Outcome and quality of life one year after percutaneous coronary interventions in octogenarians

A. Günal, W.R.M. Aengevaeren, H.R. Gehlmann, J.E. Luijten, J.S. Bos, F.W.A Verheugt

Background. While percutaneous coronary intervention (PCI) is increasingly being performed in octogenarians, little is known about the quality of life (QOL) one year after PCI. We assessed the one-year outcome and QOL after PCI.

Methods. Outcome and QOL at one year were assessed in patients of 80 years and older who underwent PCI at our institution. We used the RAND-36 Health Survey to assess health-related QOL at follow-up. The EuroSCORE was used for reference risk assessment.

Results. Ninety-eight patients (mean age 82.7 ± 2.9 years; 60% female) underwent PCI. Acute PCI was performed in 36% of the patients. Canadian Cardiovascular Society (CCS) angina class before the procedure was class III for 28% and class IV for 64%. Of the patients, 98% were in the highest-risk group (additive EuroSCORE 6+). The overall PCI success rate was 94%. Mortality at one year was 19% (38% acute vs. 12% elective PCI). At follow-up, general health was rated as fairly good and better than before PCI (CCS I and II: 77%). RAND-36 scores for the mental component were better than scores for the physical component. Physical functioning (41 ± 28) and role limitations caused by physical health problems (32 ± 37) had the worst scores. The mental component vitality had the lowest (55 ± 20) and mental health the highest (70 ± 21) score. Social functioning was in general good (67 ± 26).

Conclusion. Octogenarians have a high mortality risk following PCI, especially in acute PCI. In survivors QOL is acceptable with a better mental than physical score. In general, PCI in octogenarians has a positive effect on health perception, with less symptoms of angina pectoris. (*Neth Heart J* 2008;16:117-22.)

Keywords: octogenarians, percutaneous coronary interventions, mortality, quality of life

The elderly population in the Netherlands has grown strongly. From 1900 to 2005 the number of people aged 65 years and older increased from 300,000 to 2.3 million with an increase in octogenarians from 35,000 to 573,000.¹ The most important cause of this growth since 1900 is the increase in life expectancy. In the decades to come this growth will continue. Important causes are the increase in life expectancy and the ageing of the post World War II baby boom (1946-1970). The latter will cause a bigger increase than before. The increase in the elderly population is associated with an increase in diseases, especially cardiovascular diseases.² In 2005, a quarter of the patients admitted to hospital and 62% of the patients who died because of ischaemic cardiac disease (including acute myocardial infarction) were older than 75 years.³

The treatment of the elderly is often conservative because of comorbidity, shorter life expectancy and higher risk for complications. However, studies have shown that older patients with angina pectoris should not only be treated with medication, but also invasively by means of percutaneous coronary interventions (PCI) and coronary artery bypass grafting (CABG). The mortality rates are about the same with the use of medication or revascularisation, but the latter gives more relief of symptoms in elderly.⁴

The number of PCIs performed in the Netherlands has increased from 12,500 procedures in 1994 to 28,500 in 2004.³ The high prevalence of ischaemic cardiac disease in octogenarians and the increase in the use of PCI in the past decade has resulted in this procedure being adopted more frequently in this age

A. Günal
W.R.M. Aengevaeren
H.R. Gehlmann
J.E. Luijten
J.S. Bos
F.W.A Verheugt

Department of Cardiology, Heartlung Centre, Radboud University Nijmegen Medical Centre, Nijmegen, the Netherlands

Correspondence to: A. Günal
Department of Cardiology, Radboud University Nijmegen Medical Centre, PO Box 9101, 6500 HB Nijmegen, the Netherlands
E-mail: a.gunal@cardio.umcn.nl

category.⁵ However, little is known about the quality of life (QOL) of these patients one year after PCI. We have assessed the one-year outcome and QOL after PCI in octogenarians.

