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Benefits of cardiac surgery in octogenarians — a postoperative quality of life assessment

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Abstract

Objective: Assessment of postoperative quality of life in patients over 80 years after cardiac surgery including coronary artery bypass grafting (CABG), aortic valve replacement (AVR) and combined procedures. **Methods:** Quality of life of $n = 136$ patients over 80 years at operation (82.3 ± 2.1 years), undergoing isolated CABG in 61 patients (45%), isolated AVR in 34 patients (25%) and a combination of CABG and AVR in 41 patients (30%) between January 1999 and December 2003 was reviewed. Preoperatively 66.2% presented in NYHA-class III/IV or CCS-class III/IV. Mean ejection fraction (EF) was $59.5\% \pm 14.0$ (range 25–90%). Quality of life assessment was performed via a Seattle Angina Questionnaire. Follow-up was 100% complete for a total of 890 days (69–1853 days). **Results:** Five-year survival was 70% for the CABG group, 75% for the AVR group and 65% for the CABG/AVR group. Quality of life was remarkable in all of the three groups after surgery. Overall 97 patients (81%) were not or little disabled in their daily activity. One hundred and twelve patients (93%) were free or considerably less symptomatic. Seventy-eight patients or 65% reported to be very satisfied with their current quality of life and 112 patients (93%) felt very reassured to have continuous full access to medical treatment despite of their advanced age. **Conclusions:** A remarkable quality of life and important improvement in the functional status after cardiac surgery in patients over 80 paired with a satisfactory medium-term survival justify early intervention for heart disease in this age group. Therefore, referral practice for patients over 80 years for heart surgery should be handled liberally.

Keywords: Elderly; Aging; Quality of life; Valve surgery; Coronary surgery; Heart disease

1. Introduction

Life expectancy has increased during recent decades leading to an older growing population. In 1982, life expectancy at birth for the overall population in Switzerland, UK and USA was 76.3 years, 75.7 years and 75.5 years, respectively. Ten years later, life expectancy has raised to 79.9 years for Switzerland, 77.9 years for UK and >77 years for USA. By 2022, life expectancy will reach 82.0 years for Switzerland, 80.8 years for UK and 80.2 for USA. An 80-year-old Swiss male or female will live another 6.6 or 7.8 years, respectively. Sixteen percent of the Western European population, 13% in USA and 15% in Switzerland, compared to 7% of the world population, is over 65 years of age. Five percent of the Swiss population is aged 80 years and over, and this age group continues to rise. It is estimated that the United States population will include more than 25 million persons, at least 80 years of age, by 2050 [1].

Considering that heart diseases are the leading cause of death in the industrialised nations and the prevalence of coronary artery disease (CAD) is 18% in the United States, the amount of patients seeking treatment will further increase. Despite maximum medical therapy many patients of this age group remain severely symptomatic of their cardiovascular disease. Cardiovascular diseases are functionally limiting more than 25% of the population aged 80 years and above [2].

Continuous advances in operative techniques, myocardial protection and perioperative care have led to a steady decline in operative mortality, and cardiac surgery can be performed safely in patients of 80 years and older with good mid-term results.

Quality of life (QoL) is becoming an increasingly important aspect of assessing the outcome of any therapeutic intervention, as well as a personal perception of his or her health, physical well-being and mental state. Elkinton in 1966 [3] described quality of life as 'not just the absence of death but life with the vibrant quality that was associate with the vigour of youth'.

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2. Methods

2.1. Patient population

From a total of 161 octogenarians with consecutive heart operations between January 1999 and December 2003 at a single centre, all patients with either isolated coronary artery bypass grafting (CABG), isolated aortic valve replacement (AVR) or combined CABG/AVR were selected ($n = 136$).

Data were extracted from retrospective review of patients' records. Information on quality of life of the 120 surviving patients and causes of deaths were obtained via telephone interviews during a 2-month period by the same investigator. The surviving patient himself was questioned in the first line; relatives, patient's general practitioners or cardiologists and hospital autopsy records served to acquire additional information.

