Patient-reported outcomes after cardiac surgery

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Chapter 3

QUALITY OF LIFE IN ELDER ADULTS ONE-YEAR AFTER CORONARY BYPASS

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ABSTRACT

Background: Survival rates in the elderly after cardiac surgery have improved over the last decades and therewith more attention is directed toward Quality of Life (QoL) as a patient reported outcome measure.

Objective: The purpose of this study was to explore QoL in patients one year after coronary artery bypass grafting, with special interest in the elderly patients (≥ 80 years).

Methods: In a quantitative, retrospective single-center study patients with isolated CABG (eg. nonvalve) surgery aged 80 years or older and operated in 2013 were included (n = 32). A control group of patients aged younger than 80 years was selected by matching based on gender and a recalculated (for age) logistic European System for Cardiac Operative Risk Evaluation (log EuroSCORE I) during the same period (n = 48). QoL assessment by the EuroQol questionnaire (EQ-5D) and additional questions were performed at one-year follow-up.

Results: QoL in elderly patients was 0.79 versus 0.90 in younger patients (P = 0.013). Overall, 54.8% of the elderly experience some or extreme problems in mobility versus 18.8% in the younger group (p=0.001). Elderly patients also experience more problems in self care (19.3 versus 4.2%, P = 0.029). Nine of the elderly (29%) valued their postoperative health status to be worse than preoperatively, versus 5 (10%) in the younger group (P = 0.028). Only patients aged 80 years or older would choose not to have surgery again (12.9%). Hospital mortality was 3.1% in the elderly group (n = 32) and 0% in the younger group (n = 48).

Conclusion: Not all elderly patients experience benefits in terms of QoL one year after cardiac surgery. Therefore, potential benefits and risks need to be considered and discussed by physicians and patients before making the decision to operate or not.

INTRODUCTION

It is estimated that the world population will count 400 million persons aged over 80 years in 2050 (1). More than 40% of these elderly have symptomatic cardiac disease and an increasing number of them may become candidates for cardiac surgery (2). Continued advances in operative techniques, myocardial protection and perioperative care have led to a steady decline in operative mortality, and nowadays, cardiac surgery can be performed safely in patients of 80 years and older (3). Approximately 8,400 patients had an isolated coronary artery bypass grafting (CABG) procedure (without valve surgery) in the Netherlands in 2010 (4).

Potential benefits and risks need to be balanced individually whenever taking the informed decision to operate or not. Good survival rates after cardiac surgery have been shown repeatedly, even for the elderly (5), although they have an increased risk for prolonged intensive care and hospital stay and postoperative morbidity such as neurologic and pulmonary complications (6,7).
Moreover, the importance of outcome measures has shifted from a physician's perspective towards the patient's perspective (8). Recent studies suggest that Quality of Life (QoL) improves after CABG even for the elderly (9,10), but there are also studies with contradictory findings (7,11) Therefore, QoL after CABG is of utmost interest, especially in elderly patients, not only as an outcome of surgery but even more as an important aspect in taking the decision to operate or not.
The aim of this study was to evaluate whether elderly patients differ in health-related quality of life one year after CABG as compared with younger patients. There is no consensus in the definition of elderly. However the latest American Heart Association guidelines define elderly as 80 years of age or older (12).

METHODS

Study design and patients

We conducted an observational single-center cohort study including all patients aged 80 years or older scheduled for isolated CABG procedures operated on in 2013. Patients aged younger than 80 years were the control group, selected by matching based on gender and a recalculated logistic European System for Cardiac Operative Risk Evaluation (log EuroSCORE I). Controls were selected by two researchers who were blinded for the outcome. Patients having any kind of combined (e.g., valve) surgery were excluded. The study was approved by the Institutional Review Board (METc.2014/208). Patients were identified by chart review and then contacted for consent for the follow-up one year after surgery. One research nurse interviewed all patients by telephone. A window of -/+ 10 days was allowed when contacting the patients.

