Coronary Angiography after Myocardial Infarction

A Comparison between a Japanese Community Hospital and Western Countries

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SUMMARY

The purpose of our study was to determine differences in coronary lesions after myocardial infarction between Japan and Western countries. One hundred ninety-two patients under 69 years of age admitted to our CCU were diagnosed as having an acute myocardial infarction. One hundred thirty of 153 surviving patients received coronary arteriography, and 12% had zero-vessel, 42% single-vessel, 25% two-vessel and 12% three-vessel coronary artery disease. Of 113 patients without a previous history of myocardial infarction, 12% had zero-vessel, 44% single-vessel, 27% two-vessel and 17% three-vessel disease. We compared these results with the reports of three similar studies from Western countries. The percentage of multivessel patients in our study was the lowest among the four studies ($p < 0.05$). Coronary lesions in patients without a previous history of myocardial infarction differ from reports in the United States ($p < 0.05$). These results may suggest that we should carefully evaluate the reports of secondary prevention for chronic myocardial infarction, considering the different severity of coronary lesions in each country.

Additional Indexing Words:

Coronary angiography Coronary lesions Myocardial
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SECONDARY prevention of myocardial infarction is a major problem in any country. However, there is a great difference between countries in the mortality rate due to ischemic heart disease.^{1),2)} Therefore, in reference

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to the results of secondary prevention in other countries, it is important to know the variety of prognosis for patients diagnosed as having myocardial infarction.

The prognosis of ischemic heart disease patients varies with factors which include age, sex, involvement of coronary arteries and left ventricular function. We have concentrated on the involvement of the coronary arteries, performing coronary arteriography prospectively in patients who survived acute myocardial infarction. We examined the results and compared them with the results of similar consecutive cases reported in Western countries.

MATERIALS AND METHODS

1) Study Population

From April 1975 to December 1981, 192 patients under the age of 69 were admitted to the coronary care unit at Ashikaga Red Cross Hospital with the diagnosis of acute myocardial infarction within 7 days after the onset of symptoms. There were 153 survivors, 23 of whom refused to receive arteriography. The remaining 130 patients (85%) were entered in the study. Catheterization was performed 1 month after the onset of symptoms.

Acute myocardial infarction was diagnosed when at least two of the following criteria were fulfilled: (1) ischemic chest pain lasting more than 20 min, (2) typical rise and fall in enzyme levels and (3) evolving Q-wave abnormalities involving acute ST-segment and T-wave changes on ECG recordings. Therefore, the present study includes cases of non-transmural myocardial infarction. A previous myocardial infarction was diagnosed by the history of hospital admission for documented myocardial infarction or electrocardiographic Q-wave abnormalities that were indicative of an old myocardial infarction.

2) Coronary Arteriography

Selective coronary arteriography using the techniques of Judkins or Sones and left ventriculography were carried out. A significant coronary lesion was defined as an obstruction of greater than 51% of the luminal diameter. Each patient was classified as having one of four types of coronary artery disease: zero-, one-, two- and three-vessel disease. There were no patients with left main coronary artery disease. Multivessel disease was defined as two- or three-vessel coronary artery disease. Zero-vessel disease included not only perfectly normal coronary angiographic findings but also those cases with significant lesions of other than the major coronary arteries and coronary lesions of less than 50% obstruction. We calculated the ejection fractions of

patients who underwent left ventriculography.

3) Clinical Course

The group with complications (congestive heart failure and/or angina pectoris) during convalescence was identified 3 months after the onset of myocardial infarction. Patients with congestive heart failure were defined as those who needed digozin and/or furosemide in order to maintain NYHA II°. Patients with both congestive heart failure and angina pectoris were classified into the group with congestive heart failure.

4) Statistical Methods

Student's t-test was used to analyze differences between continuous parameters. The chi-square test was used to evaluate differences between dichotomous data. A p-value of less than 0.05 was considered significant.

RESULTS

The mean age of the 130 patients was 56.7 years (range 31—69 years). Seventy-three patients were under 59 years (average 49.8 years), and 57 patients were between 60 and 69 years (average 65.5 years). Ninety-three were men and 37 were women. Seventeen patients had a prior myocardial infarction. Their average age was 57.0 years, showing no significant difference from the average age of the 113 patients without prior myocardial infarction (56.7 years). Of the 130 patients, 107 had a transmural myocardial infarction and 23 had a non-transmural myocardial infarction. Table I presents the location of myocardial infarctions in these patients.

Table II documents the number of diseased vessels of the 130 patients in the study population. Single-vessel was the most frequent (42%), whereas zero-vessel was the least prevalent (12%). There were no patients with left main coronary artery disease. Forty-two percent of the patients 59 years or less had multivessel disease. This percentage was smaller than that of patients

Table I. Location of Myocardial Infarction

TM N=107 (82%)	Anterior	N=43 (33%)
	Inferior	N=35 (27%)
	Anterior+Inferior	N=20 (15%)
	Lateral	N= 4 (3%)
	High posterior	N= 5 (4%)
NTM N=23 (18%)		

TM=transmural; NTM=non-transmural.

Table II. Number of Arteries with Significant Stenosis

Age (years)	Number of involved vessels				Total
	0	1	2	3	
59	8	34	18	13	73
60-69	7	21	15	14	57
Total	15 (12%)	55 (42%)	33 (25%)	27 (21%)	*130 (100%)

There were no cases of left main coronary artery disease.