The postoperative quality of life assessment is based on a modified Seattle Angina Questionnaire and is 100% complete. Mean follow-up was 890 days (maximum 1853 days, minimum 69 days).

2.2. Statistical analysis

Data were analysed with GraphPad Prism® (Version 3.02). Data are presented as absolute numbers, mean ± standard deviation or percentages where appropriate. Long-term survival was analysed using the Kaplan-Meier method.

2.3. Preoperative patients' characteristics

The mean age of the 136 patients at operation was 82.3 ± 2.1 years, ranging from 80 to 91 years. More than 13% of the patients were 85 years or older. Eighty (59%) were male patients. Two-third presented with symptoms of NYHA-class III or IV, respectively, CCS-class III or more. Body mass index was 25.5 ± 3.8 kg/m^2. The preoperative variables are summarised in Table 1.

2.3.1. Isolated coronary artery bypass grafting ($n = 61$ patients)

Unstable angina pectoris was the most common symptom. Forty-two patients (69%) had a CCS of III or more. Twenty-seven patients (44%) had a history of myocardial infarction, in 11 patients less than 14 days before and in 16 patients more than 2 weeks before surgery. The left ventricular ejection fraction (LVEF) was 59 ± 13% and only five patients (8.2%) presented with a LVEF of equal to or less than 35%.

In 53 patients (87%) three-vessel and in 7 patients (11%) two-vessel disease was present. Left main stem disease was diagnosed in 25 patients (41%).

Quintuple CABG was performed in 7 patients (11%), quadruple in 25 patients (41%), triple in 23 patients (38%), whereas two-vessel revascularisation was performed six times (10%). In 47 patients (77%) a left internal mammary artery (LIMA) was harvested and 47 patients (77%) got one or more arterial conduits. Eight (13%) radial arteries were harvested and implanted. The operation time was 168 ± 40 min and the bypass time was 77 ± 29 min. Mean aortic cross-clamp time was 46 ± 18 min. Nine patients (15%) needed inotropic support during weaning from cardiopulmonary bypass (CPB) and one patient (1.6%) required support via an intra-aortic balloon pump (IABP).

2.3.2. Aortic valve replacement ($n = 34$ patients)

Twenty-one operated patients (62%) were in NHYA ≥ III and LVEF was 60.4 ± 14%.

Severe aortic stenosis was the leading pathology in all 34 patients (100%). In 16 patients (47%) concomitant aortic insufficiency grade I or II was noted. Nineteen (29%) patients showed slight to moderate mitral valve insufficiency.

Stented bioprosthesis was implanted in 25 patients (74%), stentless in 1 patient (3%) and a mechanical valve in 8 patients (24%). Mean cardiopulmonary bypass time was 76 ± 28 min and mean aortic cross-clamp time was 53 ± 14 min. Overall operation time was 152 ± 37 min.

Table 1
Preoperative patient characteristics

Variables	No. of patients (%)			
	All ($n = 136$)	CABG ($n = 61$)	AVR ($n = 34$)	CABG/AVR ($n = 41$)
Males	80 (59)	39 (64)	15 (44)	26 (63)
Age	82.3 ± 2.1	82.0 ± 1.8	82.6 ± 2.0	82.5 ± 2.6
NYHA or CCS ≥ III	90 (66)	43 (70)	21 (62)	26 (63)
Hypertension	83 (61)	38 (62)	15 (44)	30 (73)
Dyslipidemia	70 (51)	33 (54)	14 (41)	23 (56)
Pos. family history	34 (25)	14 (23)	6 (18)	14 (34)
NIDDM/IDDM	14 (10) /2 (1.5)	6 (10) /2 (3.3)	3 (9) 0	5 (13) 0
Creatinine ≥ 120 μmol/l	26 (19)	10 (16)	7 (21)	9 (22)
COPD	21 (15)	7 (11)	7 (21)	7 (17)
Tobacco abuse	33 (24)	23 (38)	4 (12)	6 (15)
PAD	19 (14)	10 (16)	4 (12)	5 (12)
Atrial fibrillation	26 (19)	7 (11)	10 (29)	9 (22)
Previous MI	35 (26)	27 (44)	2 (6)	6 (15)
Anticoagulation	14 (10)	8 (13)	5 (15)	1 (2.4)