Baseline characteristics

Baseline demographic data included age, gender, body mass index and comorbidity such as diabetes (oral therapy or insulin dependent diabetes), pulmonary disease (chronic obstructive pulmonary disease and/or history of previous lung disease), vascular disease (peripheral, abdominal vascular pathology, or operation),

neurological disease (cerebrovascular accidents and/or transient ischemic attack), renal disease (renal failure: creatinine ≥200µmoll/L, preoperative dialysis or renal transplant), myocardial infarction (history of myocardial infarction before the operation) and ventricular function (ejection fraction <30%). Baseline demographic and clinical characteristics of all patients were retrieved from the hospital information system and entered in a database anonymously.
The log EuroSCORE I is a widely used risk stratification system for adult cardiac surgery which calculates a mortality risk based on several risk factors (13). Since age is a major contributing risk factor in log EuroSCORE I the score of all patients was recalculated without age. The control group was matched based on this recalculated log EuroSCORE I so that patient groups had comparable risk profiles, except for age. Consequently, the recalculated score has no dimension and does not represent predicted mortality.

Outcome measures
The primary outcome was QoL measured by the five dimensions questionnaire (EQ-5D) at one year follow-up. The EQ-5D is a standardized and validated instrument for describing and valuing health-related quality of life developed by the EuroQol Group to provide a simple, generic measure of health for clinical and economic evaluation (14).
The EQ-5D consists of two elements. The first element is a descriptive system including five dimensions: mobility, self care, usual activities, pain & discomfort and anxiety and depression. The respondent is required to rate his own health on these five dimensions. Each dimension has three levels: no problems (1 point), some problems (2 points) and extreme problems (3 points). The second element is a rating of the respondent's own current health state on a vertical, visual analogue scale where the endpoints are labeled "Worst imaginable health state" (0 points) and "Best imaginable health state" (10 points). The EQ-5D may be converted into one single summary index (range - 0.33 to 1.00) by using a formula that essentially attaches values to each of the levels in each dimension (14).

Secondary outcome measures were mortality and the numbers of patients with any complication and with two or more complications during admission. Postoperative complications included pulmonary infection, reoperation through thoracotomy, stroke, renal failure (or renal replacement therapy), myocardial infarction and wound complications such as sternal dehiscence and mediastinitis. Furthermore, patients were requested to value their postoperative health status when compared with their preoperative health status and whether they would again choose to undergo surgery. Other secondary outcomes were intensive care unit (ICU) stay, ventilator time, Acute Physiology and Chronic Health Evaluation IV score when admitted to the ICU and hospital stay. The Acute Physiology and Chronic Health Evaluation IV score predicts hospital mortality in critically ill adults (15), with an increased score (range 0 - 299) reflecting an increased risk of hospital death (16).

Analyses

Data were analyzed using SPSS Statistics version 22.0 (SPSS Inc., Chicago, Illinois). Characteristics of patients are presented as proportions (with percentages) for dichotomous variables and as means (with standard deviations) for continuous variables. Differences in dichotomous and continuous variables were tested using the chi-square test, Fisher's exact test, Mann-Whitney *U* test, or the student's *t*-test when appropriate. All tests were two-sided and statistical significance was assumed at $P \leq 0.05$.

RESULTS

In 2013, a total of 468 isolated CABG procedures were performed in our hospital, including 32 patients (6.8%) aged 80 years and older. Forty-eight matched controls were selected from 436 patients aged below 80 years. Hospital mortality was 3.1% in the elderly group (n = 32) and 0% in the younger group (n = 48). Mean age was 81.6 ±1.8 years in the elderly group and 68.2 ±8.7 years in the younger group (Table 1). One patient in the elderly group died in the ICU shortly after surgery. The recalculated mean log EuroSCORE I (excluding age) was 5.4 in the elderly group and 5.6 in the younger group. Baseline characteristics are presented in Table 1. No statistical significant differences were observed between both groups concerning any of the comorbidity risk factors.

Postoperative data

No statistical significant differences were found in postoperative outcomes between both groups, although the proportion of patients with one complication was slightly higher in the elderly group (16.1%) compared with the younger group (14.6%; P = 0.198). The proportion of patients with two or more postoperative complications was also not statistically significant different in both groups (12.9 vs 4.2%, P = 0.211, in elder and younger patients, respectively; Table 2).

