IMPACT OF SYNTAX SCORE ON THE EARLY OUTCOME OF CABG SURGERY IN LOW EJECTION FRACTION PATIENTS

Thesis

Submitted in Partial Fulfillment of the MD Degree in Cardiothoracic Surgery

By

Mahmoud El-Degwy Ahmed

(M.B.; B.Ch, M.Sc. Cardiothoracic surgery., Cairo University)

Under Supervision of

Dr. Mohammed Abd El-Raouf

Professor of Cardiothoracic Surgery,
Faculty of Medicine, Cairo University

Dr. Ehab Mohammed El-Shihy

Professor of Cardiothoracic Surgery,
Faculty of Medicine, Cairo University

Dr. Tarek Mohammed Kandil

Lecturer of Cardiothoracic Surgery,
Faculty of Medicine, Cairo University

Dr. Alaa Mohammed Omar

Lecturer of Cardiothoracic Surgery,
Faculty of Medicine, Cairo University

Faculty of Medicine
Cairo University
2016

سورة البقرة الآية: ٣٢

Acknowledgement

First, & foremost, thanks to **Allah** the almighty & the most merciful.

I'm greatly indebted to my **Prof. Dr. Mohamed Abd El-Raouf,** Professor of Cardiothoracic Surgery Department in Cairo University, to him I wish to express my profound gratitude & deep thanks for his constructive guidance & general help which were the paramount axes in the completion of this work.

No word can fulfill the feeling of great gratitude & respect I carry to **Prof. Dr. Ehab Mohammed El-Shihy,** Professor of Cardiothoracic Surgery Department in Cairo University.

I'm offering my warmest thanks to **Dr. Tarek Mohammed Kandil,** Lecturer of Cardiothoracic Surgery, Cairo University, for his positive attitude & generosity which are the cornerstone in the completion of this work.

Special thanks & great appreciation to **Dr. Alaa Mohammed Omar,** Lecturer of Cardiothoracic Surgery in Cairo University for their generous help & scientific advice.

Finally, great thanks offered to All My Family for their patience, support, encouragement & kind help all through this work.

Abstract

Background: The SYNTAX score, a comprehensive angiographic scoring system, was recently developed as a tool for risk stratification during the SYNTAX trial (randomized trial comparing coronary artery bypass grafting with percutaneous coronary intervention). We applied the SYNTAX score in patients with multivessel disease and/or left main coronary artery disease who underwent coronary artery bypass grafting to evaluate its role in predicting incidences of major adverse cardiac and cerebrovascular events (MACCE) within 30 days.

Methods: The study including 100 consecutive patients with multivessel and/or left main CAD who were subjected to CABG. There were divided into three groups according to the Syntax score (<22, 22–32, and >32). During the 30 days follow-up, cardiovascular events including death, myocardial infarction (MI), and stroke were systematically indexed. The primary end point was the composite criteria death/ MI/stroke.

Results: The Syntax score ranged from 10–58 with a mean and Standerd deviation 32.03 ± 9.62. Baseline clinical characteristics were similar among the three groups. No statistically significant difference was found for MACCE: 0.0% versus 12.5% versus 20.5% in the groups with a Syntax score <22, 22–32, and >32, respectively (P value 0.122).

Conclusion: This study showed that, the Syntax score seems not to be sensitive predictor of major adverse cardiac and cerebrovascular events such as death, MI, or stroke.

Key words:

SYNTAX -MACCE-CABG -EF -IABP - MI

List Of Contents

Title	Page
List of abbreviations	I-II
List of tables	III-IV
List of figures	V-VI
Introduction and Aim of work	1-3
Review of literature	4-74
Chapter 1: • Normal Coronary Anatomy	4-12
Chapter 2: • Pathogenesis Of Therosclerosis (Coronary Atherosclerosis)	13-29
Chapter 3: • The Syntax Trial	30-47
Chapter 4: • Syntax Score	48-62
Chapter 5: • Syntax-Derived Risk Scores	63-71
Chapter 6: • Patients With Low Ejection Fraction Undergoing Coronary Artery Bypass Grafting	72-74
Patients and methods	75-83
Results	84-108
Discussion	109-119
Conclusion	119
Summary	120-123
References	124-

	147
Arabic summary	

List Of Abbreviations

ARTS: Arterial Revascularization Therapies Study.

ACEF: Age, Creatinine and Ejection Fraction.

ACE : Angiotensin Converting Enzyme.

APO I: Apolipoprotein I.

AWESOME: Angina with Extremely Serious Operative Mortality Evaluation.

BIMA: Bilateral internal mammary artery.

BMS: Bare metal stent.

BMI: Body Mass Index.

CABG: Coronary artery bypass graft.

CAD: Coronary Artery Disease.

CRP: C Reactive Protein.

CSS: Clinical SYNTAX Score.

DES: Drug Eluting Stent.

FFR: Fractional Flow Reserve.

GRC: Global Risk Classification.

HDL: High Denisty Lipoprotein.

ICAM-1: Intercellular Adhesion Molecule 1.

LCS: Left Coronary Sinus.

LAD: Left Anterior Descending.

LCX: Left Circumflex.

LIMA: Left internal mammary artery.

LITA: Left internal thoracic artery.

LMS: left main stem.

LDL: Low Denisty Lipoprotein.

LV: Left Ventricle.

MACCE: Major Adverse Cardiac and Cerebrovascular Events.

MI: Myocardial Infarction.

MCP-1: Monocyte Chemotactic Protein 1.

MVD: Multi-Vessel Disease.

NOS: Nitric Oxide Synthase.

OM: Obtuse marginal.

OPCAB: Off Pump Coronary artery bypass.

PCI: percutaneous Coronary Intervension.

PLB: Postero-Lateral Branch.

PCR: Polymerase Chain Reaction.