Abbreviations: BMI, body mass index; CAD, coronary artery disease; CCS, Canadian Cardiovascular Society; COPD, chronic obstructive airway disease; MI, myocardial infarction; IDDM, insulin-dependent diabetes mellitus; NIDDM, non-insulin-dependent diabetes mellitus; LVEF, left ventricular ejection fraction; NYHA, New York Heart Association; PAD, peripheral arterial disease.

Inotropic support to get off CPB was necessary in 10 patients (29%), but none of the patients required IABP support.

2.3.3. Coronary artery bypass grafting in combination with aortic valve replacement (n = 41 patients)

Six patients (15%) had left main disease, 10 patients (24%) presented with triple-vessel and 35 patients (87%) had either double- or single-vessel CAD. Twenty (48%) patients had single, 14 patients (34%) double and 11 patients (27%) triple or more vessel revascularisation. Thirteen (31%) LIMA's and three (7.3%) radial arteries were harvested.

Stented bioprosthesis was implanted in 34 patients (83%), stentless bioprosthesis in 1 patient (2.4%) and a mechanical valve in 13 patients (31%). Mean cardiopulmonary bypass time for combined AVR and CABG was 90 ± 35 min and mean aortic cross-clamp time 62 ± 19 min. Overall operative time was 169 ± 41 min.

Nineteen (46%) patients required inotropic drugs for CPB weaning, but IABP was never necessary in the perioperative phase.

3. Results

3.1. Early results

In Table 2 early complications (<30 days) are listed in relation to the type of surgery.

The most frequent postoperative complications in all groups were arrhythmias with atrial fibrillation in 29 patients (21%). Permanent pacemaker became necessary in two patients only (1.5%).

Four patients (3.0%) suffered perioperative myocardial infarction after combined AVR/CABG but none required IABP support in this group. Twenty-seven patients (20%) needed inotropic drugs to wean from CPB and in 21 patients (15%) inotropes had to be continued for more than 24 h. Prolonged mechanical ventilation (>2 days) was necessary in eight patients (5.9%). The average length of stay in the intensive care unit (ICU) was 2.7 ± 1.6 days and five patients (3.7%) stayed more than 1 week. Temporary dialysis was required in two patients (1.5%), but in both the renal function recovered completely. Eight patients (5.9%) underwent re-intervention: in six patients (4.4%) for persistent bleeding and in two patients (1.5%) because of deep sternal wound infection.

Five patients (3.7%) suffered from permanent neurological impairment and three patients (2.2%) recovered fully from a transient neurological impairment.

Hospital stay was 14.2 ± 10.1 days including six patients (4.4%) with a stay longer than 25 days (range 5–110).

3.2. Mortality (cumulative survival in brackets)

In-hospital death occurred in six patients (4.4%). One month after surgery 130 patients (95%) were alive. Survival at 1, 3 and 5 years was 93%, 90% and 73%, respectively. Highest mid-term survival rate was recorded in the isolated AVR with 31 patients (75%) alive. In contrast, combined operations with CABG/AVR showed the lowest 5-year survival with 35 patients alive (65%). The CABG group survival positioned itself between AVR and CABG/AVR groups with 54 patients alive, corresponding to a cumulative 5-year survival of 70% (see Fig. 1).

Causes of the 16 deaths over 5 years were mostly of non-cardiac origin. Fatal pneumonia caused death in five patients (31.3%). In two patients (12.5%) cerebrovascular accidents, in three patients (18.8%) septicaemia, in one patient (6.3%) mesenterial infarction, in one patient (6.3%) cerebral haemorrhage and in one female patient (6.3%) euthanasia led to death. In five patients (31.3%) a cardiac cause has been found to be at the origin of death. Table 3 shows a comparison of intervention-linked cumulative survival in octogenarians after cardiac surgery.

