Percutaneous Transluminal Coronary Angioplasty for Elderly Patients

HIDEMASA KITAZUME, M.D., ICHIRO KUBO, M.D., TORU IWAMA, M.D.

YOSHIO AGEISHI, M.D., AND AKIO SUZUKI, M.D.*

To examine the clinical efficacy of percutaneous transluminal coronary angioplasty in elderly patients, 350 consecutive procedures of coronary angioplasty were reviewed by dividing the patients into two groups: 142 cases of elderly patients whose ages were 65 years or older and 208 cases of younger patients. The primary success rate was satisfactory in both groups (86.6% in the elderly patients and 88.5% in the younger patients) and frequency of complication was acceptable (3.1% vs 2.9%) in both groups. Although restenosis tended to occur more frequently in the elderly patients (36.8% vs 27.1%), most of the lesions were re-dilated. These indicate that coronary angioplasty can be extended to elderly patients. The primary success rate started to decrease with circumflex arteries at age 70 years, and a similar trend was seen with right coronary arteries at age 65 years. Careful selection of the patients for coronary angioplasty as well as detailed analysis of the coronary anatomy and aorta are required to obtain clinical success and to prevent complications.

PERCUTANEOUS transluminal coronary angioplasty (PTCA) has become popular as a revascularization procedure because of its less invasive nature than that of the coronary bypass operation.^{1,2} Nevertheless, coronary angioplasty is not free from complications that may necessitate emergency bypass surgery,³⁻⁵ and therefore it was initially considered to be indicated only for patients at our institution who were younger than 70 years old. Yet, it was not uncommon to admit older patients with acute myocardial infarction or unstable angina. Coronary angioplasties were tried in these patients when revascularization was thought to be beneficial if patients had been active prior to the event and were free from other illness. Since we obtained a favorable outcome in these cases despite their age, we started to carry out coronary angioplasty in elderly patients more frequently only if they had been active. To examine the clinical efficacy

and applicability of PTCA in elderly patients, we analyzed 350 consecutive procedures that were carried out from August 1983 to August 1986. Patients were divided into two groups, namely, elderly patients who were 65 years or older and those who were younger than 65 years.

METHODS

Patients: As shown in Fig. 1, patients ranged mainly from 45 years to 75 years old. One hundred and forty two cases were elderly patients whose ages ranged from 65 to 81 years old, 110 of whom were men and 32 of whom were women. 208 cases were younger patients whose ages ranged from 30 to 64 years; 180 were men and 28 were women. Symptoms and indications of the angioplasties are listed in Table I in which unstable angina and acute myocardial infarctions are shown to be more common in elderly patients. Angiographic findings of the disease are shown in Table II; three vessel disease was slightly more common in elderly patients than in the

Key words:

Coronary angioplasty
Elderly patients

*Department of Internal Medicine, Bokuto Hospital; *Department of Thoracic Surgery, Tokyo Medical and Dental University; Tokyo, Japan*

Mailing address: Hidemasa Kitazume, M.D., Department of Internal Medicine, Bokuto Hospital, 4-23-15 Koto-bashi, Sumida-ku, Tokyo 130, Japan

Fig.1. Age distribution of the whole patients. Although patients were distributed in wide range of the age, most of the patients were from 45 to 74 years with peak at 65 to 69 years old. Abbreviations: M = male and F = female.

younger group, while the degree of diameter stenosis was similar in both groups.

Actual methods: The femoral artery approach was used for all patients except one. Five to ten thousand units of heparin were infused through the guiding catheters which were situated at the ascending aorta. Balloons were inflated several times for 30 to 60 seconds at 6 to 13 atmospheric pressures until adequate dilatation of the lesions was obtained. The patients were monitored at the coronary care unit and administration of 300 to 600 units per hour of heparin was continued for 12 to 24 hours after the procedure. A calcium channel blocker, long acting nitrate and platelet antagonists (either one or two kinds among 300 mg of buffered aspirin, 200 mg of dipyridamole per day and 200 mg of ticlopidine per day) were continued. A therapeutic dose of warfarin was added to the above regimen in those patients whose chronic totally occlusive lesions were successfully dilated. Patients were usually discharged 2 days after the procedure.

