Initial and long-term results of coronary angioplasty and coronary bypass surgery in patients of 75 or older

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Abstract

Objective—To evaluate clinical outcome after percutaneous transluminal coronary angioplasty (PTCA) or coronary artery bypass grafting (CABG) in patients of 75 or older who underwent either procedure between 1980 and 1987. **Subjects**—93 patients aged 75–89 with angina pectoris class III–IV (Canadian Cardiovascular Society) who underwent PTCA and 81 patients aged 75–84 with angina class III–IV who underwent CABG. Follow up was 8.2 years in the PTCA group and 8.3 years in the CABG group. **Main outcome measures**—In-hospital complications and survival at follow up. **Results**—Primary success rate for PTCA was 84% (78/93). Two patients died, two had emergency CABG, three had a myocardial infarction, and one had a cerebrovascular accident. PTCA failed in seven patients (five underwent elective CABG and two were treated conservatively). Median hospital stay was 4.3 days. Primary success rate for CABG was 63% (51/81). Six patients died, two had a cerebrovascular accident, eight had a myocardial infarction, 10 had a rethoracotomy, and four the adult respiratory distress syndrome. Median hospital stay was 14.2 days. In the PTCA group during follow up eight patients died, three had a non-fatal myocardial infarction, two had elective CABG, 10 had repeat PTCA, and four had recurrence of angina. Sixty four patients were free of angina (69%). In the CABG group during follow up eight patients died, one had a non-fatal myocardial infarction, six had PTCA, and three had recurrence of angina. Fifty seven patients were free of angina AP (70%). Actuarial survival after 10 years was 92% for PTCA and 91% for CABG. **Conclusions**—PTCA is safe in elderly patients. The complication rate is lower and hospital stay significantly shorter compared with CABG ($p < 0.05$). Long-term follow up showed no significant difference between PTCA and CABG.

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The general population is aging and the percentages and numbers of patients aged 75 or older are increasing. In this population a conservative approach is often chosen for those with ischaemic heart disease. When

symptoms are not adequately alleviated, however, options for revascularisation should be considered. Several reports have documented the efficacy of percutaneous transluminal coronary angioplasty (PTCA) in elderly patients,^{1–18} but coronary artery bypass grafting (CABG) can also be performed in this group with increasing safety.^{18–28} In this observational study we report our experience between 1980 and 1987 in patients of 75 and older who underwent PTCA or CABG.

Patients and methods

Between September 1980 and December 1987, 3142 patients underwent PTCA in our institution. Ninety three were 75 or older (3%). In the same period 3657 patients underwent CABG, of whom 81 (2%) were 75 or older. Table 1 summarises the clinical characteristics of the patients.

PROCEDURES

PTCA was performed via the femoral artery in 98% of cases. In the majority (72%) an over the wire balloon system was used. Angioplasty was considered successful when the stenosis was reduced to less than 50% of the luminal diameter, without major complications (myocardial infarction, cerebrovascular accident, emergency CABG, or death). Complete revascularisation was not necessarily the aim.

Table 1 Clinical characteristics of 174 patients of 75 or older who underwent PTCA or CABG. Values are numbers of patients unless stated otherwise

	PTCA (n = 93)	CABG (n = 81)
Men	54	53
Women	39	28
Mean age (years)	80	77
Smoker:		
Former	17	14
Current	37	31
Hypertension	47	40
Diabetes	5	3
Angina (CCS class):		
0	—	—
I	—	—
II	0	2
III	43	37
IV	50	42
Previous:		
Myocardial infarction	36	30
CABG	9	13
No of diseased vessels:		
1	4	3
2	10	16
3	79	62
Left ventricular ejection fraction(%):		
>45	69	62
25–45	22	18
<25	2	1

CCS, Canadian Cardiovascular Society.

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Table 2 Extent of procedure in patients who underwent PTCA or CABG. Values are numbers (percentages) of patients

No of vessels/anastomosis	PTCA (n = 93)	CABG (n = 81)
1/Distal	67 (72)	3 (4)
2/Distal	23 (25)	15 (19)
3/Distal	3 (3)	12 (15)
4/Distal	—	51 (62)

In patients undergoing CABG, however, complete revascularisation was performed if possible. Cardiopulmonary bypass with moderate hypothermia and cristalloid cardioplegia was used.