Table 1. Baseline characteristics of elderly and younger patient groups

Characteristics	Elderly (n = 32)	Younger (n = 48)	P value
Age (mean ±SD)	81.6 ± 1.8	68.2 ± 8.7	
Sex (female)	12 (37.5)	17 (35.4)	0.849
BMI (mean ±SD)	27.0 ± 4.1	26.9 ± 3.6	0.910
Recalculated log EuroSCORE 1 (without age)	5.4 (11.1)	5.6 (5.8)	0.921
Diabetes	10 (31.3)	14 (29.2)	0.842
Pulmonary disease	6 (18.8)	9 (18.8)	1.000
Vascular disease	5 (15.6)	5 (10.4)	0.510
TIA/stroke	3 (9.4)	5 (10.4)	1.000
Renal disease	1 (3.1)	2 (4.2)	1.000
Myocardial infarction	18 (56.3)	36 (75)	0.079
Left ventricular function			1.000
Good	29 (90.6)	44 (91.7)	
Poor	3 (9.4)	4 (8.3)	

BMI= body mass index; SD= standard deviation; TIA= transient ischemic attack.
All numbers are presented n and percentage unless otherwise indicated

Table 2. Perioperative and postoperative characteristics of elderly and younger patient groups

Characteristics	Elderly (n = 32)	Younger (n = 48)	P value
Number of grafts (mean ±SD)	2 ± 0.35	2 ± 0.25	0.528
Use of at least one arterial graft	31 (96.9)	46 (95.8)	1.000
Pulmonary infection	4 (12.5)	1 (2.1)	0.151
Re-operation	2 (6.3)	5 (10.4)	0.696
TIA/stroke	1 (3.1)	0 (0.0)	0.400
Renal complications	2 (6.3)	0 (0.0)	0.157
Myocardial infarction	2 (6.3)	3 (6.3)	1.000
Wound complications	5 (15.6)	2 (4.2)	0.109
Patients with any complication	5 (16.1)	7 (14.6)	0.198
Patients with two or more complications	4 (12.9)	2 (4.2)	0.211
ICU stay(d; mean ± SD)	2.6 ±4.8	1.6 ±1.2	0.897
Ventilator time (h; mean ± SD)	20.8 ±35.4	11.6 ±14.5	0.058
APACHE IV score (mean ± SD)	53 ±10.6	49 ±13.3	0.161
Hospital stay (d; mean ± SD)	10.7 ±14.2	8.0 ±4.0	0.502

APACHE= Acute Physiology and Chronic Health Evaluation; ICU= intensive care unit.
All numbers are presented n and percentage unless otherwise indicated

Follow-up variables

The telephone calls conducted at follow-up took approximately 10-15 minutes for each patient. One to four attempts of telephone calls were needed before patients answered. After the operation all patients were living at home, except for two elderly patients who were living in a nursing home. The two patients in the nursing home regarded their operation for causing their dependency.

Table 3 shows data on the five domains of EQ-5D, the QoL-index for both groups at one-year follow-up and the patient's health status. There are differences in two of the five domains of the EQ-5D, including mobility and self care. Elderly patients indicate more problems in mobility and self care compared with younger patients. The summary EQ-5D index also showed a significant difference between both age groups (0.79 vs 0.90, P = 0.013).

There is also a significant difference in health status between the elderly and the younger patient groups (P = 0.028). Four patients (12.9%) in the elderly group would not accept surgery again if they should make this decision anew compared to none in the younger group.

DISCUSSION

We evaluated the impact of CABG on QoL one year after surgery with special interest in the elderly patients. Our study found a significant difference in QoL between elderly and younger patients one year after CABG. Three of the five dimensions assessed by the EQ-5D were not statistically significant different between both groups but elderly scored worse on the dimensions mobility and self care. Decrease in QoL in elderly may be associated with surgery or may simply be associated with increasing age. However, a recent study by Govers et al (17) showed that functional decline in elderly patients after cardiac surgery appears to be much larger than observed in other community-dwelling older persons. Furthermore, elderly patients might need more time to recover from surgery which suggests that QoL could still improve with longer follow-up. Studies with

Table 3. Outcome measures of quality of life (EQ-5D) and health status at one-year follow-up