Patients and methods

All patients of 80 years and older who underwent PCI in our institution between October 2003 and January 2005 were included in this study, including acute procedures. Data around the procedure were analysed retrospectively. The European System for Cardiac Operative Risk Evaluation (EuroSCORE) was used for reference risk assessment. EuroSCORE is a method of calculating predicted operative mortality for patients undergoing cardiac surgery. The score system uses preoperative risk factors which are divided into patient-related factors, cardiac-related factors and operation-

related factors.⁶ Dependent on the score, patients are at low risk (EuroSCORE 1-2), moderate risk (EuroSCORE 3-5) or high risk (EuroSCORE 6+).⁶⁻⁸ In addition to this additive EuroSCORE, a logistic EuroSCORE has been developed which shows the mortality risk in terms of percentages.⁸

At follow-up we assessed if patients were still alive by consulting the hospital information system, the family doctor or the local authority. The date and reason of death were noted. We used a validated Dutch translation of the RAND-36 Health Survey to assess health-related QOL at follow-up.⁹ This survey is acknowledged as being a brief, well-developed and intensively tested instrument, derived from the Medical Outcomes Study functional status and well-being questionnaire.¹⁰ There are reference data available for the Dutch population.^{9,10} The RAND-36 survey is a 36-

Table 1. Clinical characteristics (n=98).

Age (years, SD)	82.7±2.9	Risk group	
Sex (% female)	60%	- Low	0 (0%)
CCS angina class		- Moderate	2 (2%)
- I	0 (0%)	- High	96 (98%)
- II	8 (8%)	EuroSCORE logistic (%±SD)	23±15
- III	27 (28%)	Mean (±SD) diseased vessels	2.0±0.8
- IV	63 (64%)	Number of diseased vessels	
Recent MI*	40 (41%)	- One-vessel disease	32 (33%)
Acute MI	29 (30%)	- Two-vessel disease	30 (30%)
Urgency PCI		- Three-vessel disease	36 (37%)
- Elective	63 (64%)	Mean (±SD) treated vessels	1.2±0.5
- Acute/rescue	35 (36%)	Treated vessels	
Comorbidity		- LAD	40 (34%)
- Hypertension	57 (58%)	- RCA	30 (25%)
- Hyperlipoproteinaemia	24 (25%)	- RCX	25 (21%)
- Diabetes mellitus	14 (14%)	- LMCA	3 (3%)
- Heart failure	9 (9%)	- First diagonal branch	9 (8%)
- COPD	9 (9%)	- Bypass graft	10 (9%)
- Renal insufficiency	5 (5%)	Mean (±SD) stents	1.3±0.8
- Peripheral vascular disease	7 (7%)	Medication at discharge***	
- Neurological dysfunction	2 (2%)	- Platelet inhibitor	89 (98%)
Smoking		- β-blocker	86 (95%)
- Yes	10 (10%)	- ACE inhibitor	41 (45%)
- No	75 (77%)	- Calcium antagonist	33 (36%)
- Quit	13 (13%)	- Angiotensin II receptor blocker	9 (10%)
Prior PCI	24 (25%)	- Diuretic	30 (33%)
Prior heart surgery	25 (26%)	- Nitrate	51 (56%)
LVEF**		- Digoxin	4 (4%)
- Unknown	77 (79%)	- Statin	56 (62%)
- <30%	2 (9%)		
30-50%	10 (48%)		
>50%	9 (43%)		
EuroSCORE additive (±SD)	10±3		

*Recent myocardial infarction = <90 days. **LVEF: values available for 21 patients. ***Medication available for 91 patients. CCS=Canadian Cardiovascular Society, PCI=percutaneous coronary interventions, COPD=chronic obstructive pulmonary disease, LVEF=left ventricle ejection fraction, LAD=left anterior descending artery, RCA=right coronary artery, RCX=ramus circumflexus, LMCA=left main coronary artery.

item instrument that measures eight subscales of two components of health. Each subscale consists of two to ten questions. Scores are calculated and transformed to a 0 to 100 scale, on which a higher score means better health. The state of health is divided into a physical and a mental component. The physical component includes the subscales physical functioning (PF), role limitations caused by physical health problems (RP), bodily pain (BP) and general health (GH). The mental component contains the sub-dimensions vitality (VT), social functioning (SF), role limitations caused by emotional problems (RE) and mental health (MH).¹⁰ The RAND-36 Health Survey is a practical and validated instrument for use in the elderly. Studies have shown that the QOL declines with the ageing process. However, this decline is sharper for the subscales physical functioning and physical role limitations. The mental health score remains about constant, even at very old age.¹¹ At the end of the questionnaire we added extra questions to the survey to get more information about changes in health after PCI and the current health status.

