LONG-TERM PROGNOSIS OF PATIENTS WITH CONGESTIVE HEART FAILURE

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Factors determining prognosis in 100 patients with recent onset of congestive heart failure (CHF) were evaluated. The 1 year, 3 year, 5 year, and 10 year survival rates in the entire CHF group were 78.5%, 59.8%, 50.4% and 14.7%, respectively. No correlations between age, sex, heart rate and cardiothoracic ratio, and the cumulative survival rate were found. The prognosis of patients with CHF due to underlying coronary artery disease or primary cardiomyopathy was poor compared with that of patients with other types of heart disease. Patients whose NYHA classification was class III or VI had a significantly lower survival rate than those in class II. Patients with lower left ventricular stroke work and consecutive ventricular premature depolarization also had a significantly lower survival rate. These results suggest that functional status, underlying heart disease, left ventricular stroke work, and the presence of ventricular tachycardia provide important information regarding the long-term prognosis in patients with congestive heart failure.

Congestive heart failure (CHF) is a common clinical syndrome associated with many underlying heart diseases, and its pathophysiologic factors are known to vary considerably among individual patients. Recently, new medical treatments including the use of diuretics, inotropic agents and vasodilators have been developed to facilitate the management of patients with CHF. Despite such modern management, it has been reported that the prognosis in patients with CHF remains poor, the probability of mortality within 5 years after onset of CHF being between 42% and 62%.1,2

The Framingham Study found that 4-year survival rates after the onset of overt cardiac failure was 48.5% for men and 65.9% for women.3

The purpose of the present study is to analyze the survival rate of patients with CHF and to determine some of the factors influencing the prognosis of CHF.

METHODS

One hundred patients with recent onset of CHF were entered in this study. All patients were hemodynamically monitored by Swan-Ganz catheter and thermodilution technique. The diagnosis of CHF required a history of dyspnea or fatigue on exertion, and some of the following

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physical signs: pulmonary congestion, jugular venous distention, rales, cardiomegaly, third heart sound, hepatomegaly, and peripheral edema. The cause of CHF was coronary artery disease in 46 patients, idiopathic dilated cardiomyopathy in 17, hypertrophic cardiomyopathy in 3, secondary cardiomyopathy in 2, valvular heart disease in 12, hypertensive heart disease in 11, acute viral myocarditis in 5, thyroid heart disease in 3, and beriberi heart in 1. Among the 46 patients with coronary artery disease, 36 were diagnosed as acute myocardial infarction (AMI) (7 patients were in Killip class II, 13 were in class III, and 16 were in class IV) and underwent thrombolytic therapy, while 10 patients were diagnosed as CHF due to old myocardial infarction. Twenty-six out of 36 patients underwent coronary arteriography within 4 weeks after admission, while the remaining 10 patients died before coronary arteriography. The diagnosis of cardiomyopathy was based on a right ventricular endomyocardial biopsy. The subjects consisted of 70 men and 30 women between the ages of 17 and 86 years (mean 61.5 years). Continuous electrocardiographic recordings and hemodynamic monitorings were obtained from all patients in the coronary care unit (CCU) of Kanazawa Medical University Hospital. All patients except AMI were taking at least digitalis or diuretics, or both. Sixty patients received vasodilators as the initial treatment. Forty-seven patients were treated initially with catecholamines.

The registration of patients started on January 1976 and ended on December 1985, mean follow-up period being 32.5 months (1–120 months). The cumulative survival rate from the time of initial evaluation was analyzed by the Cutler-Ederer method. Survival curves were compared using the Mantel-Haenszel procedure. Nine factors, age, sex, underlying heart disease, New York Heart Association functional class, heart rate (HR), blood pressure, cardiothoracic ratio (CTR), left ventricular stroke work index

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(LVSWI) on admission and ventricular tachycardia (VT) during CCU stay were selected for analysis. During the follow-up period, 43 patients died. Eighteen patients died of heart failure, seven of arrhythmia, four of re-infarction, one of cardiogenic shock, six of non-cardiac causes, and seven of unknown causes.

RESULTS

For the total CHF patient population, the 1 year, 3 year, 5 year, and 10 year cumulative survival rates were 78.5%, 59.8%, 50.4% and 14.7%, respectively (Fig. 1).

Cumulative survival rates in 26 patients with NYHA class II were 92% at 1 year, 79% at 3 years, and 73% at 5 years. In 39 patients with NYHA class III, the survival rate was 79% at 1 year, 59% at 3 years, and 41% at 5 years, whereas the survival rates in 35 patients with NYHA class IV were 67% at 1 year, 43% at 3 years, and 43% at 5 years, respectively. Patients in NYHA classes III and IV have a significantly lower survival rates than those in class II (Fig. 2).

The cumulative survival rates in patients with coronary artery disease were 67% at 1 year, 50% at 3 years and 44% at 5 years compared with respective 81%, 32% and 21% in the cardiomyopathy group (Fig. 3).

When the patients were dichotomized at the age of 65 years, no significant differences in cumulative survival rates were noted between the two groups. There were also no significant differences between males and females, between patients with CTR of less than 65% and those with CTR of 65% or more, and between patients with heart rates of less than 100 beats per minute on admission and those with heart rates of 100 bpm or more.

The survival rates in patients with systolic blood pressure (SBP) of less than 100 mmHg on admission were 44% at 1 year, 24% at 3 years, and 24% at 5 years, compared with 86% at 1 year, 64% at 3 years, and 56% at 5 years in those with SBP of 100 mmHg or more. The cumulative survival rate in patients with low SBP was significantly lower than that in patients with normal or high SBP. (p < 0.01) (Fig. 4).

