

Atrial Reverse Remodeling after Cardiac Resynchronization Therapy for Heart Failure

Thesis

Submitted for partial fulfillment of Doctorate degree (MD)
in **Cardiology**

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2014



(... رَبُّ أَوْزَعَنِي أَنْ أَشْكُرَ

نِعْمَتَكَ إِلَهِي أَنْفَعَتَ عَلَيَّ

وَعَلَيْكَ وَالْحَمْدُ

وَأَنْ أَعْمَلَ صَالِحاً

تَرْضَاهُ وَأَدْفِنَنِي

بِرَحْمَتِكَ فِي عِبَادِكَ

[الصَّالِحِينَ]

صدق الله العظيم

الجمال... آية رقم ١٩



Acknowledgements

First, and foremost, my deepest gratitude and thanks should be offered to **"ALLAH"**, the Most Kind and Most Merciful, for giving me the strength to complete this work.

I would like to express my sincere gratitude to **Prof. Dr. Said Abdel Hafiz Khaled**, Professor of Cardiology, Faculty of Medicine – Ain Shams University, for his continuous support and guidance for me to present this work. I really have the honor to work under his generous supervision.

I acknowledge with much gratitude to **Dr. Mohamed Amin Abdel Hameed**, Associate Professor of Cardiology, Faculty of Medicine – Ain Shams University for his great supervision and unlimited help to provide all facilities to accomplish this work.

I extend my appreciation and thanks to **Dr. Mazen Tawfik Ibrahim**, Associate Professor of Cardiology, Faculty of Medicine – Ain Shams University for his great supervision, valuable advice, help and encouragement.

I would like also to profoundly thank **Dr. Ayman Mortada Abdel Motalib**, Lecturer of Cardiology, Faculty of Medicine – Ain Shams University, for his cooperation and help during the whole work.

I can't forget to thank and appreciate **Dr. John Kamel Zarif**, Lecturer of Cardiology, Faculty of Medicine – Ain Shams University, for his great efforts to complete this work.

I would to thank all those helped me to accomplish this work, **Patients and all my Colleagues**.

Last but not least, thanks to **my Parents** and **my Family** for helping me to finish this work.

 **Alaa Allah Al Anany**

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List of Abbreviations

| | |
|-------------|--|
| ACS | : Acute coronary syndrome |
| AF | : Atrial fibrillation |
| ANP | : atrial natriuretic peptide |
| AP | : Anteroposterior |
| AV | : Atrio-ventricular |
| AVP | : Arginine vasopressin |
| BIVP | : Biventricular pacing |
| BNP | : Brain natriuretic peptide |
| BP | : Blood pressure |
| CABG | : Coronary artery bypass grafting |
| CAD | : Coronary artery disease |
| CI | : Cardiac index |
| COPD | : Chronic obstructive pulmonary disease |
| CPET | : Cardiopulmonary exercise testing |
| CRP | : C-reactive protein |
| CRT | : Cardiac resynchronization therapy |
| CT | : Computed tomography |
| CVS | : Cerebrovascular stroke |
| DM | : Diabetes mellitus. |
| EF | : Ejection fraction |
| ESR | : Erythrocyte sedimentation rate |
| HDL | : High-density lipoprotein |
| HF | : Heart failure |
| IDCM | : Idiopathic dilated cardiomyopathy |
| IL | : Interleukin |
| IVS | : Interventricular septal thickness |
| KCCQ | : Kansas City Cardiomyopathy Questionnaire |
| LA | : Left atrium |

List of Abbreviations *(Cont...)*

| | |
|---------------|---|
| LAD | : Left atrial diameter |
| LAVI | : Left atrial volume index |
| LBBB | : Left bundle branch block |
| LV | : Left ventricle |
| LVEF | : Left ventricular ejection fraction |
| LVEDD | : LV end diastolic dimension |
| LVEDV | : LV end diastolic volume |
| LVESD | : LV End systolic dimension |
| LVESV | : LV end-systolic volume |
| LVFW | : Left ventricular free wall |
| LVP | : Left ventricular |
| MI | : Myocardial infarction |
| MLHFQ | : Minnesota Living with Heart Failure Questionnaire |
| MRI | : Magnetic resonance imaging |
| MWT | : Minute walk test |
| NE | : Norepinephrine |
| NHANES | : National Health and Nutrition Examination Survey |
| NYHA | : New York Heart Association |
| PAP | : Pulmonary artery pressure |
| PCI | : Percutaneous coronary intervention |
| PCWP | : Pulmonary capillary wedge pressure |
| PET | : Positron emission tomography |
| PRA | : Plasma renin activity |
| PSLAX | : Standard parasternal long-axis |
| QOL | : Quality of life |
| RV | : Right ventricle |
| RVEF | : Right ventricular ejection fraction |
| SCV | : Superior caval vein |

List of Abbreviations *(Cont...)*

| | |
|--------------|---|
| SD | : Standard deviation |
| SOLVD | : Studies on Left Ventricular Dysfunction |
| SPECT | : Single-photon emission computed tomography |
| SPSS | : Statistical Package for the Social Sciences |
| SPWD | : Septal to posterior wall motion delay |
| STE | : Speckle-tracking echocardiography |
| TD | : Tissue Doppler |
| TNF | : Tumor necrosis factor |
| VF | : Ventricular fibrillation |
| VT | : Ventricular tachycardia |
| WHO | : World Health Organization |
| 2D | : Two-dimensional |
| 3D | : Three-dimensional |

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Introduction

Heart failure is a complex clinical syndrome characterized by impaired myocardial performance and progressive activation of neuroendocrine system leading to circulatory insufficiency and congestion. With the increasing age of the population, improved survival of patients with myocardial infarction and reduced mortality from other diseases, incidence of heart failure and the cost of managing patients with heart failure continue to increase. Data suggest that the lifetime risk of developing heart failure is about 20% ^[1].

Cardiac resynchronization therapy (CRT) is now an established treatment for patients with advanced heart failure with prolonged QRS duration. Apart from clinical benefits, improvement of left ventricular (LV) systolic function and associated LV reverse remodeling have been well reported ^[2-7]. Recently, improvement of right ventricular function also has been reported ^[8].

With improvement of LV function and reduction of mitral regurgitation, left atrial (LA) size could be reduced. Furthermore, the pressure unloading effect in the atrium may result in the improvement of atrial function. Atrial function is relatively complex. Apart from active atrial pump function as a direct result of atrial systole, atrial compliance is an important determinant of atrial reservoir and conduit functions ^[9].

With the advancement of echocardiographic technology, it is now possible to assess regional atrial function, in particular by strain (ϵ) imaging ^[10].