



**UNIVERSITI PUTRA MALAYSIA**

**ROLE OF  $^{18}$ FLUORINE FLUORODEOXYGLUCOSE IN VULNERABLE PLAQUE  
DETECTION FOR IDENTIFYING HIGH RISK PATIENTS**

**SHAZREEN BINTI SHAHARUDDIN**

**FPSK(m) 2013 27**





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**By**

**SHAZREEN BINTI SHAHARUDDIN**

**Thesis Submitted to the School of Graduate Studies,Universiti Putra Malaysia, in  
Fulfilment of the Requirements for the Degree of Master of Science.**

**OCTOBER 2013**



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Abstract of thesis presented to the Senate of University Putra Malaysia in fulfillment of the requirement for the degree Master of Science.

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**OCTOBER 2013**

**Main Supervisor: Prof. Abdul.Jalil Nordin, PhD**

**Faculty: Medicine and Health Science**

FDG-PET/CT is a combined functional and structural multi modality imaging tool that can be utilized to detect atherosclerotic plaques. This study observed the prevalence of active and calcified plaques in selected arteries during whole-body <sup>18</sup>F-FDG PET-CT and correlate the findings with risk factors in coronary artery disease. Beside that, the relationship of active and calcified plaque activity with inflammatory biomarker were determine from the blood marker. The record of 47 patients, which were divided into 17 patients retrospectively and 30 patient prospectively alongside serum inflammatory marker (eg.IL-6 and CRP) and cholesterol (eg lipid profile) undergone whole body FDG PET-CT study in various oncology cases were reviewed. To evaluate the cutoff value for abnormal uptake, retrospective study was conducted to identify patient at risk of developing vascular disease. Mean age was 58±10.3 years old. The presence of <sup>18</sup>F-FDG uptake and calcification in selected vascular walls were evaluated. The composition of plaque were recorded using CT value in Housfield unit (HU max). The intensity of <sup>18</sup>F-FDG uptake was measured as maximum blood-normalized standardize uptake value (SUVmax). <sup>18</sup>F-FDG uptake (SUVmax) and calcification (HUmax) was significantly highest in the carotid walls



with  $(1.91 \pm 0.11)$  and  $(631.7 \pm 215.5)$  respectively. There was significant relationship between high BMI (overweight) with  $^{18}\text{F}$ FDG uptake, while calcified artery significant related with hyperlipidemia, diabetes mellitus and hypertension. However the blood marker (such as C-reactive protein) showed significant with high  $^{18}\text{F}$ FDG uptake and high calcified artery. Beside that, calcified artery showed there was no significant and direct correlation with inflamed vascular wall (SUVmax). This study showed that  $^{18}\text{F}$ -FDG PET-CT can be utilized in detecting focal high FDG uptake within vascular plaque in early recognition of high risk patients having coronary artery disease.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains.

**PENGUNAAN  $^{18}\text{F}$ FLUORINE FLUORODEOXYGLUCOSE PADA PLAK YANG TIDAK STABIL DALAM MENDETEKSI PESAKIT YANG BERISIKO TINGGI.**

Oleh

**SHAZREEN SHAHARUDDIN**

**OKTOBER 2013**

**Pengerusi: Prof. Abdul.Jalil Nordin, PhD**

**Fakulti : Perubatan dan Kesihatan.**

FDG PET/CT adalah gabungan fungsi dan struktural multimodaliti alat pengimejan yang boleh digunakan untuk mengesan plak-plak aterosklerosis. Dalam kajian ini, kelaziman aktif dan pengapuran plak dalam arteri yang dipilih menggunakan  $^{18}\text{F}$ -FDG PET CT dikaitkan dengan hasil penemuan faktor risiko terjadinya penyakit vaskular. Selain daripada itu, hubungan diantara aktiviti plak mudah terjejas dengan inflamasi parameter dari penanda darah direkod. Terdapat 47 pesakit, yang dibahagikan kepada 17 pesakit retrospektif dan 30 pesakit prospektif berserta pengambilan serum darah (contohnya IL-6 dan CRP) dan kolesterol (contohnya profil lipid) dimana setiap pesakit menjalani scan pada seluruh badan menggunakan FDG PET/CT dalam pelbagai kes onkologi. Untuk evaluasi nilai purata bagi abnormal plak, kajian retrospektif telah dijalankan bagi mengidentifikasi pesakit yang berisiko untuk mendapat penyakit vaskular. Purata umur adalah  $58 \pm 10.3$  tahun. Pengambilan aktiviti  $^{18}\text{F}$ -FDG dan pengapuran pada dinding vaskular yang dipilih telah dinilai. Komposisi plak direkodkan menggunakan nilai CT dalam unit Hounsfield (HU max). Keamatan pengambilan aktiviti  $^{18}\text{F}$ -FDG telah disukat menggunakan unit 'Maximum blood-normalized standardize uptake value' (SUVmax). pengambilan aktiviti  $^{18}\text{F}$ -FDG (SUVmax) dan pengapuran (HUmax) menunjukkan nilai tertinggi dalam dinding karotid dengan purata ( $1.91 \pm 0.11$ ) dan ( $631.7 \pm 215.5$ ). Terdapat hubungan diantara BMI tinggi (melebihi paras normal) dengan pengambilan aktiviti FDG, sementara pengapuran arteri secara signifikan berkait dengan hiperlipidemia, diabetes melitus dan hipertensi. Manakala, penanda darah



