

**The Utility of Ventricular Premature Burden  
Detected by Ambulatory ECG Monitoring in  
Patients with Dilated Non Ischemic  
Cardiomyopathy for Risk Assessment of Lethal  
Ventricular Arrhythmias**

*Thesis*

*Submitted for Partial Fulfillment of Master Degree  
of Cardiology*

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**2017**

فائدة مدى انتشار الضربات البطينية المبسرة عن طريق رسم القلب  
المتنقل فى تقييم خطورة خلل النظم القلبي البطينى المبيت فى مرضى  
اعتلال عضلة القلب التمددى الغير إقفارى (الغير ناتج عن نقص التروية)

رسالة

توطئة للحصول على درجة الماجستير  
فى طب القلب والأوعية الدموية

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تحت إشراف

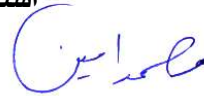
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٢٠١٧

# Acknowledgment

*First of all thanks to **Allah** whose magnificent help was the main factor in completing this work*

*I am greatly honored to express my deepest gratitude and thanks to **Professor Dr. Said Abdel Hafiz Khaled**, Prof. of Cardiology, Ain Shams University for his kind guidance and support given throughout the course of this work,*

*Grateful thanks to **Professor Dr. Mohammad Amin Abd El Hamid**, Assistant Professor of Cardiology, Ain Shams University for his continuous guidance and constructive supervision throughout the whole work,*

*I must extend my warmest gratitude to **Dr. Ahmed Nabil Ali**, Lecturer of Cardiology, Ain Shams University for his constructive supervision, helpful advice and comments throughout the whole work,*

*Sincere gratitude and thanks to **Professor Dr. Mervat Aboul Maaty Nabih**, Professor of cardiology and head of **Electrophysiology group** at the cardiology Department, Ain Shams University, for her generous and countless help throughout the work,*

*Special thanks to the **Electrophysiology group** at the Cardiology Department, Ain Shams University, for their great help to us throughout this work,*

*Last but not least, sincere gratitude to **My Family** for their continuous encouragement and spiritual support.*

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

لَسْبَحَانَكَ لَا عِلْمَ لَنَا  
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ  
الْعَلِيمُ الْعَظِيمُ

صدق الله العظيم

سورة البقرة الآية: ٣٢

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## *List of Abbreviations*

<b>Abb.</b>	<b>Full term</b>
<i>AMI</i> .....	<i>Acute MI</i>
<i>ACCF</i> .....	<i>American College of Cardiology Foundation</i>
<i>AHA</i> .....	<i>American heart association</i>
<i>AVID</i> .....	<i>Amiodarone versus ICD</i>
<i>BRS</i> .....	<i>Baroreceptor sensitivity</i>
<i>CAD</i> .....	<i>Coronary artery disease</i>
<i>CHF</i> .....	<i>Congestive heart failure</i>
<i>CIEDs</i> .....	<i>Cardiac implanted electronic devices</i>
<i>CRT</i> .....	<i>Cardiac resynchronization therapy</i>
<i>DCM</i> .....	<i>Dilated cardiomyopathy</i>
<i>ECG</i> .....	<i>Electrocardiographic monitoring</i>
<i>HF</i> .....	<i>Heart failure</i>
<i>HRV</i> .....	<i>Heart rate variability</i>
<i>ICD</i> .....	<i>Implantable cardioverter defibrillator</i>
<i>LBBB</i> .....	<i>Left bundle branch block</i>
<i>LV</i> .....	<i>Left ventricular</i>
<i>NIDCM</i> .....	<i>Non ischemic dilated cardiomyopathy</i>
<i>NSVT</i> .....	<i>Non sustained ventricular tachycardia</i>
<i>NYHA</i> .....	<i>New York Heart Association</i>
<i>PES</i> .....	<i>Programmed electrical stimulation</i>
<i>PVCs</i> .....	<i>Premature ventricular contractions</i>
<i>QALYs</i> .....	<i>Quality-adjusted life-years</i>
<i>QTd</i> .....	<i>QT dispersion</i>
<i>RFA</i> .....	<i>Radiofrequency catheter ablation</i>
<i>ROC</i> .....	<i>Receiver operating characteristic curve</i>
<i>SAECG</i> .....	<i>Several groups have evaluated the performance of the signal averaged ECG</i>
<i>SCD</i> .....	<i>Sudden cardiac death</i>
<i>TAPSE</i> .....	<i>Tricuspid annular plane systolic excursion</i>
<i>TWA</i> .....	<i>T Wave Alternans</i>



## *List of Abbreviations cont...*

<b>Abb.</b>	<b>Full term</b>
<i>VES.....</i>	<i>Ventricular extrasystoles</i>
<i>VPBs .....</i>	<i>Ventricular premature beats</i>
<i>VT .....</i>	<i>Ventricular tachycardia</i>
<i>VT/VF.....</i>	<i>Ventricular tachycardia or ventricular fibrillation</i>

## **Abstract**

Concerning the echocardiographic criteria it showed no differences between both groups (C&D).

Regarding the QRS morphology there was no relation seen between patients who completed their 6 months follow up and patients who had endpoints, however the majority of both groups had LBBB and this could be explained by the high proportion of patients who had received CRT in our study.

On basis of Holter data, patients with higher PVC burden where at risk of endpoints in our study with a  $p=0.006$  comparing both groups (C&D) with a 48% sensitivity and 91.43 specificity with a 3279 PVCs /24 hours cut off on Roc curve, also regarding the PVCs couplet, VT runs and Lown's grade, all showed strong predictive value of endpoints with  $p<0.001$  with Roc curve of Lown's grade showing 88% sensitivity and 71.43 specificity.

