Effect of Exercise on Heart Rate Recovery in Patients Post Anterior Myocardial Infarction

Thesis

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List of Abbreviations

Abbr.	Full-term
AACVPR	: American Association of Cardiovascular and Pulmonary Rehabilitation,
ACC	: American College of Cardiology
ACE	: Angiotensin-converting enzyme
ACEI	: Angiotensin-converting enzyme inhibitor
ACS	: Acute coronary syndrome
AF	: Atrial fibrillation
AHA	: American Heart Association
AMI	: Acute myocardial infarction
ARBs	: Angiotensin receptor blockers
ARR	: Absolute risk reduction
BACPR	: British Association for Cardiovascular Prevention and Rehabilitation
BMS	: Bare metallic stent
BP	: Blood pressure
CABG	: Coronary artery by bass graft
CACR	: Cuban asset cardiac rehabilitation
CAD	: Coronary artery disease
CCS	: Canadian Cardiovascular Society
CHD	: Coronary heart disease
CK-MB	: Creatinin kinase myocardial band
CMR	: Cardiac magnetic resonance
CR	: Cardiac rehabilitation
CT	: Computed tomography
ctn	: Cardiac troponin

CVD : Cardiovascular disease
DAPT : Dual antiplatelet therapy
DES : Drug eluting stent
DM : Diabetes mellitus
EACPR : European Association of Cardiovascular Prevention and Rehabilitation
ECG : Electrocardiography
EF : Ejection fraction
ESC : European society of cardiology
FHX : Family history
HDL : High density lipoprotein
HRR : Heart rate recovery
HRR1 : Heart recovery in 1^{st} minute
HRR2 : Heart recovery in 2^{nd} minute
hs-ctnt : High sensitivity cardiac troponin test
HT : Hypertension
ICD : Implantable cardioverter–defibrillator
LAD : Left anterior descending coronary artery
LBBB : Left bundle branch block
LDL : Low density lipoprotein
LVH : Left ventricular hyper atrophy
MACCE : Major adverse cardiac and cerebrovascular event
MACE : Major adverse cardiac event
MCE : Myocardial contrast echocardiograghy
METs : Metabolic equivalents
mg/dl : Milli gram per deci litter
MHR : Maximum heart rate
mmHg : Millimeter mercury
Mmol : Milli moles per letter

NICE	: National Institute for health and Care Excellence
NNT	: Number needed to treat
NRMI	: Natural register of myocardial infarction
NSTEMI	: Non-ST segment elevation myocardial infarction
NYHA	: New York Heart Association
PCI	: Percutaneous coronary intervention
RPE	: Rating perceived exertion
SD	: Standard deviation
SPSS	: Statistical Program for Social Science
STEMI	: ST segment elevation myocardial infarction
VF	: Ventricular fibrillation
VO2max	: Maximal aerobic capacity
WHO	: World Health Organization

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Abstract

Back ground: cardiovascular diseases, particularly coronary heart disease (CHD) are the most common cause of human deaths in the world. Physical activity and function capacity improvement is critical in primary and secondary prevention of cardiovascular disease. Regular exercise training and cardiac rehabilitation has been shown to reduce the rate of mortality, improve functional capacity, and control the risk factors in myocardial infarction patients.

Aim of the work: the main purpose of the present study was to assess the effect of exercise training on heart rate recovery in patients with post anterior myocardial infarction (MI).

Materials and Methods: this study was conducted on fifty adult patients who were selected from cardiac rehabilitation (CR) clinic in Ain Shams University hospital (cardiology department) between October 2016 and July 2017.The patients were one month after anterior MI who did exercise test before and after CR program to calculate heart rate recovery (HRR1 and HRR2) and to rule out residual ischemia.

