Value of Preprocedural Multidetector Computed Tomography Angiography In Prediction of Successful Percutaneous Intervention upon Patients with Chronic Totally Occluded Coronary arteries

Thesis for partial fulfillment of MD degree of cardiology

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LIST OF ABBREVIATIONS

ACS	**:**	Acute coronary syndrome
ACT	**:**	Activated clotting time
BMI	**:**	Body mass index
BMS	**:**	Bare metal stent
CA	**:**	Coronary angiography
CABG	**:**	Coronary artery bypass grafting
CACS	**:**	Coronary artery calcium score
CAD	**:**	Coronary artery disease
CART	**:**	Combined antegrade and retrograde subintimal tracking
CC	**:**	Collateral connection
CCTA	**:**	Coronary CT angiography
CHD	**:**	Congenital heart disease
cMPR	**:**	Curved multiplanar reconstruction
CTA	**:**	Computed tomography angiography
CTDI	**:**	CT dose index
CTO	**:**	Chronic total occlusion
DES	**:**	Drug eluting stent
DLP	**:**	Dose length product
DM	**:**	Diabetes mellitus
EBCT	**:**	Electron beam computed tomography

ECG	**:**	Electrocardiogram
FOV	**:**	Field of view
HbA_1C	**:**	Glycated hemoglobin
HR	**:**	Heart rate
HTN	**:**	Hypertension
HU	**:**	Hounsfield unit
IU	**:**	International unit
IV	**:**	Intravenous
IVUS	**:**	Intravascular ultrasound
JNC	**:**	Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure
Kv	**:**	Kilovolt
LAD	**:**	Left anterior descending coronary
LM	**:**	Left main coronary
LV	**:**	Left ventricle
LVEF	**:**	Left ventricular ejection fraction
MACE	**:**	Major adverse cardiac events
MAs	**:**	milliamperes
MDCT	**:**	Multidetector CT
Mg	**:**	Milligram
MIP	**:**	Maximum intensity projection
Mm	**:**	Millimeter

MPR	:	Multiplanar reconstruction
MRCD	:	Maximum recommended contrast dose
MRI	:	Magnetic resonance imaging
Ms	:	millisecond
MSCT	:	Multislice CT
MSv	:	Millisievert
OTW	:	Over the wire
PCI	:	Percutaneous coronary intervention
PE	:	Pulmonary embolism
PET	:	Positron emission tomography
PTCA	:	Percutaneous transluminal coronary angioplasty
RCA	:	Right coronary artery
S	:	Second
SPECT	:	Single photon emission computed tomography
STAR	:	Segmental wall motion abnormalities.
TAVI	:	Transcatheter aortic valve implantation
TIMI	:	Thrombolysis in myocardial infarction
VRT	:	Volume rendering technique
3D	:	Three dimensional
4D	:	Four dimensional

Introduction

Chronic total occlusion (CTO) lesions still represents the last frontier for coronary interventionist and is a frequent reason for referring patients for coronary artery bypass graft surgery (CABG).[1]

CTO intervention is a complex procedure with a variable success rate of 55–80% in most experienced centers with high success rates only in a few luminary sites.[2] Complications of this procedure include dissection, perforation, and impairment of ipsilateral collaterals to the distal bed. The major adverse coronary event (MACE) rate with a successful PCI of CTO is about 2-2.5%.[2] failed PCI is associated with MACE rate of about 5.6%.[1]

Although the most important factor of procedural failure is due to the inability to cross the total occlusion with the guide wire and to reach the distal true lumen end, other factors may prevent balloon crossing and final recanalization.

Remarkable progress has been achieved in the field of CTO interventions over the past few years pioneered by Japanese interventional cardiologists. New guide wires, techniques and specific devices have led to higher procedural success rates. Even in this subset of lesions, drug eluting stents significantly reduced

the incidence of restenosis and reocclusion providing also to these complex procedures improved long term patency.

The introduction of 64-slice multidetector computed tomographic coronary angiography (CTA) started a new era in percutaneous coronary intervention (PCI) by combining the best characteristics of catheter angiography (CA) while avoiding most of its disadvantages.

CTA is a useful tool to optimize PCI strategy as it is possible to characterize the length, course, and composition of an occluded artery and allow visualization of the distal runoff and side branches.[3]

Due to the complexity of CTO interventions and potentially higher incidence of complications, correct patient selection based on presence of factors predicting success of the procedure must be done.

Different studies in the last few years were done trying to identify preinterventional and interventional parameters that can predict success or failure of the complex procedure of CTO revascularization. These parameters were derived mainly from different imaging modalities as CA, multislice CT (MSCT) and cardiac magnetic resonance imaging (MRI).

However, despite all these trials, uptill now there is no consensus about the definite predictors of success or failure of this

type of interventions and research will have to go on to get solid informations about these predictors.

Nowadays, MSCT with the very fast going on improvement in its technology is gaining much more attention of researchers as a minimally invasive highly informative method to extract, assess and confirm predictors of success or failure of CTO interventions.

Aim of the work

This study aimed at identification of MDCT coronary angiography findings that can predict the outcome of PCI upon chronic totally occluded coronary arteries.

Introduction

Coronary artery disease (CAD) is the most common cause of sudden death and is also the most common reason for death of men and women over 20 years of age.[4]

Various invasive and non-invasive imaging techniques are used for cardiac diagnosis, with the goal of visualizing the anatomical structures of the heart and obtaining information about cardiac function by means of monitoring cardiac motion and the blood supply of the heart muscles. The most important techniques used are coronary angiography, intravascular ultrasound, echocardiography, myocardial perfusion scanning & magnetic resonance imaging.

Coronary angiography (CA) is currently the standard technique to detect and evaluate coronary artery stenosis and is the basis for decision-making regarding further work-up. Recent technological advances in CA using the bi-plane technique and flat-panel detectors have contributed to further enhancing image quality and performance. For example, the newest catheter angiography systems provide 3D modeling of the coronary arteries based on simultaneous acquisition of two projections of the same artery.

However, the invasiveness, with its subsequent complications , the considerable amount of X-ray radiation (3–6