Cumulative survival rates in patients with LVSWI of more than 30 g-m/beat/m² were 94.2% at 1 year, 82.5% at 3 years, and 55.9% at 5 years. Those in patients with LVSWI of less than 30 g-m/beat/m² were 62.2% at 1 year, 36.7% at 3 years, and 36.7% at 5 years (Fig. 5). The long-term prognosis of patients with LVSWI of more than 30 g-m/beat/m² was significantly better than that of patients with LVSWI of less than 30 g-m/beat/m² (p < 0.01).

The presence of five or more consecutive ventricular premature beats (ventricular tachycardia: VT) affected the long-term survival. Cumulative survival rates for patients without VT were significantly better than those in patients with VT (p < 0.01) (Fig. 5). Cumulative survival rates in patients with VT were 45% at 1 year, 22.7% at 3 years, and 22.7% at 5 years, whereas in patients without VT, the rates were 74% at 1 year, 50.4% at 3 years, and 24.7% at 5 years.
without VT they were 87.1% at 1 year, 69.5% at 3 years, and 56.5% at 5 years.

DISCUSSION

In the present study, we examined nine of the factors that determine the prognosis of CHF, namely, age, sex, underlying heart disease, NYHA functional class, HR, SBP, CTR, LVSWI, and VT. Among these factors, no significant difference was found in two groups dichotomized by age, sex, HR, and CTR. Although several previous articles showed that the elderly and men had poor prognosis, these factors did not correlate with survival in our study. The main cause of death in an older group was CAD while the main causes of death in a younger group were CAD and DCM. Although death rate was higher in men than in women, significant differences between the sexes could not be shown.

In patients with SBP of less than 100 mmHg the cumulative survival rate was significantly lower, because SWI were 19 ± 6 g-m/beat/m^2 and 35 ± 20 g-m/beat/m^2 for patients with SBP < 100 mmHg and SBP ≥ 100 mmHg, respectively. Thus many patients with depressed cardiac pump function were included in this group.

It has been thought that the severity of symptoms is an important prognostic variable. In our study, cumulative survival rates in patients with NYHA III or IV were lower than those in patients with NYHA II. Wilson et al. reported that functional class IV patients had a 6.8 greater relative risk of nonsudden cardiac death than functional class III patients. In a recent study, Smith reported that the probability of survival did not differ among NYHA classes I to III, being 75% and 48% at 1 and 5 years, while it was notably less for class IV, being 34% and 18% at 1 and 3 years, respectively.

Among the various underlying diseases, the survival rates in patients with coronary artery disease were lowest during the first two year period after onset of heart failure. Thereafter, the survival rates in patients with cardiomyopathy were lower than those in the CAD patients. Franciosa et al. reported that the mortality in patients with CAD were 46% and 69% at 1 and 2 years, respectively compared with 23% and 48% in those with idiopathic dilated cardiomyopathy. Unverferth reported that the mortality of dilated cardiomyopathy at 1 year was 35%. In the report of Califf et al., the survival rates of CAD patients without heart failure were 94% and 85% at 1 and 3 years, respectively, compared to 78% and 58% at in those with heart failure. Their multivariate analysis demonstrated that this poor survival was, for the most part, the result of left ventricular dysfunction and/or the presence of left main coronary artery lesions. In a more recent report by Cleland et al., 152 patients with CHF due to CAD had a poor prognosis. We are convinced that the nature of the underlying disease is an important factor determining the prognosis in CHF. Since prognosis in patients with CAD or DCM with a markedly damaged myocardium is especially poor, it is suggested that the protection of the myocardium from further injury may be of particular importance.

Our results of higher mortality in patients with left ventricular dysfunction is consistent with other reports. The Veterans Administration study showed that prognosis was poor in patients with higher systemic vascular resistance, lower left ventricular stroke work, and high levels of circulating catecholamines. Massie et al. noted a significant relation between total cardiac mortality, and both pulmonary capillary wedge pressure and stroke work index. Thus, left ventricular function is considered to be one of the most important prognostic variables.

Our results showed a significant correlation between the presence of ventricular tachycardia (5 or more consecutive ventricular premature depolarizations) and mortality. The study from University of Pennsylvania found that survival was significantly related to both functional status and ventricular ectopic activity. Unverferth et al. noted that the most important factors predicting survival and death in dilated cardiomyopathy were left intraventricular conduction delay, ventricular arrhythmias and mean right atrial pressure. Huang et al. reported that the incidence of VT was high (72%) in DCM and VT tended to occur in a non-sustained form. Similarly, Meinertz et al. followed 75 patients for approximately 1 year and noted that sudden death was related to the presence of more than 20 episodes of VT in 24 hours. Follansbee et al. reported that ten of the 37 patients with non-sustained VT suffered sudden death during the follow-up period of 30 month and that nine of the 10 patients with sudden death had a history of CHF. Thus, the presence of VT in CHF strongly suggests a poor prognosis.

The results of this study suggest that func-
tional status, underlying heart disease, blood pressure, left ventricular stroke work, and the presence of ventricular tachycardia provide information regarding the long-term prognosis in patients with congestive heart failure. Thus, we concluded that management of hemodynamic function, measures to deal with life-threatening arrhythmias, and protection of the myocardium from injury are indispensable for the improvement of the long-term prognosis in patients with congestive heart failure.

REFERENCES

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