(seperti protein C-reaktif) menunjukkan signifikansi dengan peningkatan pengambilan aktiviti FDG dan pengapuran arteri. Selain itu, pengapuran arteri menunjukkan tiada korelasi dengan inflamasi dinding arteri (SUVmax). Kesimpulannya menunjukkan bahawa  $^{18}\text{F}$ -FDG PET CT boleh digunakan dalam mengesan peningkatan aktiviti FDG dalam plak vaskular bagi pencegahan supaya dapat mengurangkan risiko berlakunya penyakit arteri koronari.





## ACKNOWLEDGEMENT

First and foremost, I would like to thank and praise Allah the Almighty who has enabled me to conduct and successfully completed this study. Whatever is good this work contains is due to Allah blessings and whatever is bad contains is due to myself.

I would like to express my sincere gratitude to my supervisor, Prof. Dr Abdul Jalil Nordin for his supervision, generous support and guidance from initial to final accomplishment of this research. My warmest gratitude also goes to my co-supervisor Dr.Zaid Fattah Azman for his valuable time and insightful comments especially in helping me in the statistical analysis.

My deepest appreciation is also to my external co-supervisor Prof. Dr Khartiza Ali and Prof. Dr Abdul Latiff for their support and assist once during my field working. This gratitude also is to Dr. Fathinul Fikri for his support and helping me in collect data and sincere thanks to all staff of PPDN (Pusat Pengimejanaan Diagnostic Nuclear) for their kind assistance.

Above all, I shall remain eternally grateful to my beloved parents, my father Prof. Dr Shaharuddin Mohd and my mother Prof. Dr. Rosnani Hashim who will always be my enormous source of inspiration and I dedicated all my effort and hard work to both of them. To my wonderful husband Mohd Firdaus Zulkafli ,my sister Shazwani Shaharuddin and my brother Muhammad Shazril Shaharuddin, thank you for your support.

Thank You Very Much.

SHAZREEN SHAHARUDDIN

2013



I certify that a Thesis Examination Committee has met on 3 Oktober 2013 to conduct the final examination of Shazreen Binti Shaharuddin on her thesis entitled " Role of  $^{18}\text{F}$ Fluorine Fluorodeoxyglucose in vulnerable plaque detection for identifying high risk patients " in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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## **DECLARATION**

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or any other institution.

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**Date: 3 Oktober 2013**



## TABLE OF CONTENTS

	Page
<b>ABSTRACT</b>	ii
<b>ABSTRAK</b>	iv
<b>ACKNOWLEDGEMENTS</b>	vi
<b>APPROVAL</b>	vii-viii
<b>DECLARATION</b>	ix
<b>LIST OF TABLES</b>	xv
<b>LIST OF FIGURES</b>	xvi
<b>LIST OF ABBREVIATIONS</b>	xiii
 <b>CHAPTER I: INTRODUCTION</b>	 1
1.1 Background	1-4
1.2 Pathogenesis Of Atherosclerosis	5-7
1.3 Atherosclerosis Risk Factors	
(a) Major risk factors	
1.3.1 Non modifiable	
1.3.1.1 Age	8
1.3.1.2 Gender	8
1.3.2 Modifiable	
1.3.2.1 Hypertension	9
1.3.2.2 Diabetes mellitus	9
1.3.2.3 Hyperlipidemia	10
1.3.2.4 Smoking	11
(b) Minor risk factors	
1.3.1 Obesity	12
1.4 Clinical Use Of Atherosclerotic Risk Factors	13-14
1.5 Clinical Detection Of Atherosclerotic Disease	
1.5.1 CT	15
1.5.2 MRI	16
1.5.3 PET	18
1.5.4 PET/CT	20
1.6 Problem Statement	23