Table 2
Early complications (<30 days) in relation to the type of surgery and additionally assessed postoperative variables

Variables	No. of patients (%)			
	All (n = 136)	CABG (n = 61)	AVR (n = 34)	CABG/AVR (n = 41)
Inotropic drug support required	27 (19.9)	9 (14.8)	9 (26.4)	9 (22.0)
IABP	1 (0.7)	1 (1.6)	0	0
ICU (days)	2.7 ± 1.6	2.8 ± 1.5	2.6 ± 1.2	2.7 ± 2.1
Prolonged ventilation (>24 h)	8 (5.9)	4 (6.6)	3 (8.8)	3 (7.3)
Duration of inotropes (h)	13.5 ± 29.0	8.3 ± 22.3	17.6 ± 33.0	0.75 ± 1.4
Number of intraoperative EC	1.5 ± 2.0	1.4 ± 1.8	1.8 ± 2.2	1.5 ± 2.0
Number of postoperative EC	1.0 ± 5.1	1.4 ± 7.4	0.9 ± 2.0	0.5 ± 1.2
Transient neurological impairment	3 (2.2)	1 (1.6)	0	2 (4.9)
Permanent neurological impairment	5 (3.7)	4 (6.6)	1 (2.9)	0
Myocardial infarction	4 (2.9)	0	0	4 (9.8)
Temporary dialysis	3 (2.2)	1 (1.6)	1 (2.9)	1 (2.4)
Antibiotic treatment (>48 h)	26 (19.1)	5 (8.2%)	11 (32.4%)	10 (24.4)
Deep sternal infections needing reoperation	2 (1.5%)	0	2 (5.9%)	0
Reoperation for bleeding	6 (4.4%)	2 (3.3%)	2 (5.9%)	2 (4.8)
Atrial fibrillation	29 (21.3%)	8 (13.2%)	10 (29.4%)	11 (26.8)
Permanent pacemaker	2 (1.5%)	0	2 (5.9%)	0
Hospital stay mean time (days)	14.2 ± 10.1	14.1 ± 13.5	13.8 ± 5.9	14.8 ± 6.2
Number of drugs at discharge	5	5	5	5

Abbreviations: EC, erythrocyte concentrate; IABP, intra-aortic balloon pump; ICU, intensive care unit.

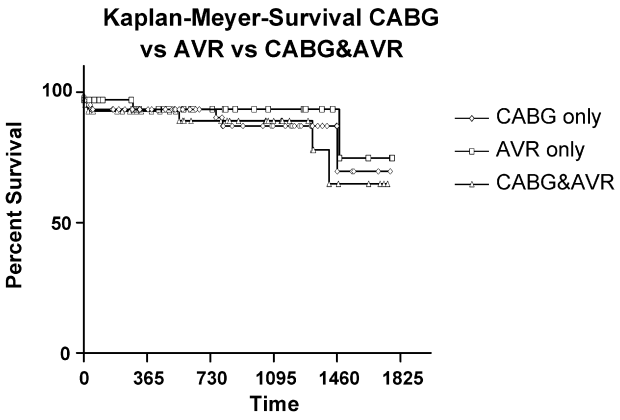

Fig. 1. Kaplan-Meyer survival curves, comparing CABG, AVR and combined procedures in patients over 80 years of age. Unit on the time axis is expressed in days and unit on the survival axis is expressed in percentage.

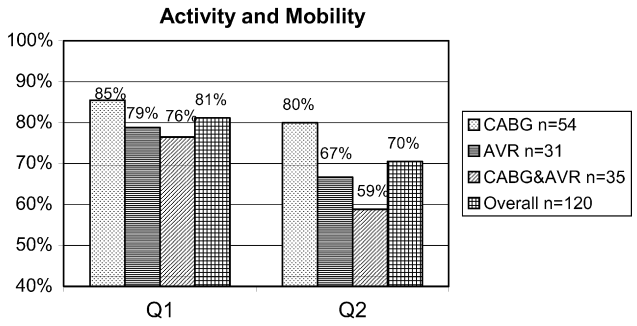

Fig. 2. Percentage and absolute numbers of patients having answered questions 1 and 2 with no or little limitations in their daily activities.