STATISTICAL ANALYSIS
Continuous variables are expressed as medians (SD). Student's *t* tests were performed to determine whether there was a significant difference between mean values.

Results
In total 122 vessels were dilated in the PTCA group: the left anterior descending artery or a graft to the left anterior descending artery in 66 patients (54%), the left circumflex coronary artery in 24 (20%), the right coronary artery in 22 (18%), and the diagonal branch in seven (6%). An unprotected left main stem was dilated in three patients (2%). These three patients had class IV angina and were unsuitable candidates for CABG. Table 2 summarises the extent of the procedure in patients who underwent PTCA or CABG. One vessel was dilated in 67 patients (72%), two vessels in 23 (25%), and three vessels in three (3%). In the CABG group three patients (4%) had a single distal anastomosis, 15 (19%) had two distal anastomoses, 12 (15%) had three, and 51 (62%) had four or more.

Complete revascularisation was performed more frequently in the CABG group than in the PTCA group, in whom only the culprit lesion was dilated in the majority of cases. PTCA was successful in 78 out of 93 patients (84%). It was impossible to cross the lesion in seven patients: five of them underwent elective CABG and two were treated conservatively.

Table 3 summarises the complications in hospital after the two procedures. Two patients died in the PTCA group. One patient underwent salvage PTCA while in cardiogenic shock after myocardial infarction; the stenosis was adequately dilated, but the

Table 3 Complications in hospital after PTCA and CABG. Values are numbers (percentages) of patients unless stated otherwise

	PTCA (n = 93)	CABG (n = 81)
Deaths	2	6*
Emergency CABG	2	—
Cerebrovascular accident	1	2
Myocardial infarction	3	8
Rethoracotomy	—	10
Prolonged ventilation	—	4
Median hospital stay (days) (range)	4·3 (2–15)	14·2 (8–53)
Survival in hospital	91 (96)	75 (92)

*Four patients underwent emergency CABG after complications of coronary angiography performed elsewhere.

patient died within 24 hours from progressive shock. The other patient developed dissection of the left main coronary artery, induced by the guiding catheter, and died during the procedure. Two patients underwent emergency CABG after failure of PTCA without complications. One patient had a cerebrovascular accident but recovered without residual symptoms and three patients suffered a myocardial infarction in the first 24 hours after PTCA. The survival rate in hospital for the PTCA group was 96% (91 patients). The median hospital stay was 4·3 days (2–15).

CABG was uneventful in 53 out of 81 patients (63%). Deaths of six patients (7%) were all related to the procedure. Four patients died during emergency surgery from evolving myocardial infarction as a result of complications during coronary angiography that had been performed elsewhere. Two other patients sustained a myocardial infarction during the operation and died on the second and third day after the procedure. In addition, 24 patients developed non-fatal complications within 30 days, including CVA (two patients), and recovered uneventfully. Eight patients had an uncomplicated myocardial infarction, 10 required rethoracotomy because of excessive bleeding, and four required prolonged ventilation (more than three days) for the adult respiratory distress syndrome. Hospital survival was 92% (75 patients). The median hospital stay was 14·2 days (8–53).

LONG TERM FOLLOW UP
Follow up was complete in all patients up to June 1991. Information was obtained from the referring physician, from patients at out patient visits, or by telephone. Table 4 shows the late outcome in the patients.

In the PTCA group mean follow up was 8·2 years (3·5–10·9). Actuarial survival was 92% after 10 years. There were eight late deaths: two sudden cardiac deaths after three and six years and six non-cardiac deaths from cancer. Three patients had a non-fatal myocardial infarction. Elective CABG was

Table 4 Outcome in patients of 75 or older after PTCA or CABG. Values are numbers (percentages) of patients unless stated otherwise