1.7 Research Questions	23
1.8 Significance Of The Study	24
1.9 Research Hypothesis	24
1.10 Objective Of The Study	
1.10.1 General Objectives	25
1.10.2 Specific Objectives	25
<b>CHAPTER II: LITERATURE REVIEW</b>	26
2.1 Background	26-27
2.2 Risk Factors	
a) Major risk factors	27
2.2.1 Non-Modifiable	
2.2.1.1 Age	28
2.2.1.2 Gender	28-29
2.2.2 Modifiable	
2.2.2.1 Hypertension	29
2.2.2.2 Diabetes mellitus	30
2.2.2.3 Hyperlipidemia	31
2.2.2.4 Smoking	32
b) Minor risk factors	
2.2.1 Obesity	33
2.3 Serum Markers	
2.3.1 C-Reactive Protein	34
2.3.2 Interleukin-6	35
2.3.3 Lipid	36
2.4 Imaging Modality In Detecting Plaque In Vascular Wall.	36-38
<b>CHAPTER III: METHODOLOGY</b>	39
3.1 Background	39



3.2 Study Duration	40
3.3 Ethic	40
3.4 Study Population	
3.4.1 Retrospective group	40
3.4.2 Prospective group	41
3.5 Sample Size	
3.5.1 Calculation Of Sample Size	42
3.6 Sampling Population	
3.6.1 Inclusion Criteria	42
3.6.2 Exclusion Criteria	43
3.7 Data Collection	
3.7.1 Patients history	43
3.7.2 Blood parameter	43-49
3.8 PET/CT Study And Data Analysis	
3.8.1 Patient Preparation.	49-50
3.8.2 Imaging Pet/Ct Technique	51
3.9 Image Analysis	52-58
3.10 Statistical Analysis	59
<b>CHAPTER IV: RESULT</b>	60
4.1. Study Demographic	
4.1.1 Non-modifiable risk factors characteristics	61
4.1.2 Modifiable risk factors characteristics	63
4.2 Correlation Between Major Risk Factors And Plaque Characteristic On <sup>18</sup> F FDG PETCT	
4.2.1 Non Modifiable	65
4.2.2 Modifiable	67
4.3 The Relationship Of Fdg Uptake (SUV) And Plaque Hardening (HU) In Various Vessels.	69
4.4. The Correlation Between Blood Parameter (Atherosclerotic Risks), Semi Quantification Value (SUV) And Evidence Of Hardening Plaque (Hu).	71



4.5. The Correlation Between Semi Quantification Value (SUV) And Evidence Of Hardening Plaque(HU)	73
---	----

4.6 Estimating A Suitable Cutoff Point For Maximum Standardized Uptake Value(SUV).	74-78
--	-------

## CHAPTER V: DISCUSSION 79

5.1 Sociodemographic	
(a) Major risk factors	
5.1.1 Non-modifiable	80
5.1.2 Modifiable	81-82

5.2. The Relationship Between SUV max and HUmax with Cardiovascular Risk Factors	
(a) Major risk factors	
5.2.1 Non-Modifiable	82-83
5.2.2 Modifiable	83-85

5.3 The Relationship Of FDG Uptake(SUV) And Calcification (HU) In Various Vessels	86
---	----

5.4 The Correlation Between Blood Parameter (Atherosclerotic Risks), Semi Quantification Value (SUV) And Evidence Of Hardening Plaque(HU)	
5.4.1 C-Reactive Protein (CRP) & Interleukin-6 (IL-6).	87
5.4.2 Lipid Profile	88

5.5 The Correlation Between Semi Quantification Value (SUV) And Evidence Of Hardening Plaque (HU).	89
--	----

5.6 Estimating A Suitable Cutoff Point For Maximum Standardized Uptake Value(SUV).	90
--	----

## CHAPTER VI: SUMMARY, CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH 91

6.1 Study Conclusion	92-94
----------------------	-------

6.2 Limitations Of Study	94-95
--------------------------	-------

6.3 Recommendations for future research	95
---	----



**REFERENCES** 96-111

**APPENDICES** 112-115

**BIODATA OF THE AUTHOR** 116

**LIST OF PUBLICATION** 117

