angina registration was at least one class lower than preoperative. Forty-one patients (9.6%) registered in the same angina class and 14 patients (3.3%) in a higher angina class (Fig. 1). More than 80% of the patients were now in NYHA I or II, and in contrast with preoperative there is a significant difference in postoperative NYHA distribution between the two groups (P=0.000) (Table 5).

Regression analysis identified a preoperative VAS-score <60 (P=0.000) and preoperative mobility problems (P=0.008) as independent multivariate predictors of a better QOL at one year post-CABG (Table 6).

4. Discussion

4.1. Patients characteristics

Of the total studied population, about 78% of the patients were in NYHA III. The reason why less patients with NYHA IV are included in this study is because these patients mostly referred in urgency or emergency and were not able to complete the preoperative Qol questionnaire. On the other hand, in this population the indication for CABG is mostly clear. This is in contrast with the patients with NYHA III or lesser, where the operation indication is more focussed on a 'possible' increase of the quality of life.

Between Group A and B there were no significant differences for preoperative comorbidity and cardiac variables, with the exception of a significantly higher percentage of women in Group B. Bute [9], but also Herlitz [10] already stated that in every QOL measure at baseline, women were at a disadvantage.

For the five studied domains of the EuroQol, there are expected, but significant differences in distribution between Group A and B.

4.2. Operative and postoperative variables

In Group A significantly (P=0.04) less patients received an arterial graft and significantly more (P=0.02) patients were operated off pump. Despite only a minority of patients (seventeen were operated off pump in our department), we can suppose that in Group A, there were more patients where we wanted to avoid the use of an extracorporeal circulation because of their poor condition. The limited number of off-pump patients (17), does not allow further analysis. For the difference in the use of an arterial graft between Group A and B, we have no clear explanation. However, also here we can suppose that in some patients with a low QOL, in combination with a higher operative risk, the IMA was not used.

Post-operative – in hospital – variables show no significant differences between the two groups for major morbidity, neither for IC-stay or hospital-stay.

4.3. Follow-up data

One year postoperative, the mean VAS for the total studied population increased significantly. There was also an increased number of patients in the higher classes of the five studied domains (Fig. 2). The results of myocardial revascularization on relief of angina is well known [1,3–5]. Nevertheless, our study clearly shows that there is a difference, if the patients are asked if they have angina in their normal life situation (96.3% answered no) or if they are asked to complete a form where it is asked to indicate at what level they have angina.

Where the increase in VAS was statistically significant for the total study group, it was only significantly increased versus preoperative in Group A. The difference between Group A and B remained also significant as preoperative. The increase for Group A is statistically significantly higher than for Group B. This confirms the report of Rumsfeld et al. (6) that patients with larger preoperative health status deficits are more likely to have an improvement of their QOL.

Despite there being an increase in the number of patients in a higher class of the five domains for both groups, the significant difference between Group A and B remained for four domains. Only for anxiety/depression (P=0.06) the preoperative difference was clearer. However, in contrast with mobility, self-care, usual activities and pain, domains where patients can really measure their increase or

Table 4
Distribution – pre- and postoperatief – over the domains of the Qol registration

	Preoperatief			Postoperatief		
	Group A	Group B	P-value	Group A	Group B	P-value
Mobility			0.000			0.000
1	72 (42.9)	187 (71.9)		109 (64.9)	220 (84.6)	
2	86 (55.5)	69 (26.5)		51 (30.4)	34 (13.1)	
3	10 (71.4)	4 (28.6)		8 (4.8)	6 (2.3)	
Self-care			0.03			0.05
1	148 (88.1)	251 (96.5)		156 (92.9)	254 (97.7)	
2	18 (10.7)	8 (3.1)		8 (4.8)	4 (1.5)	
3	2 (1.2)	1 (0.4)		4 (2.4)	2 (0.8)	
Usual activities			0.000			0.000
1	72 (42.9)	210 (80.4)		124 (73.8)	224 (86.2)	
2	84 (50)	44 (16.9)		38 (22.6)	36 (13.8)	
3	12 (7.1)	6 (2.3)		6 (3.6)	0	
Pain/discomfort			0.000			0.002
1	29 (17.3)	90 (34.6)		69 (41.1)	146 (56.2)	
2	110 65.5)	153 (58.8)		84 (50)	105 (40.4)	
3	29 (17.3)	17 (6.5)		15 (8.9)	9 (3.5)	
Anxiety/depression			0.01			0.06
1	90 (53.6)	178 (68.5)		105 (62.5)	191 (73.5)	
2	71 (42.3)	75 (28.8)		58 (34.5)	63 (24.2)	
3	7 (4.2)	7 (2.7)		5 (3.0)	6 (2.3)	

decrease, anxiety/depression is more an evaluation of their mood, which is much more subjective.

