Study of Right Ventricular Myocardial Systolic Activation in patients with Pulmonary Hypertension by Tissue Doppler Imaging

Thesis
Submitted in Partial Fulfillment of Master Degree in Cardiology

By
Wael Gomaa Ibrahim
M.B, Bch

Supervised by
Prof. Dr. Maiy Hamdy El-Sayed
Professor of Cardiology
Faculty of Medicine- Ain-Shams University

Prof. Dr. Ghada Samir El-Shahed
Professor of Cardiology
Faculty of Medicine- Ain-Shams University

Dr. Alaa Mahmoud Roshdy
Assistant Professor of Cardiology
Faculty of Medicine- Ain-Shams University

Faculty of Medicine
Ain-Shams University
٢٠١٣

List of Abbreviations

act. T Activation time. .

ANP Atrial Natriuretic Peptide.

AR Aortic regurgitation.

AV block Atrio-ventricular block..

BNP Beta Natriuretic Peptide

BP Blood pressure

CHD Congenital heart disease.

cTDI Color-coded tissue Doppler imaging

CTEPH Chronic thromboembolic pulmonary hypertension.

CXR Chest X-Ray.

٢D Two dimensional echocardiography.

ECG Electrocardiography.

EDD End diastolic dimension.

EDV End diastolic volume.

EEPV Endejection pressure/volume.

EF Ejection fraction.

EIT Electrical Impedance Tomography.

ES Eisenmenger Syndrome.

ESC European Society Of Cardiology.

ESD End systolic dimension.

ESV End systolic volume.

ET Ejection time.

FAC Fractional area change.

FS Fraction shortening.

HIV Human immunodeficiency virus.

IPAH Idiopathic Pulmonary Hypertension.

IVC Inferior vena cava.

IVCT Isovolumic contraction time.

IVRT Isovolumic relaxation time.

IVSd Interventricular septum in diastole.

٦MWT ٦-min walk test.

LA Left atrium.

LV Left ventricle.

Max PV Maximum pressure-volume ratio.

MPAP Mean Pulmonary Artery Pressure.

MRI Magnetic resonance imaging.

MVG Myocardial velocity gradient.

NIH National institutes of health.

NYHA New York Heart Association

PA Pulmonary Artery.

PAH Pulmonary Arterial Hypertension.

PAPVD Partial anomalous pulmonary venous drainage.

PCH Pulmonary capillry hemangiomatosis.

PCWP Pulmonary capillary wedge pressure.

PDA Patent ductus arteriosus.

PEP Pre ejection period

PGI٢ Prostacyclin.

PR Pulmonary regurgitation.

PRV Peak pulmonary regurgitant velocity.

pTDI Pulsed wave tissue Doppler imaging.

PWd Posterior wall in diastole.

PVOD Pulmonary veno-occlusive disease.

PVR Pulmonary Vascular Resistance.

RA Right atrium.

RAP Right atrial pressure.

RIMP RV index of myocardial performance.

RV Right ventricle.

RVAd Right ventricular area in diastole.

RVAs Right ventricular area in systole.

RVOT Right ventricular outflow tract.

RVSP Right ventricular systolic pressure.

SPAP Systolic pulmonary artery pressure.

TGF- β Transforming-growth-factor-beta.

TDI Tissue Doppler imaging.

TR Tricuspid valve Regurgitation.

TPR Total pulmonary resistance.

TSI Tissue synchronization imaging.

TT Tissue tracking

WHO World health organization.

Acknowledgment

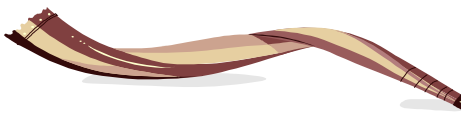
First of all, the great thanks and praise to **God** *who enabled us to complete this work in a beautiful view.*

I would like to express my deep gratitude and admiration to **Professor Dr. Maiy Hamdy El-Sayed**, *Professor of Cardiology, Ain Shams University, without her continuous guidance and encouragement this study would have never seen light.*

I am just as much indebted to **Professor Dr. Ghada Samir El-Shahed**, *Professor of Cardiology, Ain Shams University, every step and every detail in this work have been kindly assisted and supported by her effort and her care.*

A special measure of appreciation is extended for **Professor Dr. Alaa Mahmoud Roshdy**, *Assistant Professor of Cardiology, Ain Shams University. He offered me the utmost care, invaluable advice and unlimited support.*

Lastly, I don't forget my family, the best helper for me, their full support, prayers and wishes was a great motive to accomplish this work. My deepest gratitude to them and thanks will never appreciate what I owe them.



Wael Gomaa Ibrahim

Contents

List of Figures

List of Tables

Introduction

Congenital heart disease (CHD) is surely not uncommon with an incidence of ١/١٢٠ live births. The risk is estimated at ٢ to ٣٪ in children with an affected first-degree relative (higher if the relative is a parent) [١].

Approximately one third of all patients with CHD who have not undergone corrective procedures will die from pulmonary vascular disease. However, the frequency of pulmonary hypertension and the subsequent development of reversed shunting vary depending on the specific heart defect and operative interventions [٢].

The assessment of pulmonary vascular resistance (PVR) is an essential component of the evaluation of any patient with known or suspected pulmonary hypertension secondary to CHD. The current standard for measuring the pulmonary vascular resistance is cardiac catheterization (well established technique, its invasive nature poses significant risk to the seriously ill patients who are usually in need of these measurements) [٣].

A noninvasive method of evaluating PVR would (١) allow more frequent assessment of PVR, (٢) facilitate the monitoring of individual patient responses, (٣) provide a safer and easier method of estimation (٤) provide a wide spread method of diagnoses that would help in early detection of patients liable to develop pulmonary hypertension[٣].

It is therefore no surprise that echocardiographers continue to search for accurate, noninvasive means of quantifying PVR. Conventional echocardiography only provides structural information