Statistical analysis

Data are presented as frequency and percentage. Values of continuous variables are defined as mean $\pm$ SD. All values are calculated with SPSS 12.0.1.

Results

Clinical data

In total 98 patients (60% female) underwent PCI. The mean age was 82.7 ± 2.9 years (range 80 to 95 years). Of the patients over the age of 80, 64% had Canadian

Cardiovascular Society (CCS) angina class IV before the procedure. Elective PCI was performed in 64% of the patients and 36% underwent acute PCI, a high-risk subset with a large myocardial infarction, cardiogenic shock and rescue PCI. Mean additive and logistic EuroSCORE were 10 ± 3 and $23\% \pm 15$, respectively, with 98% being in the highest-risk group (additive EuroSCORE 6+) (table 1). The total number of diseased vessels was 200, of which 118 are treated. We used 126 stents. The mean diseased vessels per patient was $2.0 (\pm 0.8)$ and the mean treated vessels $1.2 (\pm 0.5)$ with a mean stent use of $1.3 (\pm 0.8)$ per patient (table 2).

Follow-up

The overall PCI success rate was 94%. Cumulative mortality at seven days was 12% (24% acute PCI vs. 7% elective PCI), at 30 days 15% (31% acute PCI vs. 9% elective PCI). Mean follow-up was $22 (\pm 7)$ months and complete in all patients. At one year, mortality was 19% (38% acute PCI vs. 12% elective PCI) (table 2). The survival curve one year after PCI (figure 1) shows that patients who underwent elective PCI have a higher survival. It also shows that the highest mortality is in the first week after PCI, especially in the acute PCI group. Causes of death in the first year after PCI were cardiac in 13% of the patients, procedure-related in 2%, non-cardiac in 3% and unknown in 1%. Procedure-related causes of death were renal insufficiency due to contrast and recurrent bleeding in the groin consequently with hypotension and renal insufficiency.

Re-intervention was performed in 6% of the patients: PCI in 5% and CABG in 1%. The mean time to re-intervention was $3.7 (\pm 3.5)$ months after PCI.

Table 2. Outcome and follow-up.

Follow-up (months)	22 $\pm$ 7
Overall success	92 (94%)
- Acute PCI (n=29)	27 (93%)
- Elective PCI (n=69)	65 (94%)
Mortality at 7 days	12 (12%)
Mortality at 30 days	15 (15%)
Survival	
- 1 month	83 (85%)
- 6 months	81 (83%)
- 12 months	79 (81%)
Survival at 1 year	
- Acute PCI (n=29)	18 (62%)
- Elective PCI (n=69)	61 (88%)
Re-intervention at 1 year	6 (6%)
MACE at 1 year	21 (21%)
Event-free survival at 1 year*	73 (75%)

PCI=percutaneous coronary interventions, MACE=major adverse cardiac events. *Event-free survival indicates free of death, reintervention, stroke and myocardial infarction.

Figure 1. Survival curve one year after PCI.

Figure 2. Canadian Cardiovascular Society angina class before and one year after PCI.

Major adverse cardiac events (MACE) were cardiac or procedure-related death, re-intervention, stroke and myocardial infarction. The MACE one year after PCI

was 21% (15% cardiac and procedure-related death and 6% re-intervention). None of the octogenarians had a stroke or myocardial infarction. The event-free survival at one year was 75%.

