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Management in Patients with Coronary Atherosclerotic Heart Disease Complicated with Chronic Heart Failure: A Community-based Study

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Abstract

Background: Disease management programs (DMPs) are developed to address the high mortality, hospitalizations and costs of chronic diseases. DMPs are enforced on cardiovascular disease generally, such as hypertension, coronary atherosclerotic heart disease, chronic heart failure, and so on. This study is aimed to assess the effect on the management of patients suffering from coronary atherosclerotic heart disease complicated with chronic heart failure.

Method: 823 community subjects who discharged from our department agreed to follow up and were enrolled randomly. They were ranked as the intensive management group and the control group. Patients in the intensive management group accepted standardized management out of hospital, regular health education, and were followed up in the form of telephone and outpatient visit.

Result: Compared with the control group, patients in the intensive management group experienced a lower rate of all cause death, cardiovascular death and readmission due to cardiovascular events (CVE), declined by 26.5%, 32.2% and 57.0% respectively. All cause death, cardiovascular death and readmission due to CVE in the intensive management group had significantly negative correlation (r=-0.967, $P<0.05$) with the years of management. Over the four years period, the survival rate of the intensive management group was 0.92, 0.85, 0.83, and 0.82 per year respectively, while that of the control group was 0.95, 0.89, 0.82, and 0.75.

Conclusion: Through standardized management out of hospital, patients with CHF due to CHD got significant benefit in reducing the rate of all cause death, cardiovascular death and readmission due to CVE, and improving survival rate.

Keywords: Heart failure; Atherosclerotic heart disease; Cardiovascular events; Chronic heart failure

Introduction

Chronic heart failure (CHF) has been the end stage of most heart disease, such as coronary atherosclerotic heart disease (CHD), hypertensive heart disease, rheumatic heart disease, and so on. CHD is the most common cause of CHF. As CHF is a disease of the elderly, subjects with CHF have a high prevalence of comorbid conditions, which can themselves cause death [1]. Meanwhile, CHF is a syndrome which encompasses heterogeneous disease processes, customarily categorized according to left ventricular ejection fraction (EF) into CHF with preserved versus reduced EF [2].

Disease management programs (DMPs) which help guide the care of patients with chronic health problems have been proposed recently. Evidence from some randomized case-controlled trials have proved that patients enrolled in DMPs have lower hospitalization rates and enhanced compliance with guideline recommended pharmacotherapy [3,4]. Heart failure case management programs have also been shown in clinical trials to be highly effective at preventing future readmission and lowering the mortality rate [5,6]. But there is few data on the patients suffering from CHD complicated with CHF in the community.

This study was undertaken to address that gap and assess the effect on the management of patients with CHD complicated with CHF.

Methods

Design

A total of 823 patients with CHF due to CHD in this study were ranked as the intensive management group and the control group. Patients that agreed to participate in the trial and signed letters of intent were up to 734. 294 patients (male=151, female=143) who discharged before 2005 were assigned to the control group, while 440 patients (male=242, female=198) after 2005 were assigned to the intensive management group. The average age of patients in the control group was 72.23 ± 8.78, and that of the counterpart was 73.08 ± 9.11. There was no significant difference of age and sex ratio between the two groups.

Selection of participants

All the participants were older than 18 years. Patients with CHD were eligible if they met one of the conditions: 1) Patients had risk factors of CHD, such as fat, smoking, hypertension, diabetes mellitus, and so on. In addition, they possessed symptoms of angina for example of chest pain. 2) Abnormal electrocardiogram showed ST segment depression. 3) Exercise stress test was positive. 4) Coronary angiography: main coronary artery had greater than 50% stenosis. Meanwhile, patients with CHF were eligible if they met one of the conditions: 1) Patients had risk factors of CHF, and suffered exertional dyspnea, nocturnal paroxysmal dyspnea as well as orthopnea. 2) Patients had lungs moist rales, distention of jugular vein, hepatic congestion, hepatojugular reflux, and hepatojugular reflux. 3) Cardiopulmonary exercise testing proved that reserves of cardiorespiratory function were impaired, and echocardiography examination displayed systolic or diastolic dysfunction.

Patients should be excluded with one of the conditions: 1) Patients who sufferred malignant tumor, severe respiratory disease or autoimmune disease. 2) Those that had pericardial effusion, constrictive pericarditis, restrictive cardiomyopathy at the same time. 3) Patients older than 90 years.

Intervention

Each subject enrolled should sign a consent form of follow-up visiting. Measures for the intensive manage group including: 1) The nurses in our department conducted a telephone visit to charge the patients for outpatient every month, and the cardiologist gave them a regular health education and medication instruction. 2) Correlative health education lecture was held, where patients were rewarded some healthy materials or health-care kits. 3) Diplomats conducted an assessment of risk factors on all the patients every six months to check the indicators of cardiovascular events (CVE), mortality, quality of life and so on.

With regard to the control group, the nurses also conducted a telephone visit to charge those patients of outpatient. At the end of the follow up period, the cardiologist should collect and access the patient's data, including the indicators of cardiovascular events (CVE), mortality, and quality of life and so on.

