The Role of Multislice Computed Tomography Coronary Angiography in Detection of Culprit Lesion Morphology in Acute Coronary Syndrome

Thesis

Submitted for partial fulfillment of Master degree in

Critical Care Medicine

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-2012-

ACKNOWLEDGEMENT

Thanks are given to ***GOD*** the source of all knowledge, by whose great aid this work has come to fruition. A gratitude to all those who assisted and guided me throughout the duration of the work, I extend to them my sincere thanks and gratitude.

I wish to express my sincere appreciation and thanks to my supervisors .It has been a great honor to proceed this work under the supervision of ***Prof./Hassan khaled***, Professor of Critical Care medicine, Faculty of Medicine, Cairo University. I am greatly indebted to him for suggesting and planning the subject, his continuous supervision and support that made the work possible and come in this form.

I would like also to express my sincere gratitude and appreciation to ***Prof./Ahmed Hossam Mowafi*** Assistant Professor of Critical Care medicine, Faculty of Medicine, Cairo University, for his continuous support, and careful guidance. Also I would like to express my appreciations to ***Dr/Mohamed Abo Hamila*** Lecturer of Critical Care medicine, Faculty of Medicine, Bany Souief University, for his sound advices and support. And my great thanks to ***Dr./Mohamed Abd Elkader*** Lecturer of Cardiology Department, Faculty of Medicine, Ain Shams university for his sincere help .

A special thanks for the discussion committee for accepting discussing this research for their valuable discussion and sincere advices. Also my thanks is extended to ***Dr.Sayed Abd Elhafez*****,** ***Dr.Alaa Hataba*** and ***Dr. Khalid Shokry*** and to my colleges the stuff members of Cardiology department in kobri Elkobba military hospital for their sincere help ,support and encouragement throughout the work.

Last but not least I wish to express my deep appreciation, love and thanks to my beloved family for their continuous encouragement, support and help not only throughout the research but through my whole life. Again I am extremely grateful to my father who has been a significant supporter to me, God bless them all.

DEDICATION

To My Mother soul

And to my beloved son

Abstract

Multislice computed tomography appears to provide high accuracy for detecting coronary artery disease and may represent a useful complement to conventional coronary angiography. Conventional invasive coronary angiography is currently the diagnostic standard for clinical evaluation of known or suspected coronary artery disease (CAD). The risk of adverse events is small, but serious and potentially life-threatening events may occur, including arrhythmia, stroke, coronary artery dissection, and access site bleeding

The purpose of our study was to assess the usefulness of dual source 128-slice definition flash CTCA for assessment of the culprit lesion morphology versus coronary angiography in patients with acute coronary syndrome.

Key Words :

Coronary care unit - Calcium scoring - Stable angina .

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LIST OF ABBREVIATIONS

ACC	American college of cardiology
ACS	Acute coronary syndrome
AHA	American Heart Association
ALB	Albumin
ALT	Alanine Aminotransferase
AMI	Acute myocardial infarction
BNP	Brain-type natriuretic peptide
CABG	Coronary by pass graft surgery
CAD	Coronary artery disease
CCS	Canadian cardiovascular society
CCTA	Coronary computed tomography angiography
CCU	Coronary care unit
CD40L	CD 40 ligand
CK	Creatine kinase
CK MB	Creatine kinase MB fraction
CrCl	Creatinine clearance
CRP	C- reactive protein
CRT	Cardiac resynchronization therapy
CS	Calcium scoring
CT	Computed tomography
CtnI	Cardiac tropnin I
CTnT	Cardiac troponin T
%DS	Percent diameter stenosis
EBCT	Electron beam c t
ECG	Electrocardiogram
ED	Emergency department
E F	Ejection fraction
ELISA	Enzyme linked immunsorbant assay
ESC	European society of cardiology
FFR	Fractional flow reserve
GFR	Glomerular filtration rate
GP	Glycogen phosphorylase
HAS	Human serum albumin
HDL-C	High density lipoprotein-cholesterol
HS CRP	High sensitivity C-reactive protein
H U	Hounsfield units
ICTUS	Invasive versus conservative treatement in unstable coronary syndrome
IHD	Ischemic heart disease
IL-6	Interleukin – 6
IVUS	Intravascular ultrasound
LAD	Left anterior descending artery
LCX	Left circumflex coronary artery
LD	Lactate dehydroogenase
LM	Left main coronary artery
LV	Left ventricle
MIP	Maximum intensity projections
MLA	Minimum luminal area

