Ain Shams University
Faculty of Medicine
Anesthesiology and Intensive Care Dep.

Acute coronary syndromes

An Essay

Submitted for partial fulfillment of
Master degree of Intensive Care

Presented By

Ahmed Mohamed Ahmed Abd El Salam

SUPERVISORS

Prof. Dr. **Alaa El Din Abd El Wahab Koraa**
Prof. of Anesthesiology and intensive care
Faculty of Medicine, Ain Shams University

Prof. Dr. **Sherif Wadie Nashed Sergios**
Prof. of Anesthesiology and intensive care
Faculty of Medicine, Ain Shams University

Dr. **Rasha Samir Abd El Wahab Bondok**
Asst. Prof. of Anesthesiology and intensive care
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
2009

INDEX

ACKNOWLEDGEMENT

I am really grateful to ***Prof.Dr./ Alaa El Din Abd El Wahab Koraa*** *Professor of Anaesthesiology and intensive care Faculty of Medicine, Ain Shams University, whose Valuable suggestions have helped me greatly in the completion of this work.*

I would like to convey my deep appreciation to ***Prof.Dr./ Sherif Wadie Nashed Sergios*** *Professor of Anaesthesiology and intensive care Faculty of Medicine****,*** *Ain Shams University and* ***Dr./ Rasha Samir Abd El Wahab Bondok*** *Asst. Professor of Anaesthesiology and intensive care Faculty of Medicine, Ain Shams University, for freely ,giving me their time and helped to make this work possible.*

I never forget to convey my deep appreciation to my ***Mom****, my wife* ***Rasha*** *and my daughters* ***Nourseen*** *and* ***Nada****, for giving me the support I needed to complete* ***this work.***

بسم الله الرحمن الرحيم

Acute coronary syndromes
المتلازمات المرضيه الحادة للشرايين التاجية

خطة بحث إيفاءا جزئيا لشروط الحصول على **درجة الماجستير فى الرعاية المركزة** مقدمة من الطبيب **أحمد محمد أحمد عبد السلام** بكالوريوس الطب والجراحة (طب الاسكندرية).

Protocol of an essay in partial fulfillment of the requirements of the degree of Master of Intensive care by

Ahmed Mohamed Ahmed Abd El Salam MB,ChB. (Alex).

Under Supervision Of — تحت إشراف

Prof.Dr.\ Alaa El Din Abd El Wahab Koraa — **الأستاذ الدكتور/ علاء الدين عبد الوهاب قراعة**
Professor of Anaesthesiology and intensive care — أستاذ التخدير والرعاية المركزة
Faculty of Medicine — كلية الطب
Ain Shams University — جامعة عين شمس

Prof.Dr.\ Sherif Wadie Nashed Sergios — **الاستاذ الدكتور/ شريف وديع ناشد سرجيوس**
Professor of Anaesthesiology and intensive care — استاذ التخدير والرعاية المركزة
Faculty of Medicine — كلية الطب
Ain Shams University — جامعة عين شمس

Dr./Rasha Samir El Wahab Bondok — **الدكتور/ رشا سمير عبد الوهاب بندق**
Lecturer of Anaesthesiology and intensive care — مدرس التخدير والرعاية المركزة
Faculty of Medicine — كلية الطب
Ain Shams University — جامعة عين شمس

Introduction — مقدمة

كلية الطب
جامعة عين شمس 2007

List of figures

List of Tables

Key Words

ACC	American College of Cardiology
ACEI	angiotensin-converting enzyme inhibitor
ACLS	advanced cardiac life support
ACS	acute coronary syndrome
ACT	activated clotting time
ADP	adenosine diphosphate
AED	automated external defibrillator
AF	atrial fibrillation
AHA	American Heart Association
AHCPR	Agency of Health Care Policy and Research
ALS	advanced life support
AMI	acute myocardial infarction
aPTT	activated partial thromboplastin time
ARB	angiotensin receptor blocker
ARD	absolute risk difference
AV	atrioventricular
BCS	British Cardiac Society
CABG	coronary artery bypass graft surgery
CABRI	Coronary Angioplasty versus Bypass Revascularisation Investigation
CAPRIE	Clopidogrel vs. Aspirin in Patients at Risk of Ischemic Events
CAPTIM	Comarison of Primary Angioplasty and Prehospital Thrombolysis in Acute Phase of Myocardial Infarction
CARS	Coumadin Aspirin Reinfarction
CASS	Coronary Artery Surgery Study
CCS	Canadian Cardiovascular Society
cGMP	cyclic guanosine monophosphate
CHD	Coronary Heart Disease
CHF	congestive heart failure
CI	confidence interval
CK	creatine kinase
COPD	chronic obstructive pulmonary
CRP	C-reactive protein
cTnI	cardiac-specific TnI
cTnT	cardiac-specific TnT
CURE	Clopidogrel in Unstable angina to Prevent Recurrent Ischemic Events
DRS	Diltiazem Reinfarction Study
DTS	Duke Treadmill Score
ECG	12-lead electrocardiogram, electrocardiographic
ED	emergency department
EF	ejection fraction (left ventricle)
EMS	emergency medical services
EMT	emergency medical technician
EP	electrophysiology

