الدقة التشخيصية للأشعة المقطعية متعددة اللواقط لتصوير الأوعية فى تقييم أمراض شرايين الطرف السفلى: دراسة مقارنة بتصوير الأوعية التقليدى

رســـالـــة

مقدمة كتوطئة للحصول على درجة الدكتوراة فى اللأشعة التشخيصية

مقدمة من

الطبيبة / كريمان محمد أحمد عبدالله

ماجستير الأشعة التشخيصية

كلية الطب – جامعة عين شمس

تحـت إشـــراف

أ.د.سحر نعيم محمد

أستاذ الأشعة التشخيصية

كلية الطب– جامعة عين شمس

أ. د . شريف حامد أبوجمرة

أستاذ الأشعة التشخيصية

كلية الطب– جامعة عين شمس

د. نيفين عبدالمنعم شلبى

مدرس الأشعه التشخيصيه

كلية الطب– جامعة عين شمس

كلية الطب

جامعة عين شمس

2014

Diagnostic accuracy of multi-detector CT angiography in evaluation of lower limb arterial diseases: Comparative study with conventional angiography

A Thesis

Submitted for partial fulfillment of M.D. Degree in Radiodiagnosis

By

Kareman Mohamed Ahmed Abdallah

M.B., B.ch. M.Sc. Radiodiagnosis

Faculty of Medicine, Ain Shams University

Under Supervision of

Prof. Dr. Sahar Naeem Mohamed

Professor of Radiodiagnosis

Faculty of Medicine, Ain Shams University

Prof. Dr. Sherif Hamed Abo Gamra

Professor of Radiodiagnosis

Faculty of Medicine, Ain Shams University

Dr. Nivine Abdel Moneim Chalabi

Lecturer of Radiodiagnosis

Faculty of Medicine, Ain Shams University

Faculty of Medicine

Ain Shams University

2014

Contents

List of Abbreviations

2 D	Two Dimentional
3D	Three Dimensional
16 D-ct	16 Detector Computed Tomography
AAA	Abdominal Aortic Aneurysm
ATA	Anterior Tibial Artery
AVF	Arteriovenous Fistula
AVM	Arteriovenous Malformation
CA	Conventional Angiography
CM	Contrast Media
CFA	Common Femoral artery
CIA	Common Iliac Artery
CM	Contrast Media
CPR	Curved Planar Reconstruction
CT	Computed Tomography
CTA	Computed Tomography Angiography
CTU	Computed Tomography Urography
DFA	Deep Femoral artery
DM	Diabetes mellitus
EIA	External Iliac Artery
Fig.	Figure
GB	Gall Bladder
HDL	High Density Lipoprotein
HU	Hounsfield Unit

IGT	Impaired Glucose Tolerance
IVC	Inferior Vena Cava
KVP	Kilo Volt
Lt	left
LDL	Low Density lipoprptein
mAs	Milliampere Second
MDCTA	Multi-detector Computed Tomography angiography
MIP	Maximum Intensity Projection
Ml/s	Milliter / Second
mm	Millimeter
MPR	Multi-Planar Reconstruction
MSCT	Multislice Computed Tomography
mSv	MilliSievart
PACS	Picture archiving and communication system
PAD	Peripheral Arterial Disease
POP A	Popliteal Artery
PTA	Posterior Tibial Artery
PVD	Peripheral Vascular Disease
ROI	Region of Interest
RT	Right
SFA	Superficial Femoral aretery
SSD	Surface shaded Display
VLDL	Very Low Density Lipoprotein
VR	Volume Rendering

List of Figures

List of Tables and Charts

Introduction

Initial diagnosis of peripheral arterial disease (PAD) typically relies on patient history and physical examination of the patient. If PAD is suspected, a number of tests needed to be performed to detect the presence of atherosclerosis, as well as to localize areas of stenosis and to estimate the degree of the stenosis **(Clement, 2008).**

Atherosclerosis is the leading cause of peripheral arterial disease and the presence of PAD is a marker of a generalized atherosclerotic burden, about half of PAD patients are asymptomatic and most patients die of atherothrombotic complications, such as myocardial infarction or stroke, rather than from complications of PAD **(Schroder et al., 2006).**

Diabetes mellitus (D.M.) is one of the major risk factors of PAD and affects the arterial tree in a centrifugal pattern. About 5% of end stage renal disease (ESRD) patients develop critical limb ischemia as atherosclerosis and D.M. are common risk factors of renal disease **(Albers et al., 2007).**

Selecting the appropriate treatment option for symptomatic patients relies heavily upon accurate visualization of the peripheral vascular anatomy. Until recently, non-invasive imaging options include arterial duplex ultrasound and magnetic resonance imaging. Although widely available, arterial duplex ultrasound can be very operator dependent and significant limitations occur with obese patients and in heavily calcified arterial segments. Magnetic resonance angiography has a high diagnostic accuracy, but is costly and not widely available **(Shareghi et al., 2010).**

While conventional digital subtraction angiography (DSA) is considered as the gold standard for imaging of peripheral vessels, its invasive nature and inherent risks of vascular complications limits use. Therefore, there remains a significant need for an accurate non-invasive imaging method in patients with PVD **(Shareghi et al., 2010).**

Computed tomography angiography is increasingly attractive due to rapid technical developments. Shorter acquisition times, thinner slices, higher spatial resolution, and improvement of multidetector computed tomographic (CT) scanners enable scanning of the whole vascular tree in a limited period with a decreasing (but still substantial) amount of contrast medium. Recent studies on CTA report sensitivity and specificity rates of around 98% for detecting PAD **(Met et al., 2010).**

The advantages of MDCT angiography over MR angiography are the short imaging time and lower cost. MR angiography is contraindicated in patients with claustrophobia or metal implants. Other limitations of MR angiography include slow flow that mimics stenosis and limitations in spatial resolution. Disadvantages of MDCT angiography include the use of radiation and the presence of severe calcifications that may cause overestimation of stenosis especially in patients with diabetes **(Ouwendijk et al., 2005).**

Computed tomography is increasingly being used as a surrogate for invasive angiography, given the lower costs and less invasive nature **(Shareghi et al., 2010).**

Multidetector CT angiography is an accurate diagnostic test in the assessment of arterial disease (50% stenosis) of the entire lower extremity **(Majanka et al., 2007).**

Aim of The Work

The objective of this thesis is to evaluate the diagnostic accuracy of multidetector CT angiography in the assessment of lower extremity arterial diseases by comparing the results with the standard of reference, conventional angiography.

Anatomy of the Arterial Supply of the Lower Limb

Arterial supply of the lower extremities is originating from the abdominal aorta which bifurcates to give the iliac arteries.

The abdominal aorta:

The abdominal aorta begins at the aortic hiatus of the diaphragm, in front of the lower border of the body of the last thoracic vertebra, and, descending in front of the vertebral column, ends on the body of the fourth lumbar vertebra, commonly a little to the left of the middle line, by dividing into the two common iliac arteries ***(Ellis and mahadevan, 2010).***

The proximal abdominal aorta is seen posterior to the diaphragmatic crura. The oesophagus is located anterior to it at this level. Other structures in the retro-crural region include the azygos and hemiazygos veins, sympathetic chain and lymph nodes on either sides of the aorta, and the thoracic duct to the right of the aorta. These stuctures, unless enlarged, are not visualized on CT **(Fig. 1.1)** ***(Hagaa, 2003)***.