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قسم

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Impact of right ventricle lead position on left ventricular function in permanent single and dual chamber pacemakers

Thesis

Submitted for Partial Fulfillment of Master Degree in Cardiology

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Impact of right ventricle lead position on left ventricular function in permanent single and dual chamber pacemakers

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ABSTRACT

Aim and objectives: To identify the short term effect of the pacemaker RV lead position related electric remodeling on LV systolic function

Patients and Methods:

The study included 30 patients who presented with an indication of permanent pacing to the cardiology department of Ain Shams university hospitals and underwent permanent single or dual-chamber pacemaker insertion, 15 patients each with right ventricular (RV) apical pacing (RV apex), and 15 patients non-apical pacing (mid septal). 2D speckle tracking imaging technique was used for quantification of global longitudinal function of the left ventricle and dyssynchrony evaluation before pacemaker implantation and after a 3-month follow-up

Results: 2D speckle tracking echocardiography 3 months follow up post pacing revealed impairment of global longitudinal strain in all patients and Intraventricular dyssynchrony was significantly more in apical location compared to a non-apical location (radial dyssynchrony: 108.67 ± 11.68 msec vs. 80.53 ± 8.17 msec, p-value < 0.001) with more difference (50.53 ± 13.30 msec) in apical location compared to non-apical location difference (29.87 ± 6.64 msec), p-value < 0.001.

Conclusion: By the analysis of 2D speckle tracking echocardiography, In the short-term follow-up, we found that radial dyssynchrony was more in apical location when compared to the non-apical location of RV lead. The RV septal pacing is a better alternative in terms of less dyssynchrony compared to RV apical pacing. Older age, the higher percentage of pacing, and device type are prognostic factors for the development of pacemaker-induced cardiomyopathy.

Keywords: Dyssynchrony; global longitudinal strain; Pacing; Speckle tracking echocardiography

List of Contents

List of Abbreviations

Abbr.	Full-term
AP	**:** Anteroposterior
AV	**:** Atrioventricular
BMI	**:** Body Mass Index
CHB	**:** Complete heart block
CRT	**:** Cardiac resynchronization therapy
CSP	**:** Conduction system pacing
DM	**:** Diabetis Mellitus
EF	**:** Ejection fraction
GLS	**:** Global longitudinal strain
HBP	**:** His bundle pacing
HD	**:** High degree
HS	**:** Highly significant
HTN	**:** Hypertension
LA	**:** Left atrium
LV	**:** Left ventricle
LVEF	**:** Left ventricle ejection fraction
LVF	**:** Left ventricular function
MRI	**:** Magnetic resonance imaging
MS	**:** Milliseconds
NS	**:** Non significant
NYHA	**:** The New York Heart Association functional classification

PICM : Pacing induced cardiomyopathy

PPM : Permanent pacemaker

RV : Right ventricle

RVP : Right ventricular pacing

S : Significant

SIC : Strain-induced crystallization

List of Tables

List of Figures

Introduction

Pacing-induced cardiomyopathy (PICM) is most commonly defined as a drop in left ventricle ejection fraction (LVEF) in the setting of chronic, high burden right ventricle (RV) pacing [(1)].

Right ventricular apical pacing can induce both interventricular dyssynchrony (between the right ventricle (RV) and the left ventricle (LV)), as well as intraventricular dyssynchrony (within the LV) [(2)]. It has been demonstrated that the presence of ventricular dyssynchrony is associated with an increased risk of cardiac morbidity and mortality in heart failure patients. Also, it has been suggested that the presence of mechanical dyssynchrony after long-term RV apical pacing is associated with reduced LV systolic function and deterioration in functional capacity [(3)].

However, few studies have focused on the short-term detrimental effects of pacemaker-related electric remodeling on LV systolic function related to RV lead position[(4)]. Therefore, the purpose of this study is to identify the short term effects of the pacemaker RV lead position related remodeling on LV systolic function.

Recent echocardiographic studies have shown that strain analysis of the myocardium is a very sensitive method for predicting clinical outcomes in various heart diseases [(5)], so we used 2D speckle tracking to assess LVEF and intraventricular dyssynchrony.