Where there was no preoperative difference in NYHA distribution, one year post-CABG there is a significant difference between Group A and B. There is a worse relief of angina in Group A and this is in contrast with the larger benefit of quality of life for Group A. Rumsfeld already indicated that preoperatively the correlation between

NYHA class and QOL is low [6]. Our study suggests this remains also for postoperative.

Important is that in Group A about 88% of the patients indicated a better QOL vs. 65% in Group B, but that in Group B nearly 27% of the patients indicated a worse QOL. This proves that patients with a good QOL may experience a decline, so that the indication for CABG in these patients must primarily be improvement of survival.

To identify independent preoperative predictors for an increased QOL, we included besides the preoperative VAS level (≥ 60 vs. < 60), registration of complaints in the five different domains, also variables based on literature, in our regression analysis [10–14]. Only a preoperative VAS < 60 and preoperative mobility problems were identified. What was confired by Rumsfeld, who stated that preoperative health status was the major determinant of change in QOL following CABG, independent of anginal burden and other clinical characteristics. In addition, we identified mobility problems as a major aspect of an increased postoperative QOL.

Table 5
Postoperative and follow-up variables

Variable	Group A $n=168$(%)	Group B $n=260$ (%)	P-value
Peri-MI	7 (4.2)	8 (3.1)	0.54
Reintervention	7 (4.2)	17 (6.5)	0.29
Postoperative complications			
Wound problems	5 (3.0)	5 (1.9)	0.48
Renal problems	4 (2.4)	2 (0.8)	0.16
Neurological problems	1 (0.6)	2 (0.8)	0.83
Pulmonary problems	12 (7.1)	14 (5.4)	0.45
Gastroenteral problems	3 (1.8)	4 (1.5)	0.84
Days on IC, mean$\pm$S.D.	2.5$\pm$5.1	1.9$\pm$4.2	0.25
Days in hospital, mean$\pm$S.D.	7.5$\pm$8.3	6.8$\pm$7.2	0.33
VAS	69.2$\pm$18.9	79.2$\pm$16.1	0.00
Difference in VAS (post- pre)	26.7$\pm$21.9	5.1$\pm$16.2	
Better – worse – equal			0.00
Better	148 (88.1)	158 (60.8)	
Equal	10 (6.0)	32 (12.3)	
Worse	10 (6.0)	70 (26.9)	
NYHA			0.00
Class I	69 (41.1)	171 (65.8)	
Class II	68 (40.5)	69 (26.5)	
Calss III	21 (12.5)	17 (605)	
Class IV	10 (6.0)	3 (1.2)	

MI, myocardial infarction; IC, intensive care.

Table 6
Regression analysis

Variable	P-value	Odds ratio	95% CI
Age ≥ 75 years	0.78	1.1	1.6–3.0
Sex	0.69	0.8	0.4–1.6
Diabetes	0.24	0.7	0.4–1.2
Vascular disease	0.22	0.6	0.4–1.2
Lung disease	0.29	0.6	0.4–1.2
Pre-NYHA	0.28	0.7	0.4–1.2
Pre-mobility $>$ level 1	0.008	2.01	1.2–3.7
Pre-self-care $>$ level 1	0.41	0.6	0.2–1.8
Pre-usual activities $>$ level 1	0.13	0.6	0.3–1.1
Pre-pain/discomfort level $>$ 1	0.11	1.3	0.8–2.1
Pre-anxiety/depression $>$ level 1	0.83	0.9	0.5–1.5
Preoperative VAS $<$ 60	0.000	2.2	1.6–3.0

4.4. Limitations of the study

A first point of criticism is of course the limited number of patients. Also, the voluntary base of our QOL registration can result in a bias of our studied patient population. Preoperatively, only a limited number of patients with NYHA IV are included. Emergency and life-saving operations are not included because of ethical reasons. But even for the 'elective' patients we can suppose that only active patients will complete the registration forms preoperatively and at the moment of the follow-up. These considerations, however, let us suppose that preferentially 'active' patients were included in this study. On the other hand we have a response for more than 95% in our follow-up [8].

A second point is the use of the EuroQol questionnaire for assessing QOL. The most validated and internationally recognised QOL questionnaire is the SF36 [6]. However, there is no golden standard and the simplicity and the design for self-completion by the respondent, makes the EuroQol questionnaire attractive for longer follow-up studies [7].

A third point is the lack of information about the rehabilitation programs postoperatively. The importance of these programs is well known [15], and all our patients were invited to participate, and about 90% did participate in a rehabilitation program. However, we have not enough registered data about these programs to include them in our study.

4.5. Conclusion and clinical implication

CABG is beneficial to good relief of angina and improves also QOL-level. However, the improvement of QOL is dependent of the preoperative QOL and independent of the preoperative angina.

The clinical implication is that in patients with a good QOL registration, even when they have a complaint of angina, the decision to perform CABG must clearly be discussed and certainly related to the operative risk. Certainly in these patients comparison with PCI results would be interesting.

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