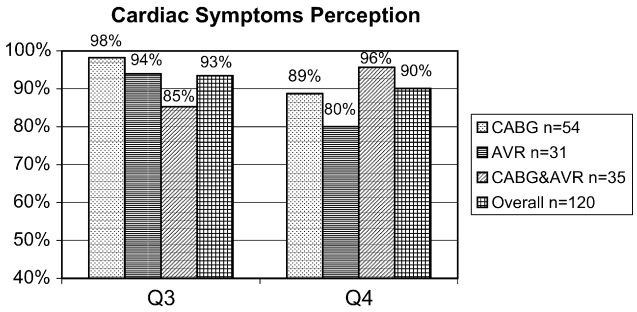

Fig. 3. Percentage and absolute numbers of patients having answered question 3 with much less or less angina or dyspnoea and question 4 with angina or dyspnoea less than once a week or never in the last 4 weeks.

3.3. Mid-term results

3.3.1. Quality of life

Mean follow-up length was 890 days (range 69–1853). Information was collected by telephone interviews.

One hundred and thirty patients left the hospital and at follow-up 120 patients were alive. A validated Seattle Angina Questionnaire including two additional questions regarding dyspnoea was used to assess the quality of life (see Fig. 4a). This 11-item multiple-choice instrument examines mobility and activity, cardiac symptoms perception, disease perception, treatment satisfaction as well as emotional well-being and enjoyment of life. In terms of also assessing valve pathologies, dyspnoea as an additional symptom was added to the questions regarding chest pain.

Quality of life improved considerably after cardiac surgery. Overall 97 patients (81%) were not or little disabled in their daily activities (see Fig. 2). Physical exercise was not or little limited in 84 patients (70%). Symptoms decreased post-cardiac surgery in 112 patients (93%), only 2 patients (1.7%) felt worse than before operation and 6 patients (5%) described unchanged symptoms (see Fig. 3). Eighty-six patients (72%) were free of angina or dyspnoea, while eight patients (6.6%) remained moderately to severely symptomatic. In the CABG group 42 patients (77.7%) did not have to take nitroglycerin anymore. Overall 93 patients (77%) were very satisfied and another 21 patients (17.4%) were satisfied by the previous treatment. Only six patients (5%) did not feel satisfied to take their prescribed medication. Furthermore, 112 patients (93.4%) were very reassured to have continuous full access to medical treatments (see Fig. 4a).

Interference of cardiac disease with daily enjoyment of life was described by only 9 patients (7.5%) while 111 patients (92.5%) had no reduction in their quality of life. Sixty-nine patients (58%) were very optimistic to conserve their present activity of life. Thirty-three patients (27.7%) did think about recurrence of their heart disease from time to time, but only 17 patients (14.2%) were anxious more frequently to have a heart attack or to die suddenly (Fig. 4b). In contrast, 30 patients (45%) undergoing aortic valve replacement, with or without concomitant CABG, worried at least once a day of dying versus 6 patients (11.1%) after isolated coronary artery bypass surgery.

And finally, 116 patients (97%) at follow-up lived in their own homes and preserved a high degree of self-care.

