



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكرو فيلم

# بسم الله الرحمن الرحيم



**MONA MAGHRABY**



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# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكرو فيلم



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التوثيق الإلكتروني والميكروفيلم

# جامعة عين شمس

## التوثيق الإلكتروني والميكروفيلم

### قسم

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تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



**MONA MAGHRABY**



# **Assessment of left atrial function in ischemic patients before and after cardiac rehabilitation using speckle tracking**

*Thesis*

*Submitted for Partial Fulfillment of Master Degree  
In Cardiology*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# قالوا

لَسْبِقَانِكَ لَا عِلْمَ لَنَا  
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ  
الْعَلِيمُ الْعَظِيمُ

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## **List of Abbreviations**

| <i>Abb.</i>              | <i>Full term</i>                  |
|--------------------------|-----------------------------------|
| <i>Abb.</i>              | <i>Full term</i>                  |
| <b>AF</b>                | Atrial fibrillation               |
| <b>AMI</b>               | Acute myocardial infarction       |
| <b>AP</b>                | Antero-posterior                  |
| <b>AR</b>                | Aortic regurgitation              |
| <b>CABG</b>              | Coronary artery bypasses grafting |
| <b>CCS</b>               | Chronic coronary syndrome         |
| <b>CHD</b>               | Coronary heart disease            |
| <b>CI</b>                | Confidence interval               |
| <b>CR</b>                | Cardiac rehabilitation            |
| <b>cTn</b>               | Cardiac troponin                  |
| <b>DES</b>               | Drug-eluting stents               |
| <b>ECG</b>               | Electrocardiogram                 |
| <b>GE</b>                | General electric                  |
| <b>HIIT</b>              | High intensity interval training  |
| <b>HR</b>                | Heart rate                        |
| <b>HRR</b>               | Heart rate reserve                |
| <b>LA</b>                | Left atrium                       |
| <b>LAD</b>               | Left anterior descending artery   |
| <b>LAV</b>               | LA volume                         |
| <b>LAVI</b>              | Left atrial volume index          |
| <b>LAV<sub>max</sub></b> | Maximum LA volume                 |
| <b>LAV<sub>min</sub></b> | Minimum LA volume                 |

## List of Abbreviations (cont...)

|                               |  |
|-------------------------------|--|
| <b>LDL</b>                    | Low-density lipoprotein                |
| <b>LV</b>                     | Left ventricular                       |
| <b>METs</b>                   | Metabolic equivalents                  |
| <b>MR</b>                     | Mitral regurgitation                   |
| <b>MRI</b>                    | Magnetic resonance imaging             |
| <b>NYHA</b>                   | New york heart association             |
| <b>PACS</b>                   | Peak atrial contraction strain         |
| <b>PALS</b>                   | Peak atrial longitudinal strain        |
| <b>PCI</b>                    | Percutaneous coronary intervention     |
| <b>RHR</b>                    | Resting heart rate                     |
| <b>ROI</b>                    | Region of interest                     |
| <b>RR</b>                     | Relative risk                          |
| <b>SPSS</b>                   | Statistical package for social science |
| <b>SR</b>                     | Strain rate                            |
| <b>STE</b>                    | Speckle tracking echocardiography      |
| <b>STEMI</b>                  | ST-elevation myocardial infarction     |
| <b>SWMA</b>                   | Segmental wall motion abnormalities    |
| <b>TR</b>                     | Tricuspid regurgitation                |
| <b>VF</b>                     | Ventricular fibrillation               |
| <b>VI</b>                     | Volume index                           |
| <b><math>\epsilon</math></b>  | Left atrial strain                     |
| <b><math>\epsilon'</math></b> | The strain rate                        |

# Introduction

Coronary heart disease (CHD) is one of the most common forms of heart disease. It affects the heart by restricting or blocking the flow of blood around it. This can lead to anginal pain or myocardial infarction. Exercise-based cardiac rehabilitation aims to restore people with CHD to health through combination of exercise with education and psychological support <sup>(1)</sup>.

Cardiac rehabilitation is a medically supervised program designed to improve cardiovascular health in patient with myocardial infarction, heart failure, angioplasty or heart surgery <sup>(2)</sup>.

The left atrium (LA) is not only a simple passive transport chamber. It is highly dynamic and responds to stretch with the secretion of atrial natriuretic peptides. The counterbalance of natriuresis, vasodilatation, and inhibition of the sympathetic and renin–angiotensin–aldosterone systems allows partial restoration of fluid and haemodynamic balance <sup>(3)</sup>.

LA function has been conventionally divided into three phases: first, as a reservoir, the LA stores pulmonary venous

return during left ventricular (LV) contraction and isovolumetric relaxation. Secondly, as a conduit, the LA transfers blood passively into the LV. Thirdly, the LA actively contracts during the final phase of diastole and contributes between 15 and 30% of LV stroke volume. As a continuum of the LV, especially during diastole, its size and function are very much influenced by the compliance of the LV<sup>(4)</sup>.

The LA plays an important role in the development of many heart diseases, and its size and function are closely correlated with various cardiovascular events. The mitral valve ring moves downward during LV systole, and the LA is directly affected by LV pressure during the entire diastole. LV systolic and diastolic functions are both impaired in patients with ischemic heart disease. The reservoir function of the LA is impaired because the mitral valve ring is not completely downcast during systole, and the LA contraction capacity can also be affected by LV diastolic dysfunction. Therefore, the clinical relevance of LA function is increasingly acknowledged <sup>(5)</sup>.

Speckle tracking has recently emerged as quantitative ultrasound technique for accurately evaluating myocardial

function by analyzing the motion of speckles identified on routine 2-dimensional sonograms. It provides non-doppler, angle independent and objective quantification of myocardial deformation.

Speckle tracking echocardiography is based on an analysis of spatial dislocation (referred to as tracking) of speckles (defined as spots generated by the interaction between the ultrasound beam and myocardial fibers) on routine 2-dimensional sonograms <sup>(6)</sup>.

By tracking the displacement of speckles during the cardiac cycle speckle –tracking echocardiography allow semi-automated elaboration of myocardial deformation. Although this new technique was introduced for exclusive analysis of LV function, several studies have recently extended its applicability to other cardiac chambers, such as the left atrium and right ventricle <sup>(7)</sup>.

In the present study, we use speckle tracking echocardiography to evaluate the LA strain and strain rates in patients with ischemic heart disease <sup>(8)</sup>.