Echo Cardiographic Predictors of Severity of Coronary Artery Disease in Patients with Angina Pectoris

Thesis

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List of Abbreviations

Abbreviation	Full term
ACUITY trial	Acute catheter and urgent intervention triage
ARTS II	Arterial Revascularization Therapies Study Part II
ASE	American society of echogardiography
BSA	Body surface Area
CABG	Coronary artery by pass graft
CAD	Coronary artery disease
CSS	clinical SYNTAX score
DM	Diabetes milletus
E	Mitral inflow rapid filling velocity
E`	Mitral annular excursion velocity
EF	Ejection fraction
ET	Ejection time
FFR	Fractional flow reserve
FSS	Functional SYNTAX score
GLSS	Global longitudinal systolic strain
HF	Heart failure
HTN	Hypertension
IVCT	Isovolumic contraction time
IVRT	Isovolumic relaxation time
LMCAD	Left main coronary artery disease
LV	Left ventricle
MACE	Major adverse cardiac events

List of Abbreviations (Cont...)

Abb.	Full term
MI	Myocardial infarction
MPI	Myocardial performance index
NCDR	National cardiovascular data registry
PCI	Percutaneous coronary interventiob
SR	Strain Rate
SS	Sytnax score
STS	Society of thoracic surgeons
SYNTAX	Synergy between Taxus drug eluting stent and coronary bypass graft in treating narrowed arteries
TLR	Target lesion revascularization

ABSTRACT

This study included 14 females (14%) and 86 males (86%) with a mean age 49.85 ± 5.94, including Patients with SCAD and having more than 75% stenosis in at least a vessel with a diameter > 1.5mm.

Our study showed there was significant statistical difference between LAD affection and /or Number of affected vessels and Tie index, GLSS, SYANTAX score.

There was also negative correlation between SYNTAX and GLSS values, while a positive correlation between Tie index, IVRT (r= - 0.313, p<0.01)), (r=0.495, p value<0.01), (r=0.39, p <0.01), respectively,. How ever there was no statistically significant difference between SYNTAX score and all above echo parameters.

Keywords: Target lesion revascularization - Sytnax score - Strain Rate - Percutaneous coronary interventiob

INTRODUCTION

The severity of coronary artery disease (CAD) is defined in several ways, including: *anatomical* by visualization of the blood vessel branches and any blockage to blood flow along the pathway, *functional* by estimating quantity of blood delivered to tissues supplied by each branch vessel, and *clinical* by determining symptoms corresponding to inadequate blood delivery, what level of activity causes them, what relieves them and the pattern of occurrence ***(Garg et al., 2010).***

The SYNTAX score is a lesion-based angiographic grading tool used to assess the severity of coronary artery disease (CAD) in stable coronary artery disease (SCAD) patients. It is able to aid revascularization decisions and predict mortality and morbidity in patients with CAD ***(Chakravarty et al., 2011).***

Ischemia occurring due to CAD causes left ventricular (LV) systolic and diastolic dysfunction which can be assessed by echocardiography. Many studies have demonstrated that diastolic dysfunction develops in patients with chronic CAD independent of LV systolic function ***(Nagueh et al., 2016).***

LV ejection fraction (EF) is an estimator of systolic function. But, when the elliptical cardiac chamber is transformed to a spherical one, the accuracy of EF tends to be low ***(Moller et al., 2001).*** The myocardial performance index (MPI or Tie index) has been widely used to reflect global

cardiac function rather than systolic or diastolic function alone, and it assess independently the myocardial performance of left and right ventricles ***(Lacorte et al., 2003).*** Tie index has since been studied in several cardiac disorders including heart failure, myocardial infarction, hypertension and diabetes mellitus and was found to predict both worsened morbidity and mortality outcome ***(Poulsen et al., 2000).***

Global longitudinal Systolic strain (GLSS) assessment by speckle tracking echocardiography is a valid method that enables assessment of regional myocardial deformation from conventional B-mode echocardiographic images. It is an accurate method for assessing LV function in patients with ischemic heart disease ***(Farooq et al., 2013).***

Aim of the Work

The aim of this study is to examine the ability of different echocardiograph modalities to determine the severity of coronary artery disease in patients with stable angina pectoris.

Chapter 1
SYNTAX SCORE

Myocardial revascularization is of benefit when the favorable outcomes as improvement in symptoms, functional status, and/or quality of life, exceeds the expected negative consequences of the procedure. Therefore, it was important to have risk assessment in clinical practice, which will be of great value to patients and physicians; it allows also comparing performance of different institutes and operators on long term. Many risk stratification models were constructed ***(Min et al., 2010).***

These scores were used to predict Major Adverse Cardiac Events (MACE) in patients undergoing PCI and CABG such as EuroSCORE (however it's not helpful in deciding treatment options), others used to predict major adverse cardiac events (MACE) in patients undergoing PCI not CABG as SYNTAX score, The National Cardiovascular Database Registry (NCDR) used in, patients undergoing CABG alone to determine risk OF MACE, also The Society of Thoracic Surgeons (STS) score is used for that purpose ***(Serruys et al., 2009)***.

