Atrial Reverse Remodeling after Cardiac Resynchronization Therapy for Heart Failure

Thesis

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in **Cardiology**

By

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نِعمَتَكَ الَّتِي أَنعَمتَ عَلَيَّ
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صدق الله العظيم
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Alaa AllahAl Anany

List of Contents

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

List of Tables

List of Tables *(Cont....)*

List of Tables *(Cont....)*

List of Tables *(Cont....)*

List of Figures

List of Figures *(Cont...)*

List of Figures *(Cont...)*

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].