Statistical analysis

Analyses were performed using SPSS statistical software, version 16.0. The baseline data in these two groups were evaluated and changes were compared from baseline to end-of-study measurements in each individual using T tests and Chi Square tests. Pearson correlation analysis was performed to reveal the possible correlation between the mortality and the period of management. Survival rate of patients for 1 year, 2 years, 3 years, 4 years after discharge was calculated by the survival analysis. A p-value of 0.05 was selected for the threshold of statistical significance.

Result

Follow-up analysis

Among 734 patients contacted, 721 （98.2%） were followed up successfully. In the intensive management group, 433 out of 440 (98.4%) patients were followed up for 3.03 years. 288 out of 294 (98.0%) patients in the control group were followed up for 3.11 years. Neither the rate nor the period of follow-up in two groups showed significant differences.

Baseline

Table 1 depicted the baseline patient profile. Two groups showed no significant differences on blood pressure, blood lipoids, smoking rate, hypertension, diabetes mellitus and other items on the baseline (P>0.05). After standardized treatment and discharge, patients of two groups showed no significant differences on utilization ratio of aspirin, angiotensin-converting enzyme inhibitor (ACEI), adrenergic receptor binder (ARB), diureticum, digoxin, β-receptor blocker and other drug on the baseline (Table 2). Patients in the intensive management group suffered from worse heart function. In terms of NYHA, the NYHA IV patients in the intensive management group occupied 70% approximately (Table 3).

Baseline	Intensive management group	Control group
Systolic blood pressure (mmHg)	161.26 ± 25.31	160.79 ± 26.80
Diastolic blood pressure (mmHg)	92.19 ± 14.58	91.08 ± 15.62
Triglyceride (mmol/L)	116.70 ± 68.30	116.90 ± 62.40
Total Cholesterol (TC, mmol/L)	155.30 ± 39.00	156.20 ± 42.20
Low-density Lipoprotein (LDL, mmol/L)	77.29 ± 26.41	79.20 ± 30.83
High-density Lipoprotein (HDL, mmol/L)	48.03 ± 15.45	49.97 ± 16.63
Smoking Rate (%)	34.9	29.2
Percutaneous Coronary Intervention Rate (%)	25.6	27.1
Hypertension (%)	65.1	62.5
Diabetes Mellitus (%)	19.4	15.6
Family Medical History (%)	28.4	31.3

Table 1: Baseline characteristics of two groups.
Two groups showed no significant differences on the baseline (*P*>0.05)

Drugs on the baseline	Intensive management group	Control group
Aspirin (%)	75.9	74.2
Angiotensin-Converting Enzyme Inhibitor (ACEI,%)	29.6	29.9
Adrenergic Receptor Binder (ARB,%)	19.2	20.8

Calcium Channel Blocker (CCB,%)	33.2	36.5
β-receptor Blocker (%)	40.2	42.4
Statins (%)	26.6	27.4
Diureticum (%)	77.9	76.0
Digoxin (%)	35.8	33.6

Table 2: Comparison of drug utilization ratio on the baseline between the two groups.
Two groups manifested no significant differences on the baseline (P>0.05).

	NYHA II (n, %) #	NYHA III (n, %) #	NYHA IV (n, %) #
Intensive management group	42,9.5%	98,22.3%	300,68.2%
Control group	45,15.3%	115,39.1%	134,45.6%

Table 3: Comparison of cardiac functional grading by NYHA on the baseline between the two groups.
From the NYHA cardiac functional grading, the difference of NYHA II, NYHA III, NYHA IV between the two groups had statistical significance.

Major cardiovascular event

Out of 433 patient's followed up in the intensive management group, 74 died of all cause (17.1%), including 51 of cardiovascular death, 11 of readmission due to CVE, 5 of stroke and 3 of myocardial infarction. Of 288 patients participated in control group, 67 died of all cause (17.1%), including 50 of cardiovascular death, 17 of readmission due to CVE, 1 of stroke and 1 of myocardial infarction. Major cardiovascular event above-mentioned exists significant differences between two groups (P<0.05). Compared with the control group, the intensive management group showed declined rates of all cause of death, cardiovascular death and readmission by 26.5%, 32.2% and 57.0% respectively. In reduction of stroke and myocardial infarction, no advantages were observed in the intensive management group.

From stratified analysis of deaths, the number of all cause death in the intensive management group were 38,29,6,1 per year over four years, with the number of cardiovascular death being 26,21,4,0 respectively. In the control group, the number of all cause death was 13,18,21,15 and that of cardiovascular death were 6,15,18,11. All cause of death, cardiovascular death and readmission due to CVE in intensive management group had significantly negative correlation (r=-0.967, P<0.05) with the years of management. The mortality of the intensive management group decreased gradually with the extension of management period, while the condition was not true in the control group.

Survival analysis

This research utilized the large sample to carry out survival analysis in follow-up population by means of Life-Tables. Over the four-year period, the survival rate of intensive management group was 92%, 85%, 83%, 82% with the standard error of 0.52, 0.73, 1.04, 1.42 per year respectively; the survival rate of control group was 95%, 89%, 82%, 75% with the standard error of 0.85, 0.96, 1.04, 1.22. The survival rate of patients in the intensive management group fell obviously in the first two years, and leveled off later; the counterpart in the control group went down over four years (Figure 1).