ESC	European Society of Cardiology
FRAXIS	FRAxiparine in Ischaemic Syndrome
FRIC	FRagmin In unstable Coronary artery
FTT	Fibrinolytic Therapy Trialists
GIK	glucose-insulin-potassium
GP	glycoprotein
GRACE	Global Registry of Acute Coronary Events
GUSTO-II	Global Use of Strategies to Open Occluded Coronary Arteries-II
GUSTO-III	Global Use of Strategies to Open Occluded Coronary Arteries-III
HDL	high-density lipoprotein
HDL-C	high-density lipoprotein cholesterol
HRT	hormone replacement therapy
hsCRP	high-sensitivity C-reactive protein
IABP	intra-aortic balloon pump
ICAM	intra-cellular adhesion molecule
ICD	implantable cardioverter defibrillator
ICH	intracranial hemorrhage
INR	international normalized ratio
IV	intravenous
ISIS	International Study of Infarct Survival
LAD	left anterior descending coronary
LBBB	left bundle-branch block
L-CAD	Lipid Coronary Artery Disease Study
LDL	low-density lipoprotein
LDL-C	low-density lipoprotein cholesterol
LMCA	Left Main Coronary Artery
LMWH	low-molecular-weight heparin
LV	left ventricular, left ventricle
LVAD	left ventricular assist device
LVEF	left ventricular ejection fraction
MB	cardiac muscle isoenzyme of creatine kinase
MCP	Monocyte chemo-attractant protein
MDPIT	Multicenter Diltiazem Postinfarction therapy
MET	metabolic equivalent
MI	myocardial infarction
MM	skeletal muscle isoenzyme of creatine kinase
MR	mitral regurgitation
MVO2	myocardial oxygen consumption
NCEP	National Cholesterol Education program
NHAAP	National Heart Attack Alert Program
NICE	National Investigators Collaborating on Enoxaparin Trail
NRMI	National Registry of Myocardial infarction
NSTEMI	non–ST-segment elevation myocardial infarction
OR	odds ratio
PCI	percutaneous coronary intervention

PCWP	pulmonary capillary wedge pressure
PH	parenchymal hemorrhage
PRAGU	Primary Angioplasty in patients transferred from General Community hospitals to specialized PTCA Unites
RBBB	right bundle-branch block
RR	relative risk
RRR	relative risk reduction
RV	right ventricular, right ventricle
SAVE	Survival and Ventricular Enlargement
SCD	sudden cardiac death
SHOCK	SHould we emergently revascularize Occluded Coronaries for cardiogenic shock
SPECT	single-photon emission computed
STEMI	ST-elevation myocardial infarction
STS	Society of Thoracic Surgeons
SVG	saphenous vein graft
TEE	transesophageal echocardiography
TIA	transient ischemic attack
TIMI	Thrombolysis In Myocardial infarction
TLC	Therapeutic Lifestyle Changes
TnC	troponin C
TNF	Tumor Necrosis Factor
TnI	troponin I
TnT	troponin T
tPA	tissue plasminogen activator
TTP	thrombotic thrombocytopenia
UA	unstable angina
UFH	unfractionated heparin
VALIANT	Valsartan in Acute Myocardial Infarction Trial
VF	Ventricular Fibrillation
VSR	Ventricualr Septal Rupture
VT	Ventricular Tachycardia
WARIS	Warfarin- Aspirin Reinfarction Study
WHI	Women Health Initiative
WHO	World Health Organization

Introduction

The acute coronary syndromes encompass a spectrum of unstable coronary artery disease from unstable angina to transmural myocardial infarction. All have a common aetiology in the formation of thrombus on an inflamed and complicated atheromatous plaque. The principles behind the presentation, investigation and management of these syndromes are similar with important distinctions depending on the category of acute coronary syndrome.

An epidemic of coronary heart disease (CHD) began during the 20th century in most industrialized countries, where CHD is a leading cause of mortality among adults. Developing countries show the beginnings of the same epidemic.

Reliable information on population incidence, prevalence, and case-fatality rates of CHD is essential in understanding, treating, and controlling the epidemic but is generally unavailable. Consistent and universal definitions of cases of CHD allow the determination of rates and comparisons within and between populations.

These case definitions are essential to epidemiological studies and other research, such as clinical trials, quality assurance, and economic analysis of healthcare costs. The need for standardization is clear, and this statement recommends updated definitions.

The WHO estimated that in 2002, 12.6% of deaths worldwide were from ischemic heart disease. Ischemic heart disease is the leading cause of death in developed countries, but third to AIDS and lower respiratory infections in developing countries. (***World Health Organization Regional Office for Europe, 2002).***

Internationally: Cardiovascular diseases account for 12 million deaths annually throughout the world.