Outcome Measures	Elderly (n=31)°	Younger (n=48)	P value
Mobility			0.001*
* No problems	14 (45.2)	39 (81.2)	
* Some problems	17 (54.8)	9 (18.8)	
* Extreme problems	0 (0.0)	0 (0.0)	
Self care			0.029*
* No problems	25 (80.6)	46 (95.8)	
* Some problems	5 (16.1)	2 (4.2)	
* Extreme problems	1 (3.2)	0 (0.0)	
Usual activities			0.257
* No problems	21 (67.7)	38 (79.2)	
* Some problems	10 (32.3)	10 (20.8)	
* Extreme problems	0 (0.0)	0 (0.0)	
Pain & discomfort			0.075
* No problems	26 (83.9)	46 (95.8)	
* Some problems	4 (12.9)	1 (2.1)	
* Extreme problems	1 (3.2)	1 (2.1)	
Anxiety & depression			0.086
* No problems	20 (64.5)	39 (81.3)	
* Some problems	10 (32.3)	9 (18.8)	
* Extreme problems	1 (3.2)	0 (0.0)	
VAS (mean ± SD)	7.0 ±1.45	7.4 ±0.86	0.134
Quality of Life index (mean ± SD)	0.79 ±0.25	0.90 ±0.14	0.013*
Health status compared to preoperative state			0.028*
* Better	12 (38.7)	29 (60.4)	
* No changes	10 (32.3)	14 (29.2)	
* Worse	9 (29.0)	5 (10.4)	

VAS= visual analogue scale. All numbers are presented n and percentage unless otherwise indicated
°n= 31 for elderly group, 1 patient died after surgery. *significant P values

follow-up up to 8 years claim that QoL-scores of elderly after CABG were similar to the general population (18,19), although selection of the fittest could have played a role.

We found that 29% of the elderly and 10% of the younger group valued their postoperative health status worse when compared with preoperative health status. At one-year follow-up most patients responded that they would again consent to surgery. Some elderly patients stated that they would now refuse surgery. These outcomes suggest that elderly patients need more counselling before they consent to cardiac surgery. The use of a frailty screening list in elderly patients might help in the process of decision-making. Lee et al (20) reported frailty to be a risk for postoperative complications and an independent predictor of in-hospital mortality, institutional discharge, and reduced mid-term survival.
As in our study, several other studies also reported low benefits in terms of QoL in older patients after CABG (7,11), while contradictory findings have also been reported (5,9,10).

Disagreements in findings on QoL after cardiac surgery may be explained by methodological weaknesses relating to design issues and length of follow-up (21). Noyez et al proposed five minimal requirements to increase validity of

postoperative QoL studies (21). These requirements include information on the total number of patients that could have been included; the number of patients actually included; information about preoperative QoL; information on how missing data were handled; and information about demographics, comorbidity, and the cardiac risk of all patients including the ones that dropped out. Maybe a sixth requirement should be to have at least one year follow-up. Our study complies with the five requirements suggested by Noyez et al except for having data on QoL at baseline. There were no missing data in our study.

When interpreting the results of QoL studies we should be aware of other confounding factors, both measured and unmeasured, associated with age, health and QoL. Kurlansky et al (22) found that diabetes mellitus, previous myocardial infarction and reoperation are predictors of impaired QoL in elderly patients after CABG. The results of our study confirm these findings.

Study Limitations

Our single-center observational cohort study has some important limitations. Our patient selection might differ from other nonacademic environments which may limit generalizability. A second limitation is the use of the EuroQol questionnaire for assessing QoL. The internationally most frequently used questionnaire is the short form 36 (SF36). However, there is no gold standard and the simplicity of the EQ-5D made this list most suitable for follow-up by telephone. Another limitation is the small number of patients so that the present study has insufficient power to reach strong conclusions. However, the percentage of elderly patients with isolated CABG and operated in 2013 in our hospital (6.8%) is comparable with the general population of people over 80 in the Dutch society in 2013 (4.2%) (23). Additional limitations include the lack of QoL data at baseline and the limited follow-up (one year).

CONCLUSION

The outcomes of our study show that a proportion of elderly patients did not achieve similar improvements in health-related quality of life compared to younger patients and may even have poor outcomes. Also, some elderly patients stated that they would now refuse surgery, which might suggest that elderly patients need more counseling before they consent to cardiac surgery. Further studies with QoL-data at baseline, longer follow-up and larger sample sizes are necessary to confirm our findings. We should realize that treatments for patients must be justified by benefits. Outcome measures such as mortality, morbidity and especially QoL are critical for decision-making from a patients perspective.

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