Role of 128-slice, dual-source CT coronary angiography as a novel imaging technique in assessment of in-stent restenosis

Thesis

Submitted for partial fulfillment of MD degree in Radio-Diagnosis

Presented by

Wasila Moustafa Mohammed Eldolify

M.Sc of Radio-diagnosis
(Ain Shams University)

Supervised by

Prof. Dr. Hesham Mahmoud Mansour

Professor of Radio-Diagnosis
Faculty of medicine Ain Shams University

Prof. Dr. Eman Ahmed Shawky Geneidi

Professor of Radio-Diagnosis
Faculty of medicine Ain Shams University

Dr. Amal Ibrahim Ahmed

Lecturer of Radio-Diagnosis
Faculty of medicine Ain Shams University

Faculty of Medicine
Ain Shams University
2019

بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا

إلا ما علمتنا إنك أنت

العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

Acknowledgment

First and foremost, I feel always indebted to **ALLAH,** *the Most Kind and Most Merciful.*

I'd like to express my respectful thanks and profound gratitude to ***Prof. Dr. Hesham Mahmoud Mansour,*** *Professor of Radio-Diagnosis Faculty of medicine Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am also delighted to express my deepest gratitude and thanks to ***Prof. Dr. Eman Ahmed Shawky Geneidi,*** *Professor of Radio-Diagnosis Faculty of medicine Ain Shams University, for her kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

I am deeply thankful to ***Dr. Amal Ibrahim Ahmed,*** *Lecturer of Radio-Diagnosis Faculty of medicine Ain Shams University, for her great help, active participation and guidance.*

Wasila Eldolify

List of Contents

List of Tables

List of Figures

List of Figures Cont...

Fig. No.	Title	Page No.

List of Figures Cont...

Fig. No.	Title	Page No.

List of Figures Cont...

Fig. No.	Title	Page No.

List of Figures Cont...

Fig. No.	Title	Page No.

List of Abbreviations

Abb.	Full term
3D	Three-dimensional
ALCAPA	Anomalous origin of the LCA from the pulmonary artery
AM	Acute marginal
AVN	Atrioventricular node artery
CS	Coronary sinus
CT	Computed tomography
DECT	Dual-energy CT
DES	Drug-eluting stents
ER	Elastic recoil
GCV	Great cardiac vein
ISR	In-stent restenosis
LAD	Left anterior descending
LCX	Left circumflex
LDL	Low-density lipoprotein
LMCA	Left main coronary artery
MCV	Middle cardiac vein
MDCT	Multi- detector row CT
NIH	Neointimal hyperplasia
OM	Obtuse marginal
PCI	Percutaneous coronary intervention
PDA	Posterior descending artery
PLV	Posterolateral left ventricular
RCA	Right coronary artery
ROI	Region of interest

List of Abbreviations Cont…

Abb.	Full term
SA	Sinoatrial
SAN	Sinoatrial node artery
SMC	Smooth muscle cell
TCFA	Thin-cap fibroatheroma
TR	Temporal resolution

Introduction

INTRODUCTION

Stenting is a nonsurgical treatment of coronary artery disease. However, there is increase incidence of in-stent restenosis. To evaluate stent patency, patients are sent for invasive coronary angiography ***(Park et al., 2012).***

Conventional coronary angiography is considered the gold standard diagnostic investigation for evaluating in-stent restenosis, but it's an invasive technique and has complications, a non-invasive tool for assessing in-stent restenosis would be of great importance to follow up patients with implanted coronary stents ***(Oncel et al., 2013).***

Evaluation of coronary artery disease by a non-invasive MSCT angiography, provides excellent image quality, decreases patient exposure to contrast media and radiation dose is also reduced when using a prospective ECG-gated coronary CT scan and low tube voltage ***(Sun et al., 2012).***

Assessment of coronary arteries especially small peripheral vessel and the coronary stents(particularly when stent caliber is less than 3 mm) with standard coronary CT angiography is limited due to relatively poor spatial resolution, insufficient temporal resolution(which causes motion and stair step artifacts) and marked coronary calcification. So to over-come these problems, multiple new imaging techniques are developed ***(Haruhiko et al., 2015).***

Radiation dose can be reduced by the use of step and shoot scan, iterative reconstruction, and a high pitch dual-source helical scan. Spatial resolution and diagnostic evaluation of small or peripheral coronary vessels and coronary stents can be improved by the use of high definition CT scanners. Coronary motion artifacts and temporal resolution can be improved by dual-source CT scanners and a motion correction algorithm ***(Haruhiko et al., 2015).***

The state of the art dual-source CT scanner that was recently introduced, achieves the currently highest temporal resolution. This improvement in temporal resolution decreases motion artifacts of the coronary arteries and provides excellent image quality ***(Nazir et al., 2014).***