MLD	Minimum luminal diameters
MPR	Multi planar reformations
MRI	Magnetic resonance imaging
MSCT	Multi slice computed tomography
NSTEACS	Non ST elevation acute coronary syndrome
NSTEMI	Non ST elevation myocardial infarction
PCI	Percutaneous coronary intervention
PE	Pulmonary embolism
PET	Positron emission tomography
PTCA	Percutaneous transluminal coronary angioplasty
RCA	Right coronary artery
RCTS	Randomized intervention trial of unstable angina
RITA	Randomized controlled trials
S A	Stable angina
SCD40L	Soluble CD40 ligand
SD	Standard deviation
SPECT	Stress Single Photon Emission Computed Tomography
STEMI	ST elevation myocardial infarction
TCFA	Thin cap fibroatheroma
TIMI	Thrombolysis in Myocardial Infarction
TIVA	Tomographic intravascular analysis
UA	Unstable angina
VRT	Volume rendering techniques

INTRODUCTION

Multislice computed tomography appears to provide high accuracy for detecting coronary artery disease and may represent a useful complement to conventional coronary angiography. Conventional invasive coronary angiography is currently the diagnostic standard for clinical evaluation of known or suspected coronary artery disease (CAD). The risk of adverse events is small, but serious and potentially life-threatening events may occur, including arrhythmia, stroke, coronary artery dissection, and access site bleeding (total complication rate, 1.8 percent; death rate, 0.1 percent). ***(http://www.medicalnewstoday****)*

Over recent years, multislice computed tomography (MSCT) has matured into a reliable imaging modality for noninvasive evaluation of the coronary arteries. With this technique, the coronary arteries are directly visualized; not only the degree of atherosclerosis but also the degree of stenosis can be evaluated with high accuracy calcium score. Accordingly, the technique may be of interest in the diagnostic work-up of patients presenting with suspected ACS in hospital with cath lab facilities. A particular advantage is the fact that non calcified atherosclerosis is also identified, thus providing a more accurate evaluation of the underlying atherosclerotic plaque burden ***(Pryor DB, et al.,1993)***. However, this is at the cost of contrast administration and a higher radiation dose. At present, data on how the CS relates to observations obtained with MSCT coronary angiography in patients presenting with suspected ACS are scarce.

Multislice computed tomography (MSCT) has been demonstrated to be a promising tool for noninvasive assessment of atherosclerotic plaque burden and composition. An important advantage of MSCT is that the technique not only visualizes luminal narrowing but can also identify atherosclerotic plaque in the arterial vessel wall. Accordingly, in contrast to invasive coronary angiography, lesions that show outward (positive) remodelling without luminal narrowing can also be easily identified. In addition, information on plaque composition can be obtained and lesions can be differentiated into non-calcified, mixed or calcified.

(Martin H K and Hoffmann, M D,) of University Hospital, Ulm, Germany and colleagues assessed the diagnostic accuracy of16-slice MSCT scanning vs. invasive coronary angiography in a large group of patients with known or suspected CAD. The study, which included 103 patients (average age, 61.5 years), was conducted from November 2003-August 2004. The patients underwent both invasive coronary angiography and MSCT using a scanner with 16 detector rows.

The researchers found that compared with invasive coronary angiography for detection of significant lesions (greater than 50 percent stenosis [narrowing]), segment-based sensitivity, specificity, and positive and negative predictive values of MSCT were 95 percent, 98 percent, 87 percent, and 99 percent, respectively. Quantitative comparison of MSCT and invasive coronary angiography showed good correlation, with MSCT systematically measuring greater-percentage stenoses. Per-patient based analysis indicated high discriminative power to identify patients who might be candidates for revascularization. ***(http://www.medicalnewstoday)***

Examination of the function, perfusion and viability of the heart muscle as well as of the morphology and function of the coronary arteries is of utmost importance in the diagnostic assessment of coronary artery disease. The current gold standard to assess the degree of stenotic artery disease is coronary angiography. In Germany alone, the total number of angiographic procedures rose by 45% from 1995 to 2000, while the fraction of interventional procedures remained almost constantly low at approximately 30%.

Identification of the coronary endoluminal lesion(s) responsible for the process now called acute coronary syndrome (ACS) has become a central focus of both non-invasive and invasive treatment modalities in patients with coronary heart disease. Impressive reductions in cardiovascular mortality seen with lipid lowering agents and angiotensin-converting enzyme inhibitors suggest a critical role for pharmacologic alteration of plaque and vessel wall dynamics.

Increasingly aggressive invasive approaches to the management of patients with coronary heart disease have suggested that catheter-based therapies directed toward a "culprit