Quality of life

The RAND-36 survey was obtained in 68 of 75 patients (91%). At follow-up the general health was rated as fairly good and better than before PCI. The CCS angina class shows that patients had less symptoms of angina pectoris at follow-up. Before the procedure, the majority of the patients were in class III and IV, while at follow-up the majority had class I and II angina (figure 2). On a scale of 0 to 100, patients gave their current health 57 ± 19 points. The results of the RAND-36 Quality of Life Survey are presented in table 3. The scores of the mental component were better than scores of the physical component. Physical functioning (41 ± 28) and role limitations caused by physical health problems (32 ± 37) had the worst scores. Patients experience problems in their daily activities due to their health. Overall, there was no problem with moderate effort, walking short distances, washing and dressing. Of the physical component, bodily pain had the highest score. On average, patients experienced mild pain, which did not interfere with their daily activities. The mental component vitality had the lowest (55 ± 20) score. This means patients sometimes felt energetic but also tired and worn out. The mental health had the highest (70 ± 21) score, which means that the octo-

Figure 3. Scores on the RAND-36 subdimensions compared with octogenarians in the general population in the Netherlands.¹⁰

Table 3. RAND-36 Quality Of Life scores for octogenarians one year after PCI (n=68) and for the general population (n=64) compared at confidence level 95%.

	PCI	Population	P value
Physical			
- Physical functioning	41±28	43±29	0.70
- Role physical	32±37	39±41	0.31
- Bodily pain	69±28	60±29	0.07
- General health	50±18	53±22	0.40
Mental			
- Vitality	55±20	53±27	0.63
- Social functioning	67±26	66±32	0.84
- Role emotional	66±42	63±44	0.70
- Mental health	70±21	67±24	0.45

Values are mean ±SD.

genarians were rarely nervous and depressed but often calm and happy. Role limitations caused by emotional problems (66±42) scored better than role limitations caused by physical health problems. Patients felt less limited by their psychological health than their physical health. Social functioning was in general good (67±26). We compared our data with octogenarians in the general population in the Netherlands¹⁰ and found no significant differences in the scores of all subscales (table 3 and figure 3).

Discussion

This study shows a high mortality but good health-related quality of life one year after PCI in octogenarians. Previous studies showed that preoperative factors influencing mortality in octogenarians undergoing PCI are cardiogenic shock, acute myocardial infarction without shock, left ventricular ejection fraction (LVEF) less than 35%, first PCI procedure, renal failure, age over 85 years and diabetes.^{5,12} In this study, high age, female gender, previous cardiac surgery, recent myocardial infarction, unstable angina pectoris, and acute procedure resulted in a high mean EuroSCORE with the majority of the patients being in the highest risk group. We did not exclude patients who underwent acute PCI. Those patients were in a worse condition than the patients who underwent elective PCI, resulting in a higher mortality rate, which causes negative selection in the study. The mortality risk after acute PCI is highest in the first week after the procedure.

In this study there is no information about minor and major complications after PCI, but major complications that resulted in death are referred to as procedure-related causes of death. It is known that medication use during PCI is related to success and complications. For example, antithrombotic drugs influence success and complications of PCI¹⁵ and statin use may reduce complications after PCI.¹⁶ It is a

limitation that we do not have data about medication use during PCI.

In all subscales, the RAND-36 scores of our study group are comparable with scores of octogenarians in the general population in the Netherlands¹⁰ (table 3 and figure 3). As with octogenarians in the general population, the RAND-36 health-related QOL survey one year after PCI revealed that the subscales physical functioning and role limitations caused by physical health problems had low scores.¹⁰ This result has also been found in previous studies that investigated health-related QOL six months after PCI in octogenarians.^{13,14} With the exception of the subscale bodily pain, the scores of all subscales are comparable with those studies. The score for bodily pain was twice as high, meaning that our patients experienced less pain.

A limitation of this study is the inability to correlate quality of life free from other factors associated with increasing age. The limited effect of PCI on physical disability is probably due to existing comorbidity and the ageing process, because patients have a positive health perception and less symptoms of angina pectoris. If the RAND-36 survey had taken been before the procedure, it would have been easier to make a comparison at follow-up.