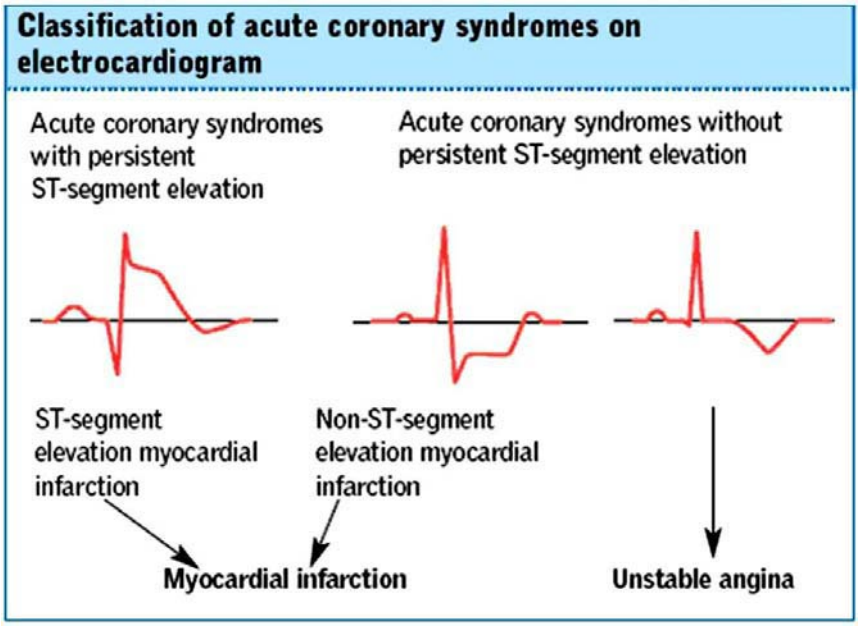
This essay addresses the diagnosis and management of patients with acute coronary syndromes (ACS) these life-threatening disorders are a major cause of emergency medical care and hospitalization worldwide.

Chapter 1

Definition of Acute Coronary Syndromes

DEFINITION OF ACUTE CORONARY SYNDROMES:

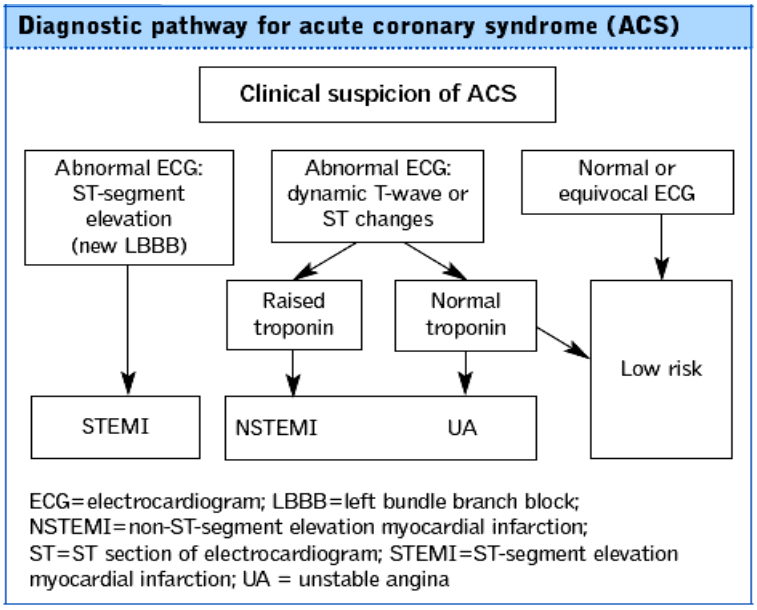
Acute coronary syndromes (ACS) are conditions characterized by the sudden onset of coronary insufficiency as a result of thrombotic occlusion of one or more coronary arteries. Three such conditions are identified: ST-segment elevation myocardial infarction (STEMI), non ST-segment elevation myocardial infarction (non-STEMI), and unstable angina (UA). **(Fig. 1-1) (*Rationale ,2001).***



Figure(1-1):Classification of acute coronary syndromes on electrocardiogram (*Rationale ,2001).*

The first condition (STEMI) is the result of complete and sustained thrombotic coronary occlusion, while the last two conditions (non-STEMI and UA) are result of either partial thrombotic coronary occlusion or transient complete occlusion with spontaneous revascularization.The definition of acute coronary syndrome depends on the specific characteristics of each element of the triad of clinical presentation (including a history of coronary artery disease), electrocardiographic

changes and biochemical cardiac markers. An acute coronary syndrome may occasionally occur in the absence of electrocardiographic changes or elevations in biochemical markers, when the diagnosis is supported by the presence of prior documented coronary artery disease or subsequent confirmatory investigations.



Figure(1-2): Diagnostic pathway for acute coronary syndrome (ACS)

(*Rationale ,2001)*

The immediate management of a patient with an acute coronary syndrome is determined by the characteristics of the presenting electrocardiogram and, in particular, the presence or absence of ST segment elevation. In combination with the clinical presentation, an ST segment elevation acute coronary syndrome is defined by the presence of ≥1 mm ST elevation in at least two adjacent limb leads, ≥2 mm ST elevation in at least two contiguous precordial leads, or new onset left bundle branch block. In the absence of ST segment elevation (non-ST segment elevation