4. Discussion

Since the mid-1980s the peri- and postoperative survival in octogenarians, after cardiac surgery, has steadily increased to become highly acceptable nowadays [4]. Patients 80 years and older represent a very distinct population from younger cardiac patients [5]. Measurement of morbidity and mortality provides only a small amount of information about the

Table 3
Comparison of intervention-linked cumulative survival in octogenarians after cardiac surgery

Operation	30-day survival	1-year survival	3-year survival	5-year survival
All operations (n = 136)	95% ± 1.7 (7)	93% ± 2.0 (9)	90% ± 2.1 (12)	73% ± 7.9 (16)
Isolated CABG (n = 61)	95% ± 2.7 (3)	93% ± 3.2 (4)	87% ± 5.3 (6)	70% ± 16.1 (7)
Isolated AVR (n = 34)	97% ± 2.8 (1)	94% ± 4.3 (2)	94% ± 4.3 (2)	75% ± 17.1 (3)
AVR and CABG (n = 41)	92% ± 4.0 (3)	92% ± 4.0 (3)	88% ± 5.3 (4)	65% ± 15.2 (6)

In parentheses: cumulative absolute numbers of occurred death within every survival interval.

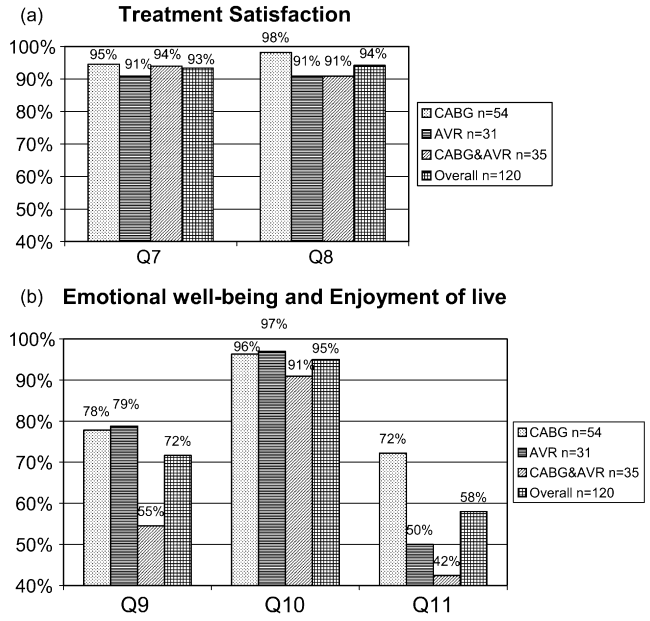

Fig. 4. (a) Percentage and absolute numbers of patients having answered questions 7 and 8 being satisfied or very satisfied with their treatment. (b) Percentage and absolute numbers of patients having answered questions 9 and 10, little interfered or not interfered, and satisfied or very satisfied about their emotional well-being, and question 8 being satisfied or very satisfied with their treatment as well as question 11 with rarely or never worrying about a heart attack or sudden death event.

patients' postoperative physical, functional, emotional and mental well-being.

Little is known about the postoperative symptom perception in patients 80 years and older after cardiac surgery. This study analyses the postoperative quality of life in 120 consecutive octogenarians post-CABG, AVR or a combination of both procedures. Mean follow-up was about 2.5 years and none of the surviving patients was lost at follow-up. Information on quality of life was obtained from close family members in the three patients with permanent neurological impairment. No one refused to answer the questionnaire. The quality of life of 54 patients after CABC surgery, of 31 patients after AVR and 35 patients after combined procedures was compared.

The initial assessment was based on the two main cardiac functional symptoms: chest pain and dyspnoea. As older patients are known to have advanced symptoms at presentation for surgery, NYHA class III and IV are more common findings in octogenarians as they are in younger patients. Alexander et al. [4] described NYHA class III to IV heart failure being present in 16.6% compared to 9.8% in patients younger than 80 years. Fruitman et al. [5] have also shown a significant higher presence of NYHA IV in octogenarians.

Questions 1–5 of the Seattle Angina Questionnaire all address either one or both symptoms. In CABG patients, unstable angina pectoris was the presenting symptom with more than two-third of the patients being in a CCS $\geq$ III. Near-equal distribution was found for dyspnoea in patients undergoing AVR with 62% being in NYHA $\geq$ III. In the combined CABG/AVR group the dyspnoea was the leading symptom (see Table 1).

