Role of Multislice CT in Assessment of Myocardial Viability

Essay

Submitted for Partial Fulfillment of Master Degree
in Diagnostic Radiology

By
Salah Elsaid Ali Hassan Elgohary
M.B.,B.Ch.

Supervised by
Prof. Dr. Sahar Mohamed El Gaafary
Professor of Radiodiagnosis
Faculty of Medicine- Ain Shams University

Dr. Mohamed Sobhy Hassan
Lecturer of Radiodiagnosis
Faculty of Medicine- Ain Shams University

Faculty of Medicine
Ain-Shams University
2013

سورة البقرة الآية: ٣٢

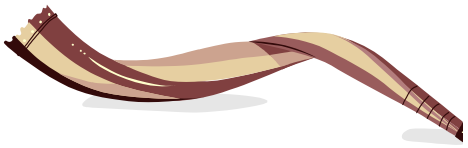
Acknowledgement

*First of all thanks to **Allah** to whom I relate any success in achieving any work in my life.*

*I would like to express my sincere gratitude to **Doctor. Sahar Mohamed El Gaafary,** Professor of Radiodiagnosis, Faculty of Medicine, Ain Shams University, for her kind supervision, valuable advice and unlimited help in providing all the facilities for this work.*

*I would like to express my great appreciation to **Doctor. Mohamed Sobhy Hassan,** Lecturer of Radiodiagnosis, Faculty of Medicine, Ain Shams University, for his kind supervision, continuous support and encouragement throughout this work.*

Last but not least, I want to thank my family for their endless help.



Salah EL-Saied EL-Gohary

Contents

List of Abbreviations

Abb.	Meaning
201Tl	201Thallium
AAo	Ascending aorta
ADP	Adenosine diphosphate
AMI	Acute myocardial infarction
AO	Aorta
As	Aortic sinus
ATP	Adenosine triphosphate
CAD	Coronary artery disease
CoA	Acyl coenzyme A
CS	Coronary sinus
CT	Computed tomography
Dao	Descending aorta
DEI	Delayed enhancement imaging
DL	First diagonal branch
ED	Early defect
EF	Ejection fraction
GCV	Great cardiac vein
HDL	High-density lipoprotein
HU	Hounsfield units
ICA	Internal carotid artery
IHD	Ischemic heart disease
IM	Intermediate branches
IVC	Inferior vena cava
LA	Left atrium
LAD	Left anterior descending coronary artery
Laur	Left auricle
LCA	The left main coronary artery
Lcx	Left circumflex artery

Abb.	Meaning
LV	Left ventricle
LVOT	The left ventricular outflow tract
MCV	Middle cardiac vein
MI	Myocardial infarction
MIP	Maximum-intensity projection
MO	Margo obtusus
MPR	Multi-planner reformat
MPS	Myocardial perfusion scintigraphy
MRI	Magnetic resonance imaging
Ms	Millisevered
MSCT	Multislice computed tomography
PDA	Posterior descending artery
PET	Positron emission tomography
PM	Papillary muscle
Porcine model	Pig model
PV	Pulmonary Vein
RA	Right atrium
rAAP	Right atrial appendage
RCA	The right coronary artery
ROI	Region of interest
RV	Right ventricle
RVOT	The right ventricular outflow tract
SCV	Superior caval vein
SPECT	Single photon emission computed tomography
SVC	Superior vena cava

List of Tables

List of Figures

Introduction

The degree of injury after acute myocardial ischaemia is a predictor of outcome and long time survival. The observation that viable myocardium may experience functional improvement after revascularization therapy while nonviable myocardium will not demonstrate the paramount clinical importance of viability assessment ***(Gutberlet et al., 2010).***

Differentiation of viable from non viable myocardium is crucial to predict functional recovery in the culprit arterial territory. The ability to distinguish dysfunctional but viable myocardium from non viable tissue after acute or chronic ischemia has important implication for the therapeutic management of patients with coronary artery disease ***(Beck et al., 2007).***

