Original Article

A Novel Cardiac Rehabilitation Programme to Decrease Cardiovascular Risks in Elderly Patients of Coronary Artery Disease

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ABSTRACT

Objective : To test efficacy of a hospital based cardiac rehabilitation exercise programme among patients with stable coronary artery disease.

Material and Methods : This cardiac rehabilitation programme involved advice regarding smoking cessation, diet and exercise that was performed using step ladder exercise and aerobics involving body stretching and bending. Successive elderly patients (Age>60yrs., n=1137) visiting the cardiology department were enrolled for the study and divided into two groups. All the subjects received usual advice regarding smoking cessation and diet modification. Group A (institution based n=570, males 357, females 213) received supervised physical exercises while group B (home based n=567, males 360, females 207) received unsupervised physical exercises. Both groups were matched for age, sex, diabetes, hypertension status, body-mass index (BMI), waist-hip ratio (WHR), lipid levels, coronary artery disease status and treadmill Metabolic Equivalent(MET) score at baseline.

Result: After 6 week follow up, in patients of Group A, there was a significant decline in BMI (24.2±5.5 to 23.1±5.1 Kg/m^2), total cholesterol (194.8±39 to160.7±95 mg/dl); LDL cholesterol (126.0±47 to 101.6±59 mg/dl) and triglycerides (133.3±69 to 122.3±72 mg/dl) and increase in CTMT-MET score (5.5±1.7 to 7.1±1.2) ($p<0.05$). In group B subjects there was insignificant decline in BMI (21.9±4.4 to 21.6±4.2 Kg/m^2) and no significant change in lipid levels or MET score (5.82±1.4 to 6.64±1.26) $p > .05$.

Conclusion : This cardiac rehabilitation program is an inexpensive and effective method to modify coronary risk factors and improve functional capacity in elderly coronary artery disease patients.

Key Words : Cardiac rehabilitation, lipid profile, elderly, coronary artery disease, BMI, MET score.

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Introduction

Secondary prevention in coronary artery disease (CAD) emphasises on control of major modifiable coronary risk factors-smoking, high blood pressure, high low-density lipoprotien (LDL) cholesterol, diabetes, and sedentary lifestyle.[1] A combination of lifestyle modification and pharmacological interventions are available for control of most of these factors. In many instances aggressive lifestyle interventions have been replaced by simple pharmacological measures, e.g., drugs are often the first line approach for control of high LDL cholesterol and often supplant tedious and unpleasant dietary interventions. Beta-blockers, aspirin, statins and angiotensin-converting enzyme (ACE) inhibitors have been shown to be of benefit in large randomised trials.[2] Regular physical activity helps in control of multiple cardiovascular risk factors.[3] However, encouraging regular physical activity involves a major lifestyle change. To achieve it in an individual is difficult and often results in non-compliance and failure.

Even in USA, where the awareness of formal cardiovascular rehabilitation programmes is high, only 10 to 20 percent of appropriate candidates participate in supervised cardiac rehabilitation programmes.[4] Home

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based rehabilitation programmes that are directed by physicians and coordinated by nurses and technicians have been developed as a way of expanding the delivery of secondary prevention services but their compliance is also poor.[13-15] In developing countries, there is a very low awareness of rehabilitation programmes among physicians and patients and there is a need for simple, patient friendly and inexpensive rehabilitation programmes to promote physical acitivity.[16] The benefits of supervised cardiac rehabilitation on secondary prevention are much more and compelling.[4] Many controlled trials of exercise after myocardial infraction and in stable angina have reported reduction in overall mortality and morbidity from cardiovascular causes.[4-12] Trials of exercise combined with nutritional counseling have demonstrated a slowing of the atherosclerotic process and decreased rates of subsequent hospitalization and death.

The ultimate goal of physical activity rehabilitation programme is to increase regular physical activity, strength , and physical functioning and expenditure of at least 1000 kcal per week in physical acitivity.[14-16] We developed a novel low-cost physical activity based cardiac rehabilitation programme and tested the efficacy in a hospital based population of stable CAD patients that included survivors of acute coronary events and chronic stable angina patients.

Material and Methods

Successive patients presenting to the cardiology department of this tertiary care center in western India were enrolled in the cardiac rehabilitation programme. Elderly patients of >60 yrs. (mean age 64.4) with stable coronary artery disease (documented stable angina or survivors of acute coronary syndromes) visiting the cardiology department were enrolled in the rehabilitation programme.

An informed consent regarding participation in the rehabilitation protocol was required from each patient. 1137 subjects (males 717, females 420) agreed to participate in the study. These subjects were randomly divided into hospital-based intervention (Group A) and home-based usual care (Group B) groups. Both groups were matched for age, sex, diabetes, hypertension status, body-mass index, waist-hip ratio, lipid levels, coronary artery disease status and treadmill MET score at baseline.

Detailed personal information of subject was obtained like educational status, family history of CAD, smoking, diabetes, hypertension, physical activity etc. according to WHO protocol. Physical examination and relevant investigation were done like blood pressure, pulse, BMI, lipid profile, fasting blood sugar, electrocardiogram. Metabolic equivalent were calculated from standard normogram.