The gender difference is decreasing with age progression. Forty-one percent of patients were women opposed to 20–30% described in younger population [4,6]. We did not identify either trend for higher female or male in-hospital mortality as described by other studies. Therefore, female gender may be a weaker risk factor in elderly compared to younger women.

The higher difference of pre- and postoperative symptoms in this older patient subgroup is a further argument for the benefit of early operative treatment in patients over 80 years of age.

In 42% left main disease was present and CAD showed to be more extensive in older patients at the time of surgery. In contrast, LVEF did not differ from values in younger collectives, and preoperative COPD or diabetes mellitus was less likely to be found in octogenarians.

Compared to the literature [7] we used the left thoracic artery more often (78%) for revascularisation of the LAD territory. In our opinion the principle of the thoracic artery as the graft of choice in CABG is valid in patients 80 years of age as well.

Peripheral vascular disease was more commonly present in CABG patients (17%) compared to patients undergoing AVR with or without concomitant CABG (12%).

Three years after surgery, 124 patients (90%) were alive and 120 patients (73%) 5 years after their operation (see Table 3). These survival rates are comparable or slightly higher than the ones described in other studies [4,6–9] and show good early- and mid-term postoperative results, justifying not withholding cardiac surgery from the increasing elderly and very old population.

However, longevity is not the primary goal in patients over 80; therefore, good operative outcomes imply not only safety and survival but also the gain of comfort in daily life. The marked improvement of the NYHA functional class as well as improvement of the CCS class we found (72% free of angina or dyspnoea) has been reported previously [5,10,13]. Nevertheless, only marginal attention had been paid in most studies to the improvement of emotional well-being, treatment satisfaction and disease perception. The results of the present study demonstrate a remarkable quality of life and an important improvement in the patients' functional status after cardiac surgery in octogenarians.

Activity and mobility improved in ischaemic and valvular disease with nearly 80% of the patients feeling no or only little limitation in their daily activity (see Fig. 2). The improvement in exercise tolerance is less homogenously distributed, reporting 80% of CABG patients being virtually free of limitation and only 59% of the patients in the combined procedures group. This difference in exercise tolerance is reflected again in the patient symptom perception. Ninety-eight percent of the CABG patients compared to 85% of CABG and AVR patients felt important improvement of their angina or dyspnoea compared to their preoperative clinical condition. The vast majority (93%) of all the octogenarians felt much better after surgery (see Fig. 3). Towards all types of operations, more than 90% of the patients were at least satisfied or very satisfied with the overall treatment of their heart disease. And it is noteworthy that nearly 100% of the CABG patients as well as 91% of the AVR or CABG and AVR patients felt pleased to have access to

full medical treatment, despite of their advanced age (see Fig. 4a). Over 95% of the patients at follow-up lived in their own homes and enjoyed a high degree of autonomy. Similar results have been found by Fruitman et al. [5], Heijmeriks et al. [11], Rumsfeld et al. [12], Kumar et al. [13] and Yun et al. [14].

Looking at an economical scale hospital costs have been reported to be 20–27% higher in the older population [15]. Avery et al. attributed the increase of total direct hospital cost in octogenarians to a more severe risk profile and to longer consecutive ICU and hospital stay [6]. However, emphasis on early extubation and timely aggressive mobilisation after surgery also in this elderly patient population has successfully decreased the overall intubation time and length of stay in ICU to 2.8 days (see Table 2). This is between the previously reported 6.8 days [4], or 5.1 days [8] and the 1.7–1.1 days of Dalrymple-Hay et al. [16]. Prolonged ventilation (>24 h) was required in only 8.7%, summarising all cardiac procedures in our study population. Our hospital stay of 14.5 days is in the range of previous publications [10]. The excellent postoperative recovery and quality of life gave back the potential of self-care and reduced consecutive disease-associated costs compared to medical treatments with repeated hospitalisation for repetitive heart failure [17].