* 37 (28%) were female.

Table III. Extent of Coronary Lesions and Previous MI

	Number of involved vessels				Total
	0	1	2	3	
Previous MI	2 (12%)	5 (29%)	2 (12%)	8 (47%)	17
No previous MI	13 (12%)	50 (44%)	31 (27%)	19 (17%)	113

MI=myocardial infarction.

Fig. 1. Clinical convalescence of patients after myocardial infarction.

* $p < 0.05$, ** NS. AS=asymptomatic; AP=angina pectoris; CHF=congestive heart failure.

between 60 and 69 years (51%), but the difference was not statistically significant.

Table III describes the extent of coronary artery disease in patients as a function of their history of previous myocardial infarction. The 17 patients with a previous myocardial infarction had a significantly higher incidence of three-vessel disease (47%) compared with the other 113 patients ($p < 0.05$). Among 94 patients with left ventriculography, the mean ejection fraction was $51.2 \pm 1.7\%$. Twelve patients had ejection fractions of less than 30%.

Fig. 1 shows the clinical convalescence data from myocardial infarction patients. Complications occurred in 25 cases, none of whom were in the zero-vessel group (0%), 8 of whom were in the single-vessel group (14%), 6 in the two-vessel group (18%) and 11 in the three-vessel group (41%). Sixteen patients (12%) suffered angina pectoris, and 9 (7%) had congestive heart failure. The multivessel group showed a significantly higher incidence of angina pectoris ($p < 0.05$), but not of congestive heart failure. We found only 2 cases of sustained ventricular tachycardia among patients with congestive heart failure during their hospital stay.

DISCUSSION

Three papers³⁾⁻⁵⁾ were selected according to the following three criteria:

- 1) They provided studies of coronary arteriography on consecutive patients after acute myocardial infarction.
- 2) They covered more than 100 cases.
- 3) They specified arteriographic findings and criteria for patient selection.

Table IV summarizes the profile of the patients in each study according to the number of diseased vessels. The average age of patients in our sample was higher than in the other studies, and our sample includes the highest ratio

Table IV. Three Studies Compared with the Present Study

Study	Number of patients		mean age (yrs)	percentage of male (%)	CAG findings					previous MI (%)	non-transmural MI (%)
	CAG recommended	CAG performed (%)			0 (%)	1 (%)	2 (%)	3 (%)	LM (%)		
Taylor ³⁾	280	106 (38)	49	74	0	26	21	53	11	25	40
Turner ⁴⁾	131	117 (89)	54	88	2	23	32	44	9	30	18
Betriu ⁵⁾	280	259 (93)	*	100	7	34	33	25	1	9	5
Present study	153	130 (85)	57	61	12	42	25	21	0	13	18

CAG=coronary arteriography; LM=left main coronary artery disease.

* age limited <60.

Table V. Four Studies in Patients without Previous Myocardial Infarction

Study	No. of pts	0	1	2	3	LM
Taylor ³⁾	78	—	36	—	64	—
Turner ⁴⁾	85	2	29	35	—	34
Betriu ⁵⁾	256	14	34	30	20	0
Present study	113	12	44	27	17	0

of females. Our definition of a significant coronary lesion was the same as those of Taylor et al³⁾ and Betriu et al.⁵⁾ Although Turner et al⁴⁾ described >70% obstruction of luminal diameter as significant, the effect of this difference may be minimal. In comparison with the results of similar consecutive cases³⁾⁻⁵⁾ there was significantly less multivessel stenosis in our results on coronary stenosis ($p < 0.05$).

A previous myocardial infarction causes more multivessel stenosis (Table III). Therefore, comparisons between studies were limited to patients who had experienced only one myocardial infarction (Table V). Thus, the cases of multivessel stenosis were significantly fewer in comparison with other studies.^{3),4)} The following two reasons may explain the results: First, the assumption that these studies derived from similar patient populations with zero to multivessel stenosis may not be justified. For example, most people may have some degree of coronary lesions in countries in which many people suffer from coronary atherosclerosis. Thus, the distribution of the degree of stenosis may be biased toward multivessel stenosis in some samples. Second, it might be a mistake to presume that a myocardial infarction is equally probable as a function of a similar degree of coronary artery involvement in U.S. and Japanese patients. In particular, three-vessel stenosis due to atherosclerotic lesions of coronary arteries are more common in the U.S. Therefore, it can be assumed that more acute myocardial infarctions will occur.

The incidence of multivessel disease was not statistically different between age groups in our study (Table II). On the other hand, both Betriu et al⁵⁾ and Taylor et al³⁾ concluded that lower age groups showed a much lower incidence of multivessel disease ($p < 0.001$ and $p < 0.005$).^{3),5)} The reason for this difference is unknown, but may be related to different etiologic parameters in different patient populations. Twelve percent of our patients suffered angina pectoris after acute myocardial infarction. Turner et al found 19% (22/117) and Taylor et al reported an incidence of 64% (68/106).^{3),4)} Thus our figure was lower ($p < 0.05$) than the latter. Turner et al referred to the incidence of congestive heart failure.⁴⁾ Their figure was 21% (25/117). Thus, the incidence of congestive heart failure (7%) in our study was significantly lower ($p < 0.01$). These data, then, indicate that the prevalence of coronary

artery disease and the prognosis for myocardial infarction may vary profoundly from country to country.

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