Follow-up: Patients were seen once a month at our out patient department or at the office of the referring physician. Follow-up coronary angiograms were obtained at 6 months after the

TABLE I CLINICAL SYMPTOMS

	Elderly	Younger	
Effort angina	78 (55%)	125 (60%)	
Unstable angina	48 (23%)	48 (13%)	$p < 0.025$
Acute infarction	28 (20%)	18 (9%)	$p < 0.005$

TABLE II ANGIOGRAPHIC DEGREE OF THE DISEASE

	Elderly	Younger	
SVD	76 (53.5%)	114 (54.8%)	
DVD	45 (31.7%)	75 (36.1%)	<i>ns</i>
TVD	21 (14.8%)	19 (9.1%)	
Stenosis	$81.9 \pm 14.3\%$ ($n = 279$)	$81.3 \pm 12.6\%$ ($n = 189$)	

Abbreviations: SVD = single vessel disease; DVD = double vessel disease; TVD = three vessel disease; *ns* = not statistically significant

procedure or earlier if symptoms recurred or became aggravated. To estimate patency rate, each newly dilated lesion was analyzed against follow-up angiograms.

Angiographic definitions: Diameter stenosis of the lesions was estimated by comparing the diameter of the lesions with the normal portions that were both proximal and distal to the lesions. The lesions were considered to be successfully dilated if dilated sites showed 20% reduction in the diameter stenosis and the residual stenosis was less than 50%. In cases in which multiple lesions were dilated, the procedures were completely successful if all of the lesions we attempted to dilate were, in fact adequately dilated; they were only partially successful if only some of the lesions were dilated. At follow-up angiograms, the lesions were registered as restenosed if diameter stenosis at dilated site exceeded 50%.

Statistical analysis: Data were expressed as mean $\pm$ SD. Comparisons were performed with Student's *t* test, the chi-square test or Fisher's exact test. A probability value of < 0.05 was considered significant.

RESULTS

Primary success: Angioplasties were successful in 86.6% (complete 83.1% and partial

3.5%) of elderly patients and in 88.5% (complete 83.2% and partial 5.3%) of younger patients. Coronary flow, therefore, was improved in more

Fig.2. Primary success in each vessel (A = anterior descending artery; C = circumflex artery and R = right coronary artery) in sub-groups, age less than 65 years, 65 years or more but less than 70 years and 70 years or more. Primary success rate decreased at age 65 for the right coronary artery and at 70 for the circumflex artery.

TABLE III TECHNICAL DIFFICULTIES

	Elderly	Younger
Guiding cath. engaging	14*	0
Guide wire crossing	13	19
Balloon cath. introducing	7	5
crossing	3	11

* $p < 0.0001$ by Fisher's exact test

TABLE V PROGNOSIS OF THE NEWLY DILATED LESIONS BY FOLLOW-UP ANGIOGRAMS

	Elderly	Younger
Whole lesions	95	170
Patent	56 (58.9%)	115 (67.6%)
Restenosed (re-dilated)	35 (36.8%) (27)	46 (27.1%) (35)
Withdrawn	4	9

TABLE IV ACTUAL COMPLICATIONS IN ELDERLY PATIENTS

Age	Sex	Presented symptom	Actual events	Outcome
68	F	Unstable angina	Reclosure followed by shock	Expired
79	M	Unstable angina	Intraalveolar bleeding	Cured
79	M	Acute infarction	CHF then pneumonia	Expired
67	M	Acute infarction	Shock during dilatation	Expired
68	M	Acute infarction	Shock during dilatation	Expired

Abbreviations: F = female; M = male; CHD = congestive heart failure

than 85% of the patients and there was no significant difference between the two groups. As seen in Fig. 2, success rate for LAD (left anterior descending artery) was around 90% in all age groups, while the rate decreased at age 70 years for CX (left circumflex artery) and at 65 years for RCA (right coronary artery).

Technical difficulties: Actual difficulties encountered during the procedure with failed and partially successful cases are listed in Table III. In elderly patients, difficulties were more frequently encountered while manipulating guiding catheters and at the time of introducing balloon catheters into the coronary arteries.

Complications: Major complications occurred in 3.1% of elderly patients and 2.9% of younger patients. Actual complications in elderly patients are listed in Table IV. All of the major complications occurred in emergent cases either for unstable angina or acute myocardial infarction and 3 of 5 cases were related to left ventricular dysfunction. Experience of these 3 cases prompted us to use intraaortic balloon pumping more vigorously at an early stage of left ventricular dysfunction, and as a consequence, prevention of further occurrence of such a complication was achieved. Intraalveolar bleeding occurred in only one case due to the use of 10,000 units of

heparin at the procedure.

Angiographic follow-up: Follow-up of the newly dilated lesions was completed in 95 lesions in the elderly patients and 170 lesions in the younger patients (Table V). The rate of restenosis tended to be higher in elderly patients (36.8% vs 27.1%) although it did not reach a statistically significant level. Most of the restenosed lesions were re-dilated.