In summary, selected patients of 80 years and older after cardiac surgery show a remarkable quality of life and a considerable increase in their emotional well-being (see Fig. 4b), as well as a important increase in their functional status with a satisfactory medium-term 5-year survival (see Fig. 1) at a reasonably low risk. The stunning recovery from being a bedridden patient to a self-caring patient is a further very important advantage after cardiac surgery in this challenging age group. Therefore, in selected octogenarians, early operative treatment should not be withheld, and adoption of an early referral practice might further increase the postoperative patients benefits.

4.1. Limitations

The present study has several limitations. The use of a modified Seattle Angina Questionnaire instead of the SF-36 questionnaire [18,19] was motivated by the increased age, the specific disease and treatment characteristics of the analysed patient population. The SF-36 is a multipurpose, short-form health survey with 36 questions. It yields an 8-scale profile of functional health and well-being scores, as well as psychometrically based physical and mental health summary. It is known to be a generic measure, as opposed to one that targets a specific age, disease or treatment group. The Seattle Angina Questionnaire [20,21] as opposed to the SF-36 is a shorter 11-item questionnaire measuring five dimensions including physical limitation, anginal stability, anginal frequency, treatment satisfaction and disease perception targeting a specific disease and treatment group. The lower number of questions and the nature of the questions were found to be more adequate to the very old patient population. All questions investigating angina-related outcomes had to be supplemented with the symptom of dyspnoea in order to address aortic valve disease as well (see Table 4). This modification is by itself not validated but does not interfere with the angina assessment and provide a simple tool to measure valve related QoL perception.

Further, the 136 patients represent a selective subgroup of the entire population. Coronary artery disease as well as valve pathologies might follow a different disease progression in these older patients and certainly show a delayed onset. A further limitation is the relatively small sample size,

Table 4
Questionnaire used for quality of life assessment via telephone interview

No.	Question (Q)/Answer options (A)
1	Q: How limited are you in your daily activities inside your flat/house? A: Severely limited/moderately limited/limited/little limited/not limited
2	Q: How limited are you moving upstairs or walk up a little hill? A: Severely limited/moderately limited/limited/little limited/not limited
3	Q: Compare your angina or dyspnoea today and before the operation? A: Lot more/somewhat more/unchanged/less/much less
4	Q: Over the past 4 weeks, on average, how many times have you had angina or dyspnoea? A: Four times or more a day/1–3 times a day/3 or more times a week/less than once a week/never in the last 4 weeks
5	Q: Over the past 4 weeks, on average, how many times have you taken nitroglycerin? A: Four times or more a day/1–3 times day/3 or more times a week/less than once a week/never in the last 4 weeks
6	Q: How bothersome is it for you to take your pills as prescribed? A: Very/moderately/little/not at all/no drugs prescribed
7	Q: How satisfied are you that everything possible is being done to treat your heart? A: Not satisfied/somewhat satisfied/satisfied/very satisfied
8	Q: How satisfied are you with the overall treatment of your heart disease? A: Very dissatisfied/somewhat dissatisfied/little dissatisfied/satisfied/very satisfied
9	Q: Over the past 4 weeks, how much has your angina or dyspnoea interfered with your enjoyment of life? A: Strongly interfered/somewhat interfered/little interfered/not interfered
10	Q: If you had to spend the rest of your life with your actual discomfort, how would you feel about this? A: Very dissatisfied/somewhat dissatisfied/little dissatisfied/satisfied/very satisfied
11	
(a)	Q: (a) How often do you worry that you may have a heart attack or die suddenly? A: Can't stop/often/from time to time/rarely/never
(b)	Q: (b) Where do you live? A: At home/with my family/with friends/at a nursery home

Translated from German.

decreasing the ability to detect factors influencing the outcome. However, the number of patients in the present series was similar to previous studies assessing cardiac surgery in octogenarians. Although we extracted retrospective data, no patient was lost in the follow-up.

This study reports postoperative results of a single centre, which may introduce institutional bias. Despite these possible limitations, postoperative survival and overall quality of life in patients 80 years and older were very good.

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