Ultimately risk stratification should be used as a guide, while clinical judgment and multidisciplinary dialogue (Heart Team) remain essential. It is important to say that none of these risk scores can accurately predict events in an individual patient. Moreover, limitations exist in these risk models,

especially because variable definitions and contents when they are applied across different populations ***(Peterson et al., 2010).***

Examples of risk stratification scores used in candidates for percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG).

Table (1): Recommended risk stratification scores to be used in candidates for percutaneous coronary intervention or coronary artery bypass grafting

Score	Calculation	Number of variables used to calculate risk		Validated outcomes	Class[a]/level[b]		Ref.[c]
		Clinical	Angiographic		PCI	CABG	
EuroSCORE	www.euroscore.org/calc.html	17	0	Short- and long-term mortality	IIb B	I B	2,3,6
SYNTAX score	www.syntaxscore.com	0	11 (per lesion)	Quantify coronary artery disease complexity	IIa B	III B	4
Mayo Clinic Risk Score	(7,8)	7	0	MACE and procedural death	IIb C	III C	—
NCDR CathPCI	(5)	8	0	In-hospital mortality	IIb B	—	5
Parsonnet score	(9)	16	0	30-day mortality	—	III B	9
STS score[d]	http://209.220.160.181/STSWebRiskCalc261/	40	2	Operative mortality, stroke, renal failure, prolonged ventilation, deep sternal infection, re-operation, morbidity, length of stay <6 or >14 days	—	I B	10
ACEF score	[Age/ejection fraction (%)] + 1 (if creatinine >2 mg/dL)(11)	2	0	Mortality in elective CABG	—	IIb C	—

[a]Class of recommendation.
[b]Level of evidence.
[c]References.
[d]The STS score is undergoing periodic adjustement which makes longitudinal comparisons difficult.
ACEF = age, creatinine, ejection fraction; CABG = coronary artery bypass grafting; MACE = major adverse cardiac event; NCDR = National Cardiovascular Database Registry; PCI = percutaneous coronary intervention; STS = Society of Thoracic Surgeons.

(Magro et al., 2011)

Definition of SYNTAX score (SS)

The SYNTAX score (SS) was recently developed as an angiographic guided comprehensive scoring system aiming to risk stratify the patients with CAD having more than 1 vessel disease and undergoing revascularization with PCI and aid in the decision of the revascularization method whether PCI or CABG. There were many preexisting classifications such as:

1. The ACC/AHA lesions classification system *(Rayan et al., 1988)*

Which classified coronary lesions according to eccentricity, calcification and length and /or thrombus into type A (not eccentric, length less than 20mm and no calcification or thrombus), B (eccentric. lesion, length more than 20mm, but no calcification or thrombus and C (eccentric lesion, having calcification or thrombus and length more than 20mm).

2. The Leaman score *(Leaman et al., 1981)*

Gives a weight to segment according to its contribution in blood supply of left ventricle, in right dominant circulation Lt system supply 84% of Lt ventricle and RCA supply 16% thus LM supply ventricle (84/16) 5 times as RCA, LAD gives 55% of LV (55% ÷ 16%) approximately 3.4 as RCA So if there is a lesion in LM it will be multiplied by 5, a lesion in proximal LAD will be multiplied by 3.5.

3. The total occlusion classification system *(Hamburger et al., 1997)*

A lesion is characterized as a total occlusion when no antegrade flow is visible distal to the obstruction. Segments distal to the occlusion may be filled by bridging, ipsilateral or contra-lateral collaterals. Parameters suggested in this system such as age of the occlusion whether it's more than three months, presence of side-branch at the site of the occlusion and their size, a blunt stump, presence of bridging collaterals and occlusion length have been incorporated also into the SYNTAX score ***(Hamburger et al., 1997).***

The length of the obstructed segment is calculated by measuring the distance between the stump of the occlusion and the first segment beyond the occlusion, visualized by ante-grade or retrograde collateral flow. The age of the total occlusion is scored based on history of previous infarction, in case that this information is absent the age of total occlusion score is unknown ***(Hamburger et al, 1997).***

4. The Duke and ICPS classification systems for bifurcation lesions *(Medina et al., 2006).*

Bifurcation is defined as a junction of a main vessel and a side branch (with a minimal diameter of 1.5mm). A lesion is scored as a bifurcation, if the main vessel and/or the side branch have a narrowing. Bifurcation lesions not involving the