A Clinicopathological Study on the Natural History of Myocardial Infarction in the Aged

MASAYA SugIURA, M. D† and RYOZO OKADA, M. D ‡

CLINICOPATHOLOGICAL correlation studies are necessary for clarifying the natural history of myocardial infarction (MI), though there have been innumerable number of literatures on the subjects. The authors examined relationships between the size and site of MI and site and degree of stenotic lesions of the coronary arteries, and often found progressive myocardial lesions around old scars giving some influences over the prognosis of MI.

MATERIALS AND METHODS

A total of 124 cases of MI was examined. There were 57 men and 67 women, with an average age of 77. Initial symptoms, electrocardiographic diagnosis, and causes of death were noted. Pathological studies included a classification into 2 main groups; massive and scattered MI, which were divided into 3 subgroups according to the size of MI; large (longer diameter of more than 5 cm), middle-sized (between 4.9 and 2.1 cm), and small (less than 2 cm). Recurrent MI was defined as multiple MI of different ages located separately or adjacently. A new concept of "progression" was introduced to define a peri-infarction fresh lesions, which was differentiated from regular healing process with reversed direction of fibrosing. As for the site of MI, anterior, posterior, lateral, septal, apical regions, right ventricle, right atrium, anterior and posterior papillary muscles were noted. Latitudinal division was made as basal, central and apical. Depth of MI was examined to denote more predominant portion as for the subendocardial, middle and subepicardial layers.

Stenosis of the coronary artery was classified into 5 degrees, as previously reported, count 5 in 100% obstruction, 4 in 75% stenosis, 3 in 50% stenosis, 2 in 25% and 1 in slight stenosis. The 3 main branches were divided into 3 segments according to distance from the ostium and incidence of the significant stenosis (count more than 4) was recorded in each of 9 segments. Distance between coronary stenosis and MI was examined and graded from 0 (just adjacent) to 4 (more than 6 cm) by distance index.

RESULTS

I. Pathological findings:

There were a total of 65 cases of massive large MI, consisting of anterior (28), posterior (27), lateral (5) and subendocardial MI (5). Ratio of the anterior to posterior MI was almost 1. In Fig.1, fresh MI was found in the posterior MI

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† Department of Internal Medicine, Yoiku-in Hospital, Tokyo Municipal Home for the Aged, Itabashi, Tokyo
‡ Department of Internal Medicine, Juntendo University School of Medicine, Hongo, Tokyo
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Fig.1. Comparison of massive large anterior and posterior myocardial infarction in respect of its age.
more than in the anterior, and recurrent MI was more frequently found in the anterior (42.8%) than in the posterior (7%). Cardiac rupture was found in 9 cases, and 8 of them were female. Peri-infarction progression showed a high incidence of 80% in both of old anterior and posterior MI. Ventricular aneurysms were found in 64% of recurrent MI; and 71% of progressive MI. Extension of MI (Fig.2) revealed a high incidence of the anterior ventricular septum and anterolateral papillary muscle involvement in the anterior MI, whereas the posterior ventricular septum and posteromedial papillary muscle involvement in the posterior MI. The right ventricle was involved more in the posterior MI. As for the depth of MI, mid to endocardial layers had larger extensions in cases of progression. In the latitudinal locations, anterior MI was mainly located from the central to apical portions, whereas the posterior MI was found mainly from basal to central or apical portions. Distance index was low (1.4 and 1.9) in both of anterior and posterior MI (Fig.3).

Grade of the coronary stenosis producing the massive large MI could be concluded as 4.2 to 4.6 of stenotic index as shown in frames in Fig.4.

Anterior, posterior and lateral MI were induced by the above-mentioned stenosis when located at the anterior descending (AD), right coronary (RC) and left circumflex (LC) arteries, respectively. In the anterior MI, only the stenosis of the AD artery was prominent, whereas in the posterior MI, the other 2 coronary arteries contributed besides the RC artery. In the lateral MI, contribution of the AD artery was considered besides the LC artery. In case of subendocardial infarction, stenosis of each of 3 branches was remarkable, which was considered to be the extreme type of the posterior MI (Fig.4).

Distribution of significant coronary stenosis (count more than 4) in 9 segments (Fig.5), revealed that the proximal portion of the AD artery, proximal and middle portion of the LC artery were prominent in fresh group of massive large anterior MI. In recurrent MI, coronary sclerosis in the proximal segment of AD artery further progressed as well as that in the middle segment increased; that is to say the advanced initial pattern. In progressive MI only the proximal segment of the AD artery showed high incidence with slight changes in other segments. In fresh group of massive large posterior MI, the middle segment of the RC artery and proximal segment of the AD artery showed high incidence of sclerosis, and low incidence of the recurrent MI in the
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II. Clinical findings:

Examination of the causes of death revealed that cases of massive large MI died of congestive heart failure (CHF) in 45%, of sudden death such as cardiac rupture and arrhythmias in 12.1%, of shock in 6%, of extracardiac death in 36.9% (Fig.6). Ratio of extra-cardiac death increased in middle-sized (77%) and small MI (82%). Influence of age of MI on the causes of death in massive large MI was marked in cases of CHF; 57% of recurrent MI, 50% of fresh MI, 38.5% of progression died of CHF. Group of progression showed lower incidence of CHF than the fresh group, but higher than old MI without progression.

DISCUSSION AND CONCLUSION

Massive large anterior MI was characterized by the presence of obstruction of more than 75% at the proximal segment of the AD artery, producing MI in the central to apical portion of the heart, with a high incidence of recurrence. On the other hand, in cases of massive large posterior MI, there was not only stenosis of the proximal portion of RC artery, but also the stenoses of other 2 main coronary arteries, producing MI from the base of the heart. Death at the acute phase was often seen, with few recurrence of MI.

Mode of death in a total of 65 cases of the massive large MI, showed that 27.7% died in acute phase with CHF in 50%, and 28% with sudden death. Recurrent MI was cause of death in 21.6% and the rest was the group of old MI, which died of CHF in 36.4%, and of extracardiac death in 63.6%. Morphologically, 79% of the old MI had a peri-infarction progression and had a higher death rate by CHF than those without progression.

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