



Cardiac Evaluation in Chronic Obstructive Pulmonary Disease Patients by Using Echocardiography

Thesis

Submitted for Partial Fulfillment of the Master Degree in
Chest Diseases

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2018



*Thanks first and last to **ALLAH** for his guidance, support and care in every step in our lives.*

I have the greatest pleasure to express my deepest gratitude to **Prof. Yasser Moustafa Mohammed**, Professor of Chest Diseases, Head of Chest Department, Faculty of Medicine, Ain Shams University for his unlimited help, encouragement, supervision, support and profuse knowledge so that this work have been accomplished.

I wish to express my appreciation to **Prof. Ghada Samir Alshahed**, Professor of Cardiac Diseases, Faculty of Medicine, Ain Shams University, for her support and great assistance.

Also, I want to express my appreciation to **Dr. Nehad Mohammed Osman**, Assistant Professor of Chest Diseases, Faculty of Medicine, Ain Shams University, for her guidance, encouragement and great help.

Lastly, I wish to express my appreciation to my family, without their support and help this work would have not been fulfilled.

Nehal Qadry Abd-Alhameed



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List of Abbreviations

Abbrev.	Meaning
6MWD	: 6-minute-walk distance
AF	: Atrial fibrillation
AMVL	: Ant mitral valve leaflet
AO	: Ascending aorta
AS	: Aortic stenosis
ASD	: Atrial septal defect
AV	: Aortic valve
BOLD	: Burden of Obstructive Lung Diseases
CAD	: Coronary artery disease
CAT	: COPD Assessment Test
CBC	: complete blood count
CF	: cardiac frequency
CFR	: Coronary flow reserve
CLD	: Chronic lung disease
CO	: Cardiac output
COPD	: Chronic obstructive pulmonary disease
CT	: Computer tomography
CPET	: Cardiopulmonary exercise testing
CTEPH	: Chronic thromboembolic pulmonary hypertension

List of Abbreviations

CV	: Chamber view
CVD	: Cardiovascular diseases
CVRF	: Cardiovascular risk factor
CW	: Continuous-wave Doppler
DE	: Doppler echocardiography
DLCO	: Diffusing capacity of the lungs for carbon monoxide
1D	: One dimension
2D	: Two dimension
3D	: Three dimension
E/A	: Peak velocity of early diastolic flow (E), peak velocity of atrial contraction (A)
ECG	: Electrocardiograph
FER	: Forced expiratory ratio
FEV1	: Forced expiratory volume in 1 second
FVC	: Forced vital capacity
GOLD	: Global Initiative for Chronic Obstructive Lung Disease
HCM	: Hypertrophic Cardiomyopathy
HF	: Heart failure
HFpEF	: Heart Failure with a Preserved Ejection Fraction
HOCM	: Hypertrophic obstructive cardiomyopathy
IC/TLC	: Inspiratory capacity/total lung capacity
IHD	: Ischemic heart disease

List of Abbreviations

IVC	: Inferior vena cava
JA	: Jet area
LA	: Left atrium
LV	: Left ventricle
LVEF	: Left ventricular ejection fraction
LVDD	: Left ventricular diastolic dysfunction
LVH	: Left ventricular hypertrophy
LVPW	: Left ventricular posterior wall
LVSD	: Left ventricular systolic dysfunction
LTOT	: Long-term oxygen therapy
M mode	: Motion mode
mMRC	: Modified British Medical Research Council
mPAP	: Mean pulmonary arterial pressure
MR	: Mitral regurge
MV	: Mitral valve
PAP	: Pulmonary artery pressure
PAWP	: Pulmonary Artery Wedge Pressure
PEEP	: Positive end-expiratory pressure
PH	: Pulmonary hypertension
PHT	: Pulmonary hypertension
PL	: Trans-pulmonary pressure
PMVL	: Posterior mitral valve leaflet

List of Abbreviations

Ppa	: Pulmonary arterial pressure
PRA	: Pressure of right atrium
PRV	: Pressure of right ventricle
PVR	: Pulmonary vascular resistance
PW	: Pulsed-wave Doppler
RA	: Right atrium
RAP	: Right atrial pressure
RHC	: Right heart catheterization
RHF	: Right heart failure
RV	: Right ventricular
RVol	: Regurgitant volume
SD	: Standard deviation
sPAP	: Systolic pulmonary artery pressure
SV	: Stroke volume
TAPSE	: Tricuspid Annular Plane Systolic Excursion,
TTE	: Transthoracic echocardiography
TTPG	: Trans-tricuspid pressure gradient
TV	: Tricuspid valve
VA/Q	: Ventilation perfusion ratio
V	: Velocity
WHO	: World Health Organization

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Introduction

Chronic obstructive pulmonary disease (COPD) is a common preventable and treatable disease characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. It has some significant extra pulmonary effects that may contribute to its severity in individual patient.

COPD is considered as a major cause of respiratory morbidity and mortality world- wide and reported to be fourth-leading cause of chronic morbidity and mortality worldwide. ⁽¹⁾

Among COPD patients, cardiovascular diseases (CVD) are responsible for approximately 50% of all hospitalizations and 20% of all deaths. However, population-based studies have suggested that regardless of smoking status, age or sex; COPD diagnosis increases the risk of cardiovascular morbidity and mortality by approximately two folds. ⁽²⁾

COPD affects pulmonary blood vessels, right ventricle, as well as left ventricle leading to development of pulmonary hypertension, cor pulmonale, right ventricular dysfunction, and left ventricular dysfunction ⁽³⁾.

Pulmonary hypertension (PH), defined as an elevated mean pulmonary arterial pressure (mPAP) ≥ 25 mmHg measured by right heart catheterization, is a common complication of chronic lung disease (CLD). PH often progresses to right heart failure (RHF), with initial compensatory right ventricular (RV) hypertrophy becoming overwhelmed by increased systolic requirements, whilst left ventricular (LV) systolic function remains preserved. The term “cor pulmonale” has been used to describe this form of RHF and hypertrophy. It is a progressive condition, associated with increased mortality in CLD. ⁽⁴⁾

Pulmonary artery pressures and other cardiac of hemodynamic parameters can be accurately assessed by right heart catheterization (RHC), Doppler echocardiography (DE) has gained popularity in the last 2 decades for non-invasive estimation of systolic pulmonary artery pressure (sPAP) from the peak velocity of tricuspid regurgitated jet. ⁽⁵⁾

Left ventricular systolic dysfunction (LVSD) is defined as an LVEF $< 50\%$ ⁽⁶⁾. The reported prevalence of LVSD in patients with stable COPD varies widely, and is related to the exclusion of cardiovascular risk factor (CVRF) in different series (0%–16% in COPD patients