So far, assessment of myocardial viability is performed by single photon emission computed tomography (SPECT), positron emission tomography (PET), stress echocardiography and magnetic resonance imaging (MRI) ***(Kramer et al., 2005).***

Although coronary angiography has become a safe procedure with only a small risk coronary arteries associated, the inconvenience for the patient and the economic burden have both fueled the quest to find an alternative, noninvasive method to visualize and assess coronary arteries ***(Ohnesorge et al., 2000).***

Since 1999, multidetector computed tomography (MDCT) systems with simultaneous acquisition of four slices and half per second have become available. Multi-row acquisition with these scanners allows for considerably improved visualization of the coronary arteries ***(Ohnesorge et al., 1999).***

Much like contrast magnetic resonance (CMR), CT can also be used for assessing the extent of scar and tissue viability. Although the notion of using contrast-enhanced CT to assess viability is not new, recent advances in its temporal and spatial resolution with multidetector CT technology have renewed the clinical interest for this application ***(Gerber et al., 2006).***

The 320-Multidetector CT has craniocaudal coverage of 16cm in a single gantry rotation, which allows coronary imaging in a single heartbeat in a majority of patients. This eliminates potential artifacts at the transitions zone between gantry rotations, which are still seen with current state of the art 64-slice systems. Coupled with prospective image acquisition, the radiation exposure appears to compare favorably to current CT systems ***(Husmann et al., 2008).***

Aim of the Work

To highlight the role of Multi detector CT in the evaluation of the myocardium viability and its importance of being non invasive diagnostic technique.

Gross Anatomy of the Heart

The heart has a pyramidal shape and lies in the anterior mediastinum immediately posterior to the central portion of the diaphragm (Fig. 1-1) ***(Callaway and Wilde, 2006).***

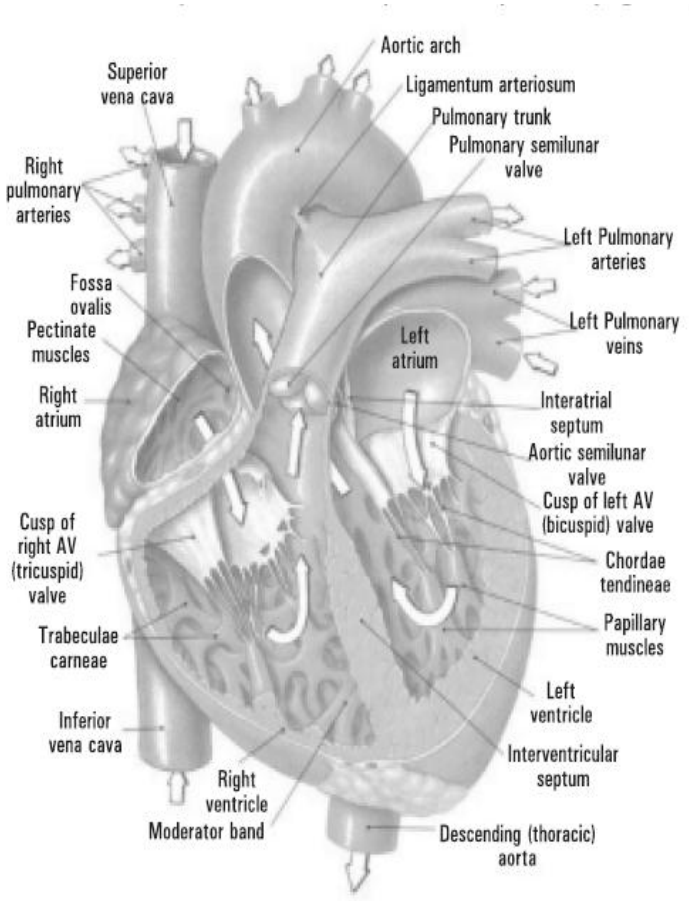


Fig. (1-1): Anatomy of heart ***(Quoted from Urmil, 2010).***

The pericardium:

The pericardium is normally thin paper, measuring 2 mm or less. It is composed of two layers, the parietal layer and the