Influence of Coronary Artery Disease Severity on Left Ventricular Global Longitudinal Strain in Patients Presented With Anterior STEMI after Primary Percutaneous Coronary Intervention

Thesis

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List of Abbreviations

Abb.	Full term
5-HT	*5-hydroxytryptamine*
ABP	*Arterial blood pressure*
ADP	*Adenosine diphosphate*
AMI	*Acute myocardial infarction*
Ap	*Apical*
CABG	*Coronary artery bypass grafting*
CAD	*Coronary artery disease*
CCU	*Coronary care unit*
CK	*Creatine kinase*
CK-MB	*Creatine kinase-myocardial band*
cTn	*Cardiac troponins*
Diast	*Diastole*
Diff	*difference*
DM	*Diabetes mellitus*
ε	*Strain*
EF	*Ejection fraction*
GLS	*Global longitudinal strain*
GP	*Glycoprotein*
HF	*Heart failure*
hs	*High-sensitive*
L	*Length*
LAD	*Left anterior descending*
LBBB	*Left bundle branch block*
LDH	*Lactate Dehydrogenase*
LV	*Left ventricular*
LVEF	*Left ventricular ejection fraction*
MACE	*Major adverse cardiac events*
MI	*Myocardial infarction*
MR	*Mitral regurgitation*

List of Abbreviations (Cont...)

Abb.	Full term
NSTEMI	*Non–ST-segment elevation myocardial infarction*
PCI	*Percutaneous coronary intervention*
ROC	*Receiver operating characteristic curve*
ROI	*Region of interest*
Rot	*Rotation*
RWMAs	*regional wall motion abnormalities*
SR	*Strain rate*
STEMI	*ST-segment elevation myocardial infarction*
ST–T	*ST-segment–T wave*
SWMI	*Segmental wall motion score index*
Syst	*Systole*
TIMI	*Thrombolysis in myocardial infarction*
TXA2	*Thromboxane A2*
URL	*Upper reference limit*
WMSI	*Wall Motion Score Index*

INTRODUCTION

Acute myocardial infarction is the leading cause of death in North America and Europe. Each year an estimated 785000 Americans will sustain a new myocardial infarction, and another 470000 will have a recurrent myocardial infarction. A new myocardial infarction occur every 25 seconds and new case of death from myocardial infarction occur every minute ***(Nienaber, 1998)***.

Several studies have demonstrated a benefit from myocardial reperfusion, with reduced infarct size and associated improvement in later regional and global ventricular function ***(Sutton and Sharpe, 2000)***.

Primary PCI is the treatment of choice for acute coronary syndrome with ST elevation myocardial infarction; but it is unclear whether it has also benefit on left ventricular function remodeling especially in relation to time delay to primary PCI that may affect patients morbidity ***(Saeed et al., 2012)***.

Typically myocardial infarction allows significant architectural changes in composition, shape, and contractile function of myocardium. Especially left ventricle which is the major contributor to the contractile function of the heart, so it affects the systolic and diastolic functions of the heart ***(Richardson et al., 2015)***.

Echocardiography is assuming a prominent role for evaluating left ventricular function after myocardial infarction; it provides substantial information regarding left ventricular remodeling post acute ST elevation myocardial infarction and the associated significant changes in systolic and diastolic echocardiographic derived indices ***(Shacham et al., 2016; French and Kramer, 2007)***.

Doppler tissue imaging of mitral annular velocity reflects the rate of change in left ventricular long axis dimensions and volume; thus impaired relaxation results in impaired relaxation results in a reduced early mitral annular velocity (e`) compared with other indicator of diastolic dysfunction ***(Sia et al., 2008)***.

Ejection fraction (EF) is the most commonly used method to assess systolic function and a reduced EF, commonly measured by echocardiography, is known to be associated with a poor outcome. However, EF is relatively insensitive to regional differences in myocardial function and has been shown to be a poor predictor of late myocardial dysfunction when measured acutely after reperfusion therapy ***(Shetye, 2015).***

Wall Motion Score Index (WMSI) has also been used in addition to EF but it has the inherent shortcoming of being a subjective measure based on the experience of the assessor ***(Shetye, 2015).***

Strain is defined as the change in length of an object relative to its original length. In the heart, myocardial strain is a sensitive measure of contractility. Strain can be calculated at both the segmental and global level and in the three axes of myocardial contraction - circumferential, longitudinal and radial ***(Shetye, 2015)***.

Echocardiographic global longitudinal strain (GLS) is increasingly recognized as a more effective technique than conventional ejection fraction (EF) in detecting subtle changes in left ventricular (LV) function ***(Krishnasamy et al., 2015).***

GLS was found to be a robust prognostic marker following myocardial infarction and cardiac surgery, and in patients with cardiomyopathy and aortic stenosis ***(Krishnasamy et al., 2015).***

Two-dimensional echocardiographic left ventricular (LV) global longitudinal strain (GLS) after ST-segment elevation myocardial infarction (STEMI) is moderately correlated with infarct size and reflects the residual LV systolic function. This correlation may be influenced by the presence of myocardial ischemia ***(Dimitriu-Leen et al., 2017).***

AIM OF THE STUDY

Is to identify the value of 2D speckle tracking derived global longitudinal strain (GLS) in predicting the presence of other significant coronary artery lesions in patients with acute ST elevations anterior myocardial infarction.

ACUTE ST ELEVATION ANTERIOR MYOCARDIAL INFARCTION

Epidemiology

Acute myocardial infarction is the leading cause of death in North America and Europe. Each year an estimated 785000 Americans will suffer a new myocardial infarction, and another 470000 will have a recurrent myocardial infarction. A new myocardial infarction occur every 25 seconds and new case of death from myocardial infarction occur every minute ***(Sutton and Sharpe, 2000).***

In the United States approximately 1.5 million cases of MI occur annually. The annual incidence of AMI for persons aged 30–69 years is estimated by the British Heart Foundation at 0.6% for men and at 0.1% for women. In ***Begium Bartholomeeussen et al*** demonstrated similar yearly incidence of AMI of 0.55% for men and 0.19% for women for the age group 45–75-year-old ***(Bruyninckx et al., 2008).***

Ischemia-reperfusion injury leads to a sequence of events that result in predictable changes to the structure and function of LV that may eventually cause congestive heart disease. Since the advent of primary (PCI) to treat AMI, immediate survival has improved; but at the expense of a rising incidence of progressive heart failure (HF) ***(Bogaert et al., 2000).***

ST segment elevation myocardial infarction (STEMI) is the most serious presentation of atherosclerotic coronary artery disease (CAD) carrying the most hazardous consequences ***(Tosteson et al., 1996).***

Definition of Myocardial Infarction:

Third Universal definition of Myocardial Infarction

The term myocardial infarction (MI) according to European Society of Cardiology is defined as ***(Thygesen et al., 2012).***

* Detection of a rise and/or fall of cardiac biomarker values [preferably cardiac troponin (cTn)] with at least one value above the 99th percentile upper reference limit (URL) and with at least one of the following:

- Symptoms of ischemia.
- New or presumed new significant ST-segment–T wave (ST–T) changes or new left bundle branch block (LBBB).
- Development of pathological Q waves in the ECG.
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.
- Identification of an intracoronary thrombus by angiography or autopsy.
- Cardiac death with symptoms suggestive of myocardial ischemia and presumed new ischemic ECG changes or new