DISCUSSION

Over-all success rate was acceptable even in the elderly patients despite the fact that these patients underwent the procedure in a state of emergency for acute myocardial infarction and/or unstable angina, which was more prevalent than in the younger group. Our result seems better than in previous reports^{6,7}. This is probably due to improvement of the balloon systems. Since the success rate showed a tendency to fall for RCA lesions at age 65 years and for CX at age 70, it is advisable to analyze the coronary anatomy carefully for non-LAD lesions especially for elderly patients. Specific difficulties in elderly patients occurred during manipulation of the guiding catheters and at introduction of the balloon catheters into the coronary arteries. It is probably due to an advanced atherosclerotic change of the aorta, deformities of the coronary ostium and tortuosity of the coronary arteries. The patients must be carefully selected for angioplasty by analyzing these aspects of the coronary arteries and aorta.

Although complications were not frequently seen in elderly patients in our experience, it is more difficult to do emergency bypass surgery once these have occurred. It may be safer not to use an excessive amount of heparin during the procedure although immediate reclosure of the dilated site is another fear. Ever since we experienced a severe intraalveolar bleeding, we have used only 5000 units of heparin for patients who were 75 years or older.

Restenosis tended to be higher in elderly patients,⁸⁻¹² possibly either due to the characteristic of the elderly patient or simply due to the progressive nature of the disease because of which the patient had unstable angina or acute myocardial infarction. It is advisable to follow the patient carefully to detect restenosis as soon as possible.

Efficacy of the coronary angioplasty is determined by measuring primary success rate

against frequency of complications and long term prognosis of the dilated lesions. Since the primary success rate in our experience was satisfactorily high and the rate of complications was acceptable, it may be possible to achieve a higher success rate in the future by analyzing the coronary anatomy and aorta more carefully than before. Careful follow-up of the patients after angioplasty can detect restenosis and most of such restenosed lesions can be re-dilated. Considering these factors and other advantages of the coronary angioplasty over the coronary bypass surgery, such as shorter hospital stay and more rapid return to activity, PTCA could be the choice of treatment over coronary bypass surgery in elderly patients.^{7,11} Once revascularization is established and sustained, the effect is very desirable.

Acknowledgement

We thank Dr. Tei Hakuta, Heart Station, Maedabashi Hospital, Yokohama, for advice and review of the manuscript.

REFERENCES

1. GRUENTZIG AR, SENNING A, SIEGENTHALER WE: Nonoperative dilatation of coronary-artery stenosis, percutaneous transluminal coronary angioplasty. *New Engl J Med* 301: 61, 1979
2. WILLIAM VL: Percutaneous transluminal coronary angioplasty, a 1985 perspective. *Circulation* 71: 189, 1985
3. COWLEY MJ, DORROS G, KESLEY SF, et al: Acute coronary events associated with percutaneous transluminal coronary angioplasty. *Am J Cardiol* 53: 12c, 1984
4. AKINS CW, BLOCK PC: Surgical intervention for failed percutaneous transluminal coronary angioplasty. *Am J Cardiol* 53: 108c, 1984
5. MURPHY DA, CRAVER JM, JONES EL, et al: Surgical management of acute myocardial ischemia following percutaneous transluminal coronary angioplasty. *J Thorac Cardiovasc Surg* 87: 332, 1984
6. MOCK MB, HOLMES DR, VLIESTRA RE, et al: Percutaneous transluminal coronary angioplasty (PTCA) in the elderly patients: experience in the National Heart, Lung, and Blood Institute PTCA registry. *Am J Cardiol* 53: 89c, 1984
7. RAIZNER AE, HUST RG, LEWIS JM, et al: Transluminal coronary angioplasty in the elderly. *Am J Cardiol* 57: 29, 1986
8. MABIN TA, HOMES DR, SMITH HC, et al: Follow-up clinical results in patients undergoing percutaneous transluminal coronary angioplasty. *Circulation* 71: 754, 1985
9. LEINBERGER PP, ROUBIN GS, HOLLMAN J, et al: Restenosis after successful coronary angioplasty in patients with single-vessel disease. *Circulation* 73: 710, 1986

10. BERGER E, WILLIAMS DO, REINERT S, et al: Sustained efficacy of percutaneous transluminal coronary angioplasty. *Am Heart J* 111: 233, 1986
11. GERSH BJ, KRONMAL RA, FRYE RL, et al: Coronary arteriography and coronary artery bypass surgery: morbidity and mortality in patients ages 65 years or older a report from the coronary artery surgery study. *Circulation* 67: 483, 1983
12. YAMAGUCHI T, KASHIDA M, DEGAWA T, et al: Influence of percutaneous transluminal coronary angioplasty (PTCA) on coronary atherosclerosis. *J Jpn Athero Soc* 14: 863, 1986 (in Japanese).