Incremental value of 2-dimensional longitudinal radial and circumferential speckle tracking strain imaging to wall motion analysis for detection of coronary artery disease in patients undergoing dobutamine stress echocardiography

Thesis

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Presented By

Yomna Ahmed Omar Mohamed Abou El Seoud

Master degree in cardiology. Ain Shams University

Supervised by

Doctor Adel Kamal El Etriby

Professor of Cardiology Ain Shams University

Doctor Bassem Wadeaa Habib

Professor. of Cardiology Ain Shams University

Doctor Zeinab Abdel Salam

Assistant Prof. of Cardiology Ain Shams University

Doctor Alaa Mahmoud Roshdy

Assistant Prof. of Cardiology Ain Shams University

Doctor Mohamed Ahmed Abdel Rahman

Assistant Prof. of Cardiology Ain Shams University

Faculty of Medicine

Ain-Shams University

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DSE	Dobutamine stress echocardiography
CAD	Coronary artery disease
STE	Speckle tracking echocardiography
LV	Left ventricular
WMSI	Wall motion score index
LM	Left main coronary artery
RCA	Right coronary artery
LAD	Left Anterior Descending
LCX	Left Circumflex
LDL	Low-density lipoprotein
UA	Unstable angina
AMI	Acute myocardial infarction
STEMI	ST segment elevation myocardial infarction
SCD	Sudden cardiac death
ACS	Acute coronary syndromes
LDL-C	Low-density lipoprotein cholesterol
CRP	C-reactive protein
CABG	Coronary artery bypass graft surgery
CCBs	Calcium channel blockers
PCI	Percutaneous coronary intervention

DESs	Drug-eluting stents
BMSs	Bare metal stents
MI	Myocardial infarction
RV	Right ventricular

INTRODUCTION

INTRODUCTION

Although several noninvasive techniques are at hand for evaluating myocardial ischemia, many coronary angiograms yield negative results that may be explained by low diagnostic accuracy of most noninvasive tests. Dobutamine stress echocardiography (DSE) is considered one of the good options in clinical practice. ***(Eike N, et al., 1999)***

DSE is a feasible, safe and useful exercise-independent stress modality for assessing the presence, localization and extent of CAD. The diagnostic accuracy of DSE seems at least comparable to other, competitive noninvasive stress modalities used in patients with limited exercise capacity. ***(Geleijnse ML, et al., 1997)***

Wall motion analysis during DSE is subjective, and an expert observer is required to achieve the published levels of accuracy. ***(Hoffmann R, et al., 1996)***

Speckle tracking echocardiography (STE) is a new technique based on pure 2D grayscale ultrasound acquisition allowing calculation of segmental strains. Because of scattering, reflection, and interference of the ultrasound beams in myocardial tissue, speckle formations in gray-scale echocardiographic images represent tissue markers that can be tracked from frame to frame throughout the cardiac cycle. ***(Thomas H, et al., 2005)***

Speckle tracking has been integrated into the most recent echocardiographic systems for quick, automated or manual evaluation of left ventricular (LV) function. It is commercially available software that automatically or manually tracks myocardial motion throughout the cardiac cycle and allows rapid generation of regional myocardial strain curves that are site specific and angle independent. ***(Marta S, et al., 2009)***

During 2D speckle tracking analysis, manual tracing of the endocardial border at end systole and the region of interest width should be adjusted to include the entire myocardium. The software then automatically tracks and accepts segments of good tracking quality and rejects poorly tracked segments while allowing the observer to manually override its decisions based on visual assessments of tracking quality. ***(Marta S, et al., 2009)***

Recent studies on quantitative longitudinal strain rate analysis with tissue Doppler imaging during DSE showed high sensitivity and specificity in detecting significant coronary artery disease (CAD). ***(Bjork Ingul C, et al., 2007)*** However, these techniques required either specialized post processing software or time-consuming image post processing with manual tracking of the sample volume. ***(Weidemann F, et al., 2007)***

Although the use of wall motion score index (WMSI) during DSE relies on visual assessment of myocardial radial

thickening, 2D speckle tracking not only allows quantification of LV radial strain but also LV circumferential and longitudinal strains that are not visually apparent. However, the comparative diagnostic accuracies of these 3 orthogonal myocardial strains during DSE for the detection of CAD have not been previously reported. ***(Voigt JU, et al., 2004)***