Role of Multi-Detector-Computed Tomography (MDCT) in post-interventional evaluation of coronary arteries

Essay

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بسم الله الرحمن الرحيم

وَعَلَّمَ ءَادَمَ ٱلۡأَسۡمَآءَ كُلَّهَا ثُمَّ عَرَضَهُمۡ عَلَى ٱلۡمَلَٰٓئِكَةِ فَقَالَ
أَنۢبِـُٔونِي بِأَسۡمَآءِ هَٰٓؤُلَآءِ إِن كُنتُمۡ صَٰدِقِينَ ٣١ قَالُواْ سُبۡحَٰنَكَ
لَا عِلۡمَ لَنَآ إِلَّا مَا عَلَّمۡتَنَآۖ إِنَّكَ أَنتَ ٱلۡعَلِيمُ ٱلۡحَكِيمُ ٣٢

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3 D & 4 D	Three and four dimensional
AHA	American heart association
ASA	Acetyl Salicylic Acid (Asprin)
ASE	Agatston score equivalent
ATP	Adinosine tri-phosphate
bpm	Beat per minute
CABG	Coronary artery bypass graft
CAD	Coronary artery disease
CNR	Contrast-to-noise ratio
CT	Computed tomography
CTA	Computed tomographic angiography
CTCA	Computed tomographic coronary angiography
DSCT	Dual source computed tomography
EBCT	Electron beam computed tomography
ECG	Electrocardiogram
FOV	Field of view
GCV	Great cardiac vein
HR	Heart rate
HU	Hounsfield units
IMA	Internal mammary artery
IVUS	Intra-vascular ultrasound
LAD	Left anterior descending artery
LCX	Left circumflex artery
LIMA	Left internal mammary artery
LMT	Left main (coronary) trunk
MRA	Magnetic resonance angiography
MRI	Magnetic resonance imaging
msec	Millisecond
mSv	Milliseiver (unit for radiation measurement)
NPV	Negative predictive value
PCI	Per-cutaneous intervention
PDA	Posterior descending artery
PE	Pulmonary embolism
PET	Positron emission tomography
PL	Postero-lateral artery
PPV	Positive predictive value
RIMA	Right internal mammary artery
SNR	Signal-to-noise ratio
SVC	Superior vena cava
TECAB	Totally endoscopic coronary artery bypass
US	Ultrasound

INTRODUCTION

Recurrent ischemic symptoms in patients with previous coronary artery bypass graft (CABG) surgery for advanced coronary artery disease (CAD) is a common problem. Conventional coronary angiography (CCA) is currently the reference standard technique for evaluation of status of CABG and coronary arteries. CCA, however, is expensive and has a small risk of potentially life-threatening complications, including arrhythmia, stroke, coronary artery or graft dissection, embolic events, and myocardial infarction; the morbidity rate is 0% to 2%, and the mortality rate is 0.14% to 0.28% .

Therefore, a reliable noninvasive imaging modality is preferable for evaluation of patients suspected of having graft stenosis or occlusion. (Türkvatan A et al., 2009).

However, imaging of coronary artery stents is an important issue in cardiology because stenting is the predominant form of myocardial revascularization, with an estimated 664,000 angioplasty procedures have been performed in the United States in 2003. [Mühlenbruch G et al.,2007].

Computed tomography (CT) has been embraced as the premier non invasive modality for vascular imaging of the thorax and imaging of the heart , however, always been technically challenge because of the hearts continuous motion (Schoepf , 2004).

But the introduction of new generation MDCT scanner , with the ability to acquire up to 64 sub millimeter slices , provided more accurate detection of the vascular lumen with shorter scan time and fewer cardiac or respiratory artifacts , making it superior to conventional angiography in delineating the osteal origin and proximal path of an anomalous coronary artery .(Anders et al., 2006).

So that, MDCT permits non-invasive assessment of coronary artery bypass grafts with decreasing numbers of unevaluated graft segments. It is used to assess coronary artery bypass graft patency.(Nikolaou et al., 2006) especially with its sub-millimeter spatial resolution and premedication with oral beta-blockade (Herzog et al., 2004).

In addition, numerous studies comparing the accuracy of multidetector (64-row) computed tomography (64-MDCT) assessment of coronary graft patency and stenosis with that of CAG have shown that 64-MDCT is a reliable diagnostic tool and less invasive than CAG. (Doi H et al.,2008).

In the other hand, making the diagnosis of in-stent restenosis by using multislice CT scanners with 16 or fewer detectors (1-7) is limited by such factors as blooming and streak artifacts. Sixty-four-detector row CT has recently been introduced for clinical use with its improved spatial and temporal resolution. The use of 64-detector row CT improves the visualization of the coronary stent lumen and the detection of in-stent stenosis.(Suzuki S et al.,2009).

MDCT may reduce the need of an invasive procedure. This may prove to be particularly beneficial in coronary CT angiography.

Aim of the work

The aim of this study is to highlight the manifestations of post interventional coronary artery disease by MDCT.

Gross & CT Anatomy of the coronary arteries