Results: in the present study there was not only statistically significant improvement in HR recovery in 1^{st} minute and HR recovery in 2^{nd} minute but also improvement in resting heart rate (RHR) which decreased significantly. Moreover, Metabolic equivalent (METs) and HR reserve was improved significantly with CR**.** However, there were a trend toward decrease but no statistically significant in resting Blood Pressure (BP) (systole and diastole), peak BP (systole and diastole), and maximum HR before and after CR.

Conclusion: from present study we found that CR program improves HR recovery in 1^{st} minute, HR recovery in 2^{nd} minute, resting HR, HR reserve and METs so CR program should be implemented in routine management of ischemic patients.

Key Words: Cardiovascular diseases - Exercise training - Myocardial infarction - Heart disease.

Introduction

Cardiovascular disease (CVD) is one of the most common causes of death throughout the world ***(Woo and Turner, 2012).*** In 2007, CVD accounted for 33.6% of overall deaths and 15% of health expenditure in the United States ***(Thayer and Lane, 2007; Wylie- Rosett et al., 2011).***

Coronary heart disease (CHD) is the most common type of CVD ***(Woo and Turner, 2012)***. There are many risk factors associated with coronary heart disease and stroke. Some risk factors such as family history, ethnicity and age, cannot be changed. Other risk factors that can be treated or changed include tobacco exposure, high blood pressure (hypertension), high cholesterol, obesity, physical inactivity, diabetes, unhealthy diets, and harmful use of alcohol. Furthermore, the concomitant presence of the components of the metabolic syndrome, namely abdominal obesity, hypertension, impaired glucose metabolism, and insulin resistance, markedly increase the risk ***(Wilson et al., 2005).***

The heart rate is an important prognostic factor of CVD; the heart rate is predominantly regulated and determined by the autonomic nervous system function. As the heart rate is a significant indicator of myocardial oxygen demand, it is has been demonstrated that individuals with a resting heart rate of more than 90 beats per minute (bpm)

have a threefold increased mortality risk compared to those with a rate lower than 60 bpm ***(Ducimetière, 2001).***

Heart rate recovery (HRR) was defined as the difference between HR at peak exercise and exactly 1 minute or 2 minutes into the recovery period. A HRR value <12 beats/minute at 1 minute into the recovery phase or <22 beats/minute at 2 minutes into the recovery phase was considered abnormal ***(Jolly et al., 2011).***

Change in heart rate (HR) during exercise and recovery from exercise are mediated by the balance between sympathetic and vagal activity. An attenuated heart rate recovery (HRR) after exercise, thought to be a marker of reduced parasympathetic activity ***(Jouven et al., 2005).***

A delayed decrease in heart rate during the first minute after graded exercise is a powerful predictor of overall mortality in both patients with and without heart disease, independent of workload, the presence or absence of myocardial perfusion defects, and changes in heart rate during exercise Whether HRR may also serve as a powerful and convenient.Instrument to monitor improvement in training status during exercise based rehabilitation of patients with established heart disease remains, to our knowledge, to be proven ***(Cole et al., 1999).***

Cardiac rehabilitation (CR) is a combination of exercise training course and nutritional and psychological counseling aimed at improving the health status of patients with CVD ***(Ades et al., 2012).***

In most current guidelines of cardiovascular societies worldwide, cardiac rehabilitation is a class I recommendation ***(Thomas et al., 2007).***

Recent studies show that cardiac rehabilitation is not only clinically effective, but also cost-effective and compares favorably with other medical interventions performed commonly in patients with coronary heart disease. Ades *et al*. showed that cardiac rehabilitation was more cost-effective following myocardial infarction, compared to lipid lowering drugs, thrombolytic and CABG. Only smoking cessation was more cost effective than cardiac rehabilitation ***(Ades et al., 2012).***

The beneficial effects of this technique are proven in patients with a wide range of heart diseases in that this program can result in improved outcome and reduced mortality. Cardiac rehabilitation is an integral part of management of cardiac patients ***(Woo and Turner, 2012).***

Aim of the Work

To assess the effect of exercise training on heart rate recovery in post ST elevation anterior myocardial infarction patients