Conclusion

Octogenarians have a high mortality risk following PCI, especially in acute PCI in the first week after procedure. In survivors, QOL is acceptable with a better mental than physical score. In general, PCI in octogenarians has a positive effect on health perception, with less symptoms of angina pectoris. The limited effect of PCI on physical disability is probably due to existing comorbidity and the ageing process. ■

References

- 1 Centraal Bureau voor de Statistiek (CBS), database of population statistics, <http://statline.cbs.nl>
- 2 van den Berg Jeths A, Timmermans JM, Hoeymans N, Woittiez IB. 'Ouderen nu en in de toekomst' Gezondheid, verpleging en verzorging 2000-2020. National Institute for Public Health and the Environment (RIVM) and Social and Cultural Planning Office of the Netherlands (SCP) by order of Ministry of Health, Welfare and Sport, Bilthoven, June 2004.
- 3 Koek HL, van Dis SJ, Peters RJG, Bots ML. Hart- en vaatziekten in Nederland 2005, cijfers over ziekte en sterfte. Publication of the Netherlands Heart Foundation, April 2005
- 4 Kaiser C, Kuster GM, Erne P, Amann W, Naegeli B, Osswald S, et al. and the TIME Investigators. Risks and benefits of optimised medical and revascularisation therapy in elderly patients with angina-on-treatment analysis of the TIME trial. *Eur Heart J* 2004;25:1036-42
- 5 Batchelor WB, Anstrom KJ, Muhlbauer LH, Grosswald R, Weintraub WS, O'Neill WW, et al. Contemporary outcome trends in the elderly undergoing percutaneous coronary interventions: results in 7,472 octogenarians. National Cardiovascular Network Collaboration. *J Am Coll Cardiol* 2000;36:723-30
- 6 Toupoulis IK, Anagnostopoulos CE, Derose JJ, Swistel DG. Does EuroSCORE predict length of stay and specific postoperative complications after coronary artery bypass grafting? *Int J Cardiol* 2005;105:19-25.
- 7 Nashef SA, Roques F, Michel P, Gauducheau E, Lemeshow S, Salamon R. European system for cardiac operative risk evaluation (EuroSCORE). *Eur J Cardiothorac Surg* 1999;16:9-13.

- 8 Shanmugam G, West M, Berg G. Additive and logistic EuroSCORE performance in high risk patients. *Interact Cardiovasc Thorac Surg* 2005;**4**:299-303.
- 9 Zee KI van der, Sanderman R. Het meten van de gezondheidstoestand met de RAND-36: een handleiding. Groningen: Noordelijk Centrum voor Gezondheidsvraagstukken, 1993.
- 10 Aaronson NK, Muller M, Cohen PDA, Essink-Bot ML, Fekkes M, Sanderman R, et al. Translation, validation, and norming of the Dutch language version of the SF-36 health survey in community and chronic disease populations. *J Clin Epidemiol* 1998;**51**:1055-68.
- 11 Walters SJ, Munro JF, Brazier JE. Using the SF-36 with older adults: a cross-sectional community-based survey. *Age Ageing* 2001;**30**:337-43.
- 12 Weintraub WS, Veledar E, Thompson T, Burnette J, Jurkowitz C, Mahoney E. Percutaneous coronary intervention outcomes in octogenarians during the stent era (National Cardiovascular Network). *Am J Cardiol* 2001;**88**:1407-10, A6.
- 13 Kachler J, Koester R, Hamm CW, Meinertz T. Quality of life following percutaneous coronary interventions in octogenarians. *Dtsch Med Wochenschr* 2005;**130**:639-43.
- 14 Kahler J, Lutke M, Weckmuller J, Koster R, Meinertz T, Hamm CW. Coronary angioplasty in octogenarians: Quality of life and costs. *Eur Heart J* 1999;**20**:1791-8.
- 15 Silber S, Albertsson P, Avilés F, Camici P, Colombo A, Hamm C, et al. Guidelines for percutaneous coronary interventions. *Eur Heart J* 2005;**26**:804-47.
- 16 Herrmann J, Lerman A, Baumgart D, Volbracht L, Schulz R, von Birgelen C, et al. Preprocedural Statin Medication Reduces the Extent of Periprocedural Non-Q-Wave Myocardial Infarction. *Circulation* 2002;**106**:2180-3.