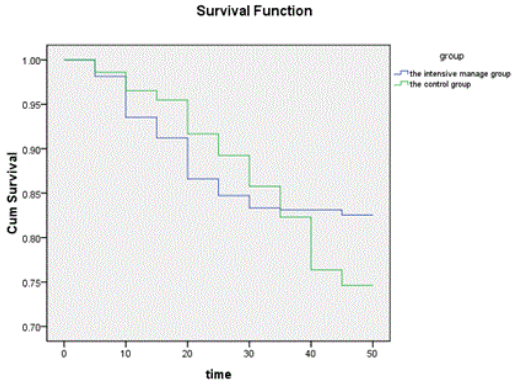

Figure 1: The comparison of survival rate between the two groups.

Discussion

In recent years, the incidence of CHD was increasing. Epidemiological survey of the incidence of CHF and CHD also showed an increasing trend.

Framingham study showed that CHD and hypertension were the main etiologies of CHF, occupying about 90%. In the study of patients with CHF, CHD was the primary factor to be considered. In addition, CHF was increasing in prevalence and represented a great amount of the health care system costs [7,8]. Thus, it was the important reason for our study which enrolled the patients with CHD complicated with CHF.

This study was based on community-level management. In the community, two groups of subjects with CHD complicated with CHF experienced different mortality, readmission due to CVE, and compliance on the drugs. Compared with the control group, the intensive management group showed declined rates of all cause of death, cardiovascular death and readmission due to CVE by 26.5%, 32.2% and 57.0% respectively. But there is no significant difference in stroke and myocardial infarction. Survival analysis demonstrated that the survival rate of patients in the intensive management group fell more slowly than the control group over the four years.

Currently, patients with CHD and CHF in China are the largest group of patients suffering from cardiovascular disease. A great many patients, especially those with CHF who were readmitted after first discharge, were still unclear of the percentage of remittance. Regards to the correlation of EF and death in patients with heart failure, several studies found that patients with heart failure experienced high mortality irrespective of EF and the frequency of non-cardiovascular deaths. Accordingly, cardiovascular deaths were less frequent among subjects with preserved EF [9].

Nowadays, DMPs have been proposed, and have received more and more attention. It is even more important than the assessment of laboratory parameters. Several studies have shown that DMPs decrease hospitalization rates and increase adherence to medication. In the cardiovascular field, DMPs is important and effective, especially to CHD and CHF, and many studies have proved that. Pazin-Filho et al. [10] conducted a study in a community hospital, of 4545 consecutive CHF admissions, only 10% enrolled and of those only 52.2% made a call. Enrollment in the program was related to age, CHF as the main reason for admission, previous admission for CHF, and shorter hospital stay. Among DMP participants mortality rates were lowest in the first month (80/1000 person-years) and increased subsequently. The opposite mortality pattern occurred in non-enrolled groups with mortality in the first month are 814 per 1000 person/year in refusers and much higher in ineligible (1569/1000 person year). This difference remained significant after adjustment. Re-admission rates were lower among participants who called consistently [10].

In the management of CHD, Gill R and his research team was aimed to assess whether a community based intervention, for men and women aged between 45 and 64 years without pre-existing CHD, would reduce their Framingham scores when reassessed one year later. They found that the community intervention for primary prevention of CHD reduced Framingham risk scores at one year in those who engage with the programmer [11].

ACC/AHA 2009 guidelines for the diagnosis and management of heart failure in adults suggested that patients with heart failure should be educated and managed after discharge. But education to heart failure patients and their families is critical and often complex. Failure of these patients to understand how best to follow physician's and other healthcare providers' instructions is often a cause of HF exacerbation leading to subsequent hospital readmission. Furthermore, physician and other healthcare providers should increase publicity and education efforts which were carried out from the beginning of hospitalization.

On the other hand, this study has several limitations. The main limitation of the present study was the lack of comparison about drugs` utilization rate between the two groups, which is closely related to the cardiovascular events. The other limitation was the small sample size in this community-based study. And the communities enrolled was so centralized that the study couldn`t reflect the whole situation about DMPs in China. Thus, larger scale studies are required to validate our findings. Finally, to our regret, we didn`t review the coronary angiography in the follow-up period, so it was hard to evaluate the stenosis in major coronary arteries.

Despite the limitations of this study, we have shown that DMPs can reduce all-cause mortality, cardiovascular death, and readmission due to CVE. However, those limitations should be confirmed by our further studies.

Conclusion

Through the standardized management of patients with CHD combined with CHF out of hospital, all-cause mortality, cardiovascular death, and readmission due to CVE were significantly declined and survival rate of these patients was improved. This study demonstrated the importance of intervention and management to patients out of hospital, which was meaningful to the treatment strategies and guidelines for further amendments.

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Conflicts of Interest and Source of Funding

The major source of funding was from Hangzhou First People's Hospital. The authors declare that they have no competing interests.

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