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**Al-Quds University**



**Detection and Quantification of Iron in Liver and  
Myocardium using MRI**

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**M.Sc. Thesis**

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# **Detection and Quantification of Iron in Liver and Myocardium using MRI**

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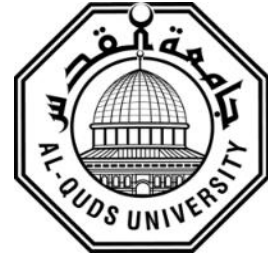
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**Supervisor: Dr. Mohammed Hjouj PhD.**

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**Thesis Approval**  
**Detection and Quantification of Iron in Liver**  
**and Myocardium using MRI**

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## **Dedication**

I am most deeply grateful to My whole loving family for the support and for the patience during the writing process. I sincerely want to thank my dear wife Amal her pragmatic and objective views, helped and supported me I also thank her for the patience, persistence and encouragement. My wife and children, bring the most precious moments in my life.

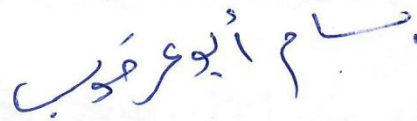
Bassam Abdul-Aziz Abuarquob

## **Declaration**

I certify that this thesis submitted for the degree of master, is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not been submitted for higher degree to any other university or institution.

Name: Bassam Abdul-Aziz Abuarquob

Signed:



Date: 20/7/2019

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## **Abstract**

**Background:** MRI is a medical imaging method that does not use harmful or ionizing radiation so it is safe and can be used to measure the proportions of iron that accumulate in the organs of the human body, especially the heart and liver.

**Methods and sample:** The study was conducted on 50 patients suffering from major thalassemia and treated through chronic blood transfusion, as well as 20 other patients who do not suffer from Thalassemia or any diseases in the heart or liver through the use of their medical files and their medical history in Alia Governmental Hospital . Magnetic Resonance 1.5 Tesla-type Philips Ingenia .

Retrospective case control study was carried out in the period between December 2018 to March 2019 at the Hebron Governmental Hospital. The Results were compared between liver and heart T2\* with SF levels, On one hand and on the other hand results compared between LIC and MIC with T2\*, and LIC with MIC.

**Results:** The average of SF in patients with thalassemia major was 2150 ng/ml (SD 179ng/ml). positive correlation was found between LIC and MIC with SF, also positive correlation was found between SF and T2\* of liver and heart .and significant relation between LIC and MIC.

**Conclusions:** Although the serum ferritin levels normal and abnormal were found among major thalassemia patients, there were results showing elevated iron concentrations in the liver and heart of major thalassemia. There is an urgent need for new and accurate studies to prove the importance of MRI for Determine the location and quantity of iron accumulated in the muscle of the liver ,Heart and other organs especially that this

procedure safe and harmful, In order to give the correct and accurate chelating treatment and follow up and control the improvement in the reduction of iron ratios accumulated.



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## **List of Abbreviations**

ALT: Alanine Aminotransferase

AST: Aspartate Aminotransferase

DR: Digital Radiography

FOV: Field of View

GRE: Gradient Echo

HIC: Hepatic Iron Concentration

IO: Iron Overload

MIC: Myocardium Iron Concentration

MRI: Magnetic Resonance Imaging

MR: Magnetic Resonance

R2: Transverse relaxation rate (1/s) from spin echo

R2\*: Transverse relaxation rate (1/s) from gradient echo.

RBC: Red Blood Cell

RE: Reticulo-endothelial

SIR: Signal Intensity Ratio

RIO: Region Of Interest

SNR: Signal-to-Noise Ratio

T: Tesla

TE: Echo Time

TR :Repetition Time

T2: Transverse relaxation time (ms) from spin echo

T2\*: Transverse relaxation time (ms) from gradient echo

## **Chapter One:**

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### **Introduction**

Thalassemia patients who are treated with blood transfusion to raise the level of red blood cells and raise their hemoglobin levels. Continuous blood transfusion causes iron to be elevated in the body. Each blood unit contains 250 mg of iron[1].

Ferritin serum, which acts as a blood test, does not give full or correct accuracy to the high concentration of iron in the tissues of the body, since the blood test gives the rates of Ferritin and trans ferritin that pass through the blood and may be high because of inflammation in the patient or cancer so this is not accurate reading, They are comprehensive[2].

Scientific studies on the accumulation of iron in the heart and liver proved a direct relationship between high serum ferritin ratios and excess iron in the organs of the human body, but it was difficult to determine the amount of iron in the heart compared to the liver because of the nature of absorption of iron at the heart of the complex [3-6].

Previous studies have shown a weak relationship between high ferritin and excess iron ratios in the heart muscle[7,8]. This study was therefore important in showing the