**Keywords:** Ventricular tachycardia- Ventricular premature beats- Ventricular extrasystoles- Radiofrequency catheter ablation - Coronary artery disease

## INTRODUCTION

**D**ilated cardiomyopathy (DCM) is an important cause of sudden cardiac death (SCD) and heart failure (HF). Different causes can lead to DCM, including inherited, infectious, and inflammatory diseases. However, the majority of cases remain unexplained after a thorough review for secondary cause (*Lakdawala et al., 2013*).

Premature ventricular contractions (PVCs) are common arrhythmia with an estimated prevalence of 1% to 4% in the general population on standard 12-lead ECG and between 40% and 75% of subjects on 24- to 48-hour ECG monitoring (*Ng, 2006*). They are often seen in association with structural heart disease and represent increased risk of SCD (*Messineo, 1989*) which is the final event in approximately 35–50% of patients with chronic heart failure (*Packer, 1985*). The prevalence and complexity of ambulatory ventricular arrhythmias increase dramatically as LV function deteriorates (*Califf et al., 1982*). Numerous studies have shown an independent direct relationship of complex cardiac arrhythmias (repetitive forms) and LV dysfunction with subsequent mortality (*Kjekshus, 1900*). The presence of complex ventricular arrhythmias (especially non-sustained ventricular tachycardia) on ambulatory monitoring predicts total cardiac mortality. This observation suggests that the frequency and complexity of rhythm disturbances in patients with severe heart failure reflect

the severity of the underlying disease process rather than a specific arrhythmogenic state (*Min-Soo, 2013*).

However, many patients with DCM have well-compensated heart failure, with ventricular tachycardia (VT) being the dominant problem affecting quality of life. Improvements in pharmacologic and non-pharmacologic therapy for DCM continue to extend patient survival for this condition. As a consequence, the DCM population at risk for the development of VT will continue to increase (*Deyell and Callans, 2011*).

Ambulatory ECG can be useful for symptom evaluation and risk stratification, especially in patients with a family history of SCD or frequent ventricular ectopy (*Lakdawala et al., 2013*).

The technology and techniques available for ventricular tachycardia (VT) ablation have grown considerably in recent years and, as a consequence, the success rates for catheter ablation of VT have also improved. Sustained, monomorphic VT is less common in DCM than among patients with ischemic heart disease (*Deyell and Callans, 2011*). Ablation of VT in DCM is challenging. The success rates have ranged between 50% and 70%, which is less than that reported for ischemic VT (*Haqqani et al., 2011*). However, ablation is frequently the only available therapy for patients who have failed antiarrhythmic therapy (*Deyell and Callans, 2011*).

In some cases of frequent ventricular ectopy associated with LV dysfunction, catheter ablation or pharmacological therapy has been associated with reversal of cardiomyopathy, and the origin of the pathogenic premature ventricular contractions in these cases would be considered idiopathic rather than secondary to a myocardial process (*Lakdawala et al., 2013*).

## **AIM OF THE WORK**

The aim of the present study is to evaluate the utility of ventricular premature burden detected by ambulatory electrocardiographic monitoring (Holter ECG) in patients with dilated non ischemic cardiomyopathy for short term risk assessment of lethal ventricular arrhythmias.

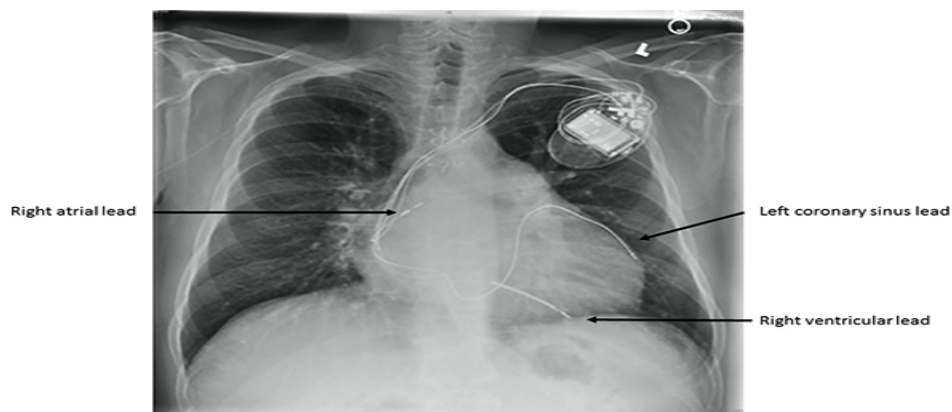
## Chapter One

# INDICATION OF CARDIAC RESYNCHRONIZATION THERAPY IN DILATED CARDIOMYOPATHY

CRT is one of the most-successful therapies for heart failure to have emerged in the past few decades (*Vernooy et al., 2014*).

In 1993, the cardiac surgeon Bakker et al. introduced biventricular pacing as a novel method to treat heart failure by synchronous stimulation of the right and left ventricle (*Bakker et al., 2000*).

After this first-in-man implantation, the rapid development of trans-venous left ventricular (LV) leads and the implementation of biventricular pacing in implantable cardio-verter/defibrillators have established cardiac resynchronization therapy (CRT) as a standard treatment of heart failure with systolic LV dysfunction and broad QRS complexes (*Meine et al., 2016*).



**Figure (1):** Cardiac resynchronization therapy (*Murashita, 2017*).