All the subjects received health education regarding cessation of smoking, dietary advise according to modified American Heart Association Step II diet and regular home-based physical activity included advise regarding walking. The drug therapy was based on the discretion of the physician. The hospital based exercise protocol included mild to moderate intensity calisthenics. Events of exercise like walking forward, walking backward, toe raising, calisthenics and stretching, and cycling were included. The subject was scheduled to attend this programme three times a week for six weeks. In the first week each exercise was performed for two minutes (total 22 minutes), for three minutes each in second and third week (33 minutes), four minutes each in fourth and fifth week (44 minutes per day) and six minutes each in the sixth week (66 minutes) at every attendance. At the end of six weeks the subjects were re-assessed. BMI, blood pressure and lipid profile were determined and effort tolerance evaluated by stress test and METs were calculated.

Statistical analysis: Continuous variables were reported as mean±1 standard deviation and ordinal data as percent. Inter-group comparisons were performed using t-test or chi-square test as appropriate. P-value of <0.05 was considered significant.

Results

Total 1137 elderly subjects participated in the study after an informed consent. These were divided into Group A (n=570; males 357, females 213) that performed supervised rehabilitation exercise at the hospital as out patients while group B (n=567; males 360, females 207) opted for exercises at home. Both the groups were not having significantly different mean age, smoking, hypertension, diabetes, body-mass index (BMI), lipid levels, and coronary disease status at baseline.

Reassessment of BMI and lipid levels (total cholesterol, LDL and HDL cholesterol, triglycerides) was performed at 6 weeks. At the end of 6 week follow up in Group A, there was a significant decline in BMI (24.2±5.5 to 23.1±5.1 Kg/m^2); total cholesterol (194.8±39 to 160.7±95 mg/dl); LDL cholesterol (126.0±47 to

101.6±59 mg/dl) and triglycerides (133.3±69 to 122.3±72 mg/dl) and increase in effort tolerance i.e. increased MET score (5.5±1.7 to 7.1±1.2) ($p<0.05$, highly significant). In-group B subjects, there was insignificant decline in BMI (21.9±4.4 to 21.6±4.2 Kg/m^2) and no significant change in lipid levels or MET score (5.82±1.4 to 5.64±1.26).

Discussion

This study shows that a simple hospital based cardiac rehabilitation programme focusing on physical exercise improves exercise tolerance and also decreases obesity and cholesterol levels over a short term follow up.

Exercise capacity consistently improves after cardiac rehabilitation. This improvement is due to physiological adaptations to aerobic conditioning in CHD patients including central (cardiac) and peripheral (skeletal muscle and vascular) adaptations. Cardiac adaptation include increase in cardiac dimensions, stroke work, cardiac output, and after load corrected indices of left ventricular function. Skeletal muscle adaptations include an increase in fiber area and oxidant enzyme activity. Vascular adaptations include increase in the density of skeletal muscle capillaries and improvements in endothelial dependent vasodilatation in both epicardial and resistance coronary arteries.

After six weeks of aerobic conditioning, several days in a week at an intensity of 70to 85 percent of maximal heart rate, exercise tolerance on the treadmill increased by 30-50 percent.[4] In the intervention group, the treadmill MET score increased from 5.5±1.7 to 7.1±1.2, i.e. an improvement of 29.1%. This improvement is similar to previously reported results. Previously published systematic reviews of cardiac rehabilitation have shown survival benefits of 20-24%. Oldridge and O'Connor et al reported that cardiac rehabilitation was associated with a 25% reduction in over all mortality from cardiovascular causes at three years.[7] The mechanisms of exercise related decrease in mortality are multifactoraial and include favourable lipid effects, improvements in endothelium mediated coronary vasodilatation, changes in body composition, increased heart rate variability and autonomic tone, increased fibrinolysis and improvements in psychological factors.[4]

Cardiac rehabilitation programmes improve the process of care, reduce admissions to hospital and improved quality of life and enhance functional status in these patients. Oldridge et al and Ades et al reported that the cost effectiveness of cardiac rehabilitation, was US $ 4,950 per year.[6,18]

In our study, the cases subjected under supervised cardiac rehabilitation programme show significant decline in BMI, improvement in lipid profile and increased MET score as compared to unsupervised home based exercise programme.

Exercise and effort tolerance decrease cardiac morbidity and mortality in them. This hospital based cardiac rehabilitation programme is safe, inexpensive and practically feasible for developing countries including India to reduce health related cost of hospital as well as patient care.

Short Comings

Although in the absence of long-term data and mortality statistics it is difficult to derive cost benefit equations. Efficacy of drugs and long-term outcomes of continuous exercise has not been evaluated. Although more studies are needed, exercise as a cardiovascular therapy needs strong recommendation.[3]

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International Conference Calendar

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June 15-18, 2006

Hilton Kuala Lumpur, Kuala Lumpur, Malaysia

The First Japan-ASEAN Men's Health & Aging Conference in conjunction with The Second National Men's Health & Aging Conference. Contact: +603 - 2162 0566 Fax: +603 - 2161 6560 or mailto:MH2006@console.com.my.

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