	PTCA (n = 93)	CABG (n = 81)
Death:		
In hospital	2	6*
Late:		
Cardiac	2	3
Non-cardiac	6	5
Survival	83 (89)	67 (83)
Actuarial survival after 10 years (%)	92	91
Myocardial infarction:		
Non-fatal	3	1
None	80	66
Elective CABG	2	—
No myocardial infarction or repeat CABG	78	66
Repeat PTCA	10	—
PTCA	—	6
No myocardial infarction, CABG, or PTCA	68	60
Recurrence of angina	4	3
No myocardial infarction, CABG, PTCA, or angina	64 (70)	57 (76)

*Four patients underwent emergency CABG after complications of coronary angiography performed elsewhere.

performed in two patients because of recurrence of angina pectoris, and repeat PTCA was performed in 10 patients. Thus in the PTCA group 68 patients (76%) had long term event free survival. Four of these patients had class II-III angina pectoris according to the Canadian Cardiovascular Society's definitions, and this was treated conservatively. Therefore 64 patients (70% of the initially surviving group) were free of angina.

In the CABG group mean follow up was 8.3 years (3.5–11.2). Actuarial 10 year survival was 91% (excluding the four early deaths during emergency surgery). There were eight late deaths (11%): one patient died after 5.4 years from myocardial infarction, two patients died suddenly 2.4 and 6.8 years after operation, and five patients died of cancer. Only 1 patient had a non-fatal myocardial infarction. Elective PTCA was performed in six of the patients who had had CABG because of recurrence of angina pectoris. Thus in the CABG group 60 patients (80%) had event free long term survival. Three of these patients had class II-III angina pectoris, which was treated conservatively. Thus 57 patients (76% of the initial group) survived free of angina. The figure shows total survival calculated by the Kaplan-Meier method²⁹ for all patients of 75 or older who underwent PTCA or CABG. The four patients who were referred to our institution for emergency CABG after complications during coronary angiography elsewhere and died are not included. There was no significant difference between the two groups.

Discussion

Patients of 75 or older form a considerable and rapidly growing proportion of the population. In 1995 the number of elderly citizens (>65) in The Netherlands will increase to two million, and it is calculated that in 2030 one million Dutch citizens will be 75 or older.

Kaplan-Meier curve of total survival time for patients of 75 or older who underwent PTCA or CABG. Vertical lines are 95% confidence intervals. The four patients who were referred to our institution for emergency bypass surgery after complications of coronary angiography and died during the procedure are not included in the analysis.

Cardiovascular disease remains the main cause of morbidity and mortality in this age group,³⁰ and an increasing number of elderly patients unresponsive to medical treatment for angina pectoris will be referred for PTCA or CABG. In this group CABG is associated with an increased mortality and morbidity.^{18–28} In a recent review of the influence of age on the results of coronary artery surgery, Weintraub *et al* reported the highest mortality in patients of 80 or older, followed by those of 70–79.²⁷ Wound infection and neurological events were higher than in younger patients. Several reports indicate that the results of PTCA in elderly patients are comparable to those obtained in younger patients,³¹ although other authors report lower success rates and increased morbidity.¹² Thus PTCA may be an attractive alternative to surgery.^{1–17 32}

Our results for both PTCA and CABG are similar. The rate of complications tended to be higher in the CABG group, and the stay in hospital was also significantly longer. Late outcome was excellent in both groups, although there was a trend towards more cardiac events necessitating repeated interventions in the PTCA group to achieve the same late outcome. Interestingly, mortality during follow up in both groups was mainly from cancer and not coronary artery disease. We also observed that dilating the culprit lesion in most patients who had PTCA was sufficient to achieve a similar late outcome as complete revascularisation in patients who had CABG.

A point of criticism of our study is how patients were selected. The procedures were not randomly assigned, and there is no explanation why PTCA was done in a certain cohort of patients and CABG in another (indication bias).

In conclusion, PTCA and CABG in patients of 75 or older have low complication rates. In elderly patients dilatation of the culprit lesion often provided adequate symptomatic relief in the majority of patients. The complication rate for PTCA was lower and the hospital stay was shorter compared with CABG. These observations suggest that PTCA is preferable to CABG when the culprit lesion is suitable for PTCA. If the culprit lesion is not identified or unsuitable for PTCA, CABG can be performed with an acceptable risk.

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