

Abstract

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However, there was no statistically significant difference in EF% after rehabilitation between two groups.

These findings were consistent with most of the previous studies in the same field.

The present study found that CR program improves HRR1, HRR2, RHR, Lipid profile and QOL so CR program should be implemented in routine management of ischemic patients.

Keywords: Functional capacity- Ejection fraction- Coronary artery disease- Peripheral artery disease

**Effect of Cardiac Rehabilitation Program on
Heart Rate Recovery in Patients with Acute
Myocardial Infarction Post Primary
Percutaneous Coronary Angioplasty**

Thesis

*Submitted for Partial Fulfillment of M.Sc of
Cardiology*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

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List of Abbreviations

Abb.	Full term
<i>AHA</i>	<i>American Heart Association</i>
<i>BMI</i>	<i>Body mass index</i>
<i>BP</i>	<i>Blood pressure</i>
<i>CABG</i>	<i>Coronary artery bypass graft</i>
<i>CAD</i>	<i>Coronary artery disease</i>
<i>CHD</i>	<i>Coronary heart disease</i>
<i>CR</i>	<i>Cardiac rehabilitation</i>
<i>CVD</i>	<i>Cardiovascular disease</i>
<i>CVF</i>	<i>Cardiovascular fitness</i>
<i>EF%</i>	<i>Ejection fraction</i>
<i>FC</i>	<i>Functional capacity</i>
<i>HF</i>	<i>Heart failure</i>
<i>HRR</i>	<i>Heart rate recovery</i>
<i>LDL</i>	<i>Low Density Lipoprotein</i>
<i>MI</i>	<i>Myocardial infarction</i>
<i>PAD</i>	<i>Peripheral artery disease</i>
<i>PSA</i>	<i>Parasympathetic activity</i>
<i>PTCA</i>	<i>Percutaneous transluminal coronary angioplasty</i>
<i>QOL</i>	<i>Quality of life</i>
<i>RHR</i>	<i>Resting heart rate</i>

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Also resting lipid profile significantly improved in group I and in group II mostly related to statins. However we noted more improvement in TGs and HDL in group I than in group II may be due to combination benefits of exercise and statins.

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INTRODUCTION

Coronary artery disease (CAD) is the main cause of death worldwide (*Viviane et al., 2015*).

It is potentially fatal disease with high lifetime prevalence. In terms of mortality it represents the most important disease in the group of all cardiovascular disease (CVD) which, in turn, are responsible for most of the deaths in developing and in industrialized countries (*Falk et al., 2010*).

In Egypt, and Similar to other Arab countries, ischemic heart disease and stroke are the second and fourth common cause of death in 1990 but in 2010 they shifted to be the first and second cause respectively. (CAD) mortality accounts for 46% of total deaths for all ages and both sexes. Trends in CAD mortality in the last few years show a minor reduction due to preventive efforts especially against smoking, an operational action plan to reduce the burden of tobacco use (*Abdul Rahim et al., 2014*).

The development of CAD is multicausal and is related to a variety of risk factors, many of them strongly influenced by individual behavior, such as smoking, exercise, diet, diabetes mellitus, hypertension and hypercholesterolemia (*Graham et al., 2007*). It has been suggested that modification of these modifiable risk factors could reduce the burden of CAD by approximately 90%. These risk factors, however, also strongly

influence the prognosis of patients with established CAD. In addition to the well-established pharmacological management of patients with CAD, behavioral changes to modify these lifestyle factors in affected individuals are therefore recommended to form the basis of all secondary prevention strategies of CAD (*Falk et al., 2010*).

Cardiac rehabilitation (CR) programs have become an integral part of the standard of care in modern cardiology. Their scope has shifted from the emphasis on exercise therapy to comprehensive secondary prevention strategies managing risk factors, nutritional, psychological, behavioral and social factors that can affect patient outcomes. While the importance of primary prevention measures aimed at delaying or preventing the onset of CVD is obvious and cannot be emphasized enough, (CR) is mainly involved with secondary prevention which relies on early detection of the disease process and application of interventions to prevent the progression of disease. These interventions include education; counseling and behavioral strategies to promote lifestyle change and modify risk factors. Clinical trials have proven that strategies for the detection and the modification of risk factors can slow, stabilize or even modestly reverse the progression of atherosclerosis and reduce cardiovascular events. In most current guidelines of cardiovascular societies worldwide, CR is a class I recommendation. The American Heart Association (AHA) defined CR as a “medically supervised program to help heart

patients recover quickly and improve their overall physical and mental functioning” (*Keteyian et al., 2010*).

Goals for CR include improving aerobic endurance and muscular strength, and modifying cardiovascular risk factors, including losing weight, lowering cholesterol, improving blood glucose, controlling blood pressure(BP), and smoking cessation (*Christensen and Jordan 2008*). Recent research has shown that people who have experienced cardiac events can handle more frequent and intense exercise than originally thought (*Munkvik et al., 2010*). Quality of life (QOL) reflects the functional effect of an illness and its therapy from the patient’s point of view. Poor (QOL) has been associated with poorer outcomes, such as lower survival rates, increases in the number of hospitalizations, decreased capacity to perform activities of daily living, and decreased compliance with treatments in other populations like cardiac patients (*Havik et al., 2007*).

Heart rate changes associated with taking and cessation of physical activity are a result of permanent cooperation between the parts of the autonomic nervous system. Double neural control, based on reciprocal feedback inhibition of both parts of the autonomic nervous system, increases the body’s regulatory abilities, better adapts it to the environment. The increase in heart rate that supplements exercise is due to combination of sympathetic activation and parasympathetic withdrawal (*Wang et al., 2011*). The rapid post-exercise decrease in heart rate is thought to be predominantly due to

parasympathetic reactivation (*Imai et al., 1994; Wang et al., 2011*). Observations of double neural control indicated that a simple parameter – the difference in the uppermost heart rate and the heart rate measured after sixty seconds during the recovery phase of the exertion test (HRR1min) – objectifies the dynamics of post-exercise heart rate recovery HRR adaptation. Disorders in autonomic regulation of the circulatory system's function results in less pronounced decrease of heart rate after exercise cessation and is associated with total and cardiovascular mortality and morbidity in apparently healthy subjects, in patients with coronary artery disease or in patients with diabetes (*Gayda et al., 2012*).

AIM OF THE STUDY

The aim is to study the effect of cardiac rehabilitation program on heart rate recovery in patients with acute myocardial infarction post primary percutaneous coronary intervention.

Chapter 1

CARDIAC REHABILITATION

Definition:

CR is supervised aerobic and strength exercise along with monitoring of physiological responses (BP, HR, and electrical heart rhythms). Also CR included lifestyle changes, risk factor control, cardiovascular pharmacology, and a psychological health screening (*Saeidi et al., 2013*).

While the importance of primary prevention measures aimed at delaying or preventing the onset of CVD is obvious and cannot be emphasized enough, CR is mainly involved with secondary prevention which relies on early detection of the disease process and application of interventions to prevent the progression of disease. These interventions include education; counseling and behavioral strategies to promote lifestyle change and modify risk factors. Clinical trials have proven that strategies for the detection and the modification of risk factors can slow, stabilize or even modestly reverse the progression of atherosclerosis and reduce cardiovascular events (*Piepoli et al., 2010*).

Components and organization of cardiac rehabilitation

Cardiac rehabilitation team:

The CR program needs a team of health professionals, including specialists and generalists. It is important that the