بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

MONA MAGHRABY

Effect of Cardiac Rehabilitation Program on Right Ventricular Function after Acute Inferior Wall Myocardial Infarction

Thesis

Submitted for Partial Fulfillment of
Master Degree in **Cardiology**

Presented by

Hazem Salama Emad Salem
M.B.B.Ch., Ain Shams University, 2015

Under Supervision of

Prof. Dr. Mohamed Khairy Abdel Dayem
Professor of Cardiology
Faculty of Medicine, Ain Shams University

Prof. Dr. Hazem M. Reda Khorshid
Professor of Cardiology
Faculty of Medicine, Ain Shams University

Dr. Ahmed Kadry Abdel Hady
Lecturer of Cardiology
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
2021

Acknowledgments

First and foremost, I feel always indebted to Allah *the Most Beneficent and Merciful.*

I would like to express my deepest appreciation and gratitude to Prof. Dr. Mohamed Khairy Abdel Dayem, *Professor of Cardiology, Faculty of Medicine, Ain Shams University, for his help in picking this important subject, and for his continuous and unconditioned guidance and support.*

I would also like to thank Prof. Dr. Hazem Khorshid *and* Dr. Ahmed Kadry *their patience and meticulous remarks which have helped me keeping this essay structured, organized and concise.*

I would also like to thank Dr. Azza Omran *for her help in recruiting the patients and doing the echocardiographic studies for them.*

Hazem Salama Emad Salem

List of Contents

List of Tables

List of Figures

List of Figures cont...

List of Abbreviations

Abb.	Full term
ACS	*Acute coronary syndrome*
AMI	*Acute myocardial infarction*
CAD	*Stable coronary artery disease*
CBCR	*Center-based cardiac rehabilitation*
CPET	*Cardiopulmonary exercise test*
TDI	*Tissue doppler imaging*
RVH	*Right ventricular hypertrophy*
RVSP	*Right Ventricular systolic pressure*
ESC	*European society of cardiology*
ExCR	*Exercise-based cardiac rehabilitation*
FAC	*Fractional area change*
FWS	*Free wall strain*
GDMT	*Guideline-directed medical therapy*
GLS	*Global longitudinal strain*
HBCR	*Home-based cardiac rehabilitation*
LAD	*Left atrial diameter*
LGE	*Late gadolinium enhancement*
LV	*Left ventricle*
LVEDD	*Left ventricular end-diastolic dimension*
LVEF	*Left ventricle ejection fraction*
LVESD	*Left ventricular end-systolic dimension*
MR	*Mitral valve regurgitation*
PCI	*Percutaneous coronary intervention*
RV	*Right ventricle*
RV FWS	*Right ventricular free wall strain*
RV GLS	*Right ventricular global longitudinal strain*
RVMI	*Right ventricular myocardial infarction*
S' velocity	*Systolic lateral tricuspid annular velocity*
STE	*Speckle-tracking echocardiography*
TAPSE	*Tricuspid annular plane systolic excursion*

INTRODUCTION

The overall goal of cardiac rehabilitation (CR) is to improve the quality of life and reduce cardiovascular risk factors. Cardiac rehabilitation involves interventions that aimed at controlling risk factors, improve blood pressure, lipid profile and diabetes mellitus control, tobacco cessation, behavioral counseling, and step-by-step physical activity. Additional components of CR include supervised sessions of aerobic exercise, nutrition counseling, screening for and managing depression, and assuring the latest immunizations. Cardiac rehabilitation is recommended for patients following myocardial infarction, bypass surgery, percutaneous coronary intervention (PCI), and for patients with heart failure (HF), stable angina, and several other conditions [(1)].

Acute myocardial infarction (AMI) results in loss of myocardial tissue and consequently regional or global impairment of myocardial contractile function [(2)]. The extent of viable myocardial tissue is considered a major factor of recovery after myocardial infarction [(3)].

The right ventricle (RV) is a thin-walled chamber that functions at low oxygen demands and pressure. It is perfused throughout the cardiac cycle in both systole and diastole, and its ability to extract oxygen is increased during hemodynamic stress. All of these factors make the RV less susceptible to infarction than the left ventricle (LV). Isolated infarction of the

RV is extremely rare; right ventricular infarction (RVI) usually is noted in association with inferior wall myocardial infarction. The prevalence of RVI in inferior wall myocardial infarction is about 34% [(4)].

Increasing recognition of right ventricular infarction, either in association with left ventricular infarction or as an isolated event, emphasizes the clinical contribution of the RV to total cardiac function**.** Patients with right ventricular infarctions associated with inferior infarctions have much higher rates of significant hypotension, bradycardia requiring pacing support, and in-hospital mortality than isolated inferior infarctions [(5)].

Systolic RV function can be assessed by several conventional measurements. Cardiac magnetic resonance is considered the gold standard; however, it is limited by the cost and availability [(6)]. The RV fractional area change (RVFAC) is one of the conventional echocardiography parameters to assess RV function. The superiority of RVFAC over most other classical echocardiographic parameters could be due to its ability to consider both longitudinal and radial shortening [(7)]. Other Local longitudinal parameters assessing the RV function are Tricuspid Annular Plane Systolic Excursion (TAPSE) and Systolic TV Annular Velocity (S' velocity) [(8)]**.** Tissue Doppler imaging (TDI) has been introduced as a method to quantitatively assess regional myocardial function by providing a map of color-encoded tissue velocities**.** TDI offers no

solution, to the issue of distinguishing local velocity from translational motion and tethering effects from other regions.

A potentially more specific measure of regional function would be the quantification of regional deformation or strain. The concept of myocardial strain was defined by Mirsky and Parmley as fractional tissue deformation in response to the applied force (stress) [(9)].

Speckle tracking echocardiography (STE) is an echocardiographic imaging technique that analyzes the motion of tissues in the heart by using ultrasonic sound waves to generate interference patterns and natural acoustic reflections[(10)]. These reflections, also described as ‘‘speckles’’, ‘‘markers’’, ‘‘patterns’’, ‘‘features’’, or ‘‘fingerprints’’, are tracked consecutively frame to frame and ultimately resolved into angle-independent two-dimensional and three-dimensional strain-based sequences. These sequences provide both quantitative and qualitative information regarding tissue deformation and motion [(11)]. Speckle tracking is based on tracking of characteristic speckle patterns created by interference of ultrasound beams in the myocardium [(12)].

Two-dimensional STE strain has been validated as a promising tool for the evaluation of RV systolic function in several clinical settings, including PH, pulmonary embolism, HF, AMI, cardiomyopathies, and valvular heart diseases. Two-dimensional STE strain is currently the method of choice

because it is less affected by angle dependency and more reproducible than TDI strain. In addition to that, all studies reported low inter-and intra-observer variability and good feasibility, making longitudinal strain an effective and reproducible tool for the assessment of RV function [(6)].

AIM OF THE WORK

This study aims to assess the functional recovery of the RV using speckle tracking derived longitudinal strain of the RV lateral wall both within 48 hours of presentation and after 3 to 6 months of CR in patients with acute inferior ST-segment elevation myocardial infarction who were treated with successful reperfusion therapy by primary percutaneous intervention.