RCA: Right Coronary Artery.

RCS: Right Coronary Sinus.

RSS: Residual SYNTAX Score.

SAN: Sino-Atrial Node.

SYNTAX: Synergy between PCI with Taxus and Cardiac Surgery.

SOS: Stent or Surgery study.

VACAM-1: Vascular Cell Adheion Molecule 1.

List Of Tables

Table	Title	Page
1	Comparison between SS and Derived SS systems.	69
2	Descriptive statistics of demographic data in the study sample.	84
3	Risk factors in the study sample.	85
4	Clinical characteristics in the study sample.	86
5	Descriptive statistics of ejection fraction.	86
6	Descriptive statistics of SYNTAX score.	87
7	Descriptive statistics of intra-operative findings.	87
8	Descriptive statistics of post-operative findings.	88
9	Descriptive statistics of post-operative findings.	89
10	Results of association between SYNTAX score and demographic data.	90
11	Results of association between SYNTAX score and Risks factors.	91
12	Results of association between SYNTAX score and Clinical characteristics.	92
13	Results of association between SYNTAX score and ejection fraction.	93
14	Results of association between SYNTAX score and intra-operative findings.	94
15	Results of association between SYNTAX score and Post-operative findings.	96
16	Results of association between SYNTAX score and Early.	99
17	Results of association between SYNTAX score Subgroups and Demographic data.	100
18	Results of association between SYNTAX score subgroups and Risks factors.	101

19	Results of association between SYNTAX score Subgroups and Clinical characteristics.	102
20	Results of association between syntax score Subgroup and intra-operative findings.	104
21	Results of association between SYNTAX score subgroups and Post-operative findings.	107
22	Results of association between SYNTAX score Subgroups and Early Outcome.	108

List Of Figures

Figure	Title	Page
1	Normal anatomy of aortic root.	4
2	Diagram illustrating right coronary artery.	6
3	Diagram of the normal right coronary artery anatomy.	8-9
4	Diagram of the left coronary artery.	10
5	Role of monocytes in the initiation and progression of atherosclerosis.	18
6	Cross section of coronary artery containing plaque assumed to be rupture prone.	27
7	SYNTAX score components.	52
8	Right dominance.	53
9	Left dominance.	53
10	Scores evolving from SYNTAX score.	63
11	SYNTAX score of patient with left main coronary disease in combination with three vessel disease.	78
12	Pie chart representing gender distribution in the whole sample .	84
13	Bar chart representing risk factors in the whole sample.	85
14	Bar chart representing Early Outcome in the whole sample.	89
15	Scatter diagram representing positive correlation between SYNTAX score and number of grafts.	94
16	Scatter diagram representing positive correlation between syntax score and Total CPB.	95
17	Scatter diagram representing positive correlation between SYNTAX score and cross-clamp time.	95
18	Scatter diagram representing positive correlation between	97

	SYNTAX score and Total ICU stay.	
19	Scatter diagram representing positive correlation between SYNTAX score and Mechanical ventilation.	98
20	Bar Chart representing positive correlation between SYNTAX score Subgroup and number of grafts.	104
21	Bar Chart representing positive correlation between SYNTAX score Subgroup and Total CPB.	105
22	Scatter diagram representing positive correlation between SYNTAX score Subgroup and Cross clamp time.	105

INTRODUCTION

The optimal revascularization strategy in patients with multivessel coronary artery disease (CAD) is still an important topic of debate among interventional cardiologists and cardiac surgeons. The SYNTAX score stratifies patients regarding the angiographic complexity of coronary injuries, allowing for the establishment of prognosis of patients with three-vessel CAD and/or trunk injury, and represents an important tool for the best revascularization-strategy decision, whether surgical or percutaneous ***(Silva et al., 2014).***

Treatment of patients with complex coronary artery disease who require myocardial revascularization consists of both coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI). A great number of randomized clinical trials continue to be performed as technology improves and patient selection changes to establish current preferred revascularization strategies . It is important to consider patient selection, procedural factors, postoperative care and strategies for follow-up, all of which can influence outcomes significantly ***(Heada et al., 2015).***

Coronary artery bypass graft surgery (CABG) is considered the standard of care for the treatment of left main coronary artery disease ***(Taggart et al., 2008)***. However, Interventionists have progressively increased their armamentarium to treat complex CAD through development of new-generation drug-eluting stents (DES) and novel antithrombotic drugs ***(Stone et al. 2004) (Giustino and Mehran., 2015).*** In addition, whereas PCI has improved, CABG has also progressed with better perioperative management, more frequent use of arterial grafting, and improved

techniques with minimally invasive and off-pump surgery as options ***(Nishida et al., 2005) (Giustino and Mehran., 2015).***

As a result of continually improving the treatment strategy in patients with coronary artery disease, the SYNTAX (Synergy Between Percutaneous Intervention With TAXUS Drug- Eluting Stent and Cardiac Surgery) trial has recently been initiated ***(Ong et al., 2006).***

The Syntax score was recently developed to characterize the coronary vasculature with respect to the number of lesions and their functional impact, location, and complexity ***(Sianos et al., 2005).***

The SYNTAX score is a comprehensive, angiographic scoring system, aiming to assist in patient selection and risk stratification. It merges several previously validated angiographic classifications based on morphology and location of coronary artery lesions within the coronary tree. Recently, the predictive value of the SYNTAX score was assessed in patients who underwent PCI ***(Sianos et al., 2005).***

Avalidation of this angiographic classification tool is lacking for patients undergoing CABG. the SYNTAX score applied in patients with left main coronary artery disease (isolated, or in combination with one-, two-, or three-vessel disease) who underwent primary CABG to examine its role in predicting short-term and long-term incidences of major adverse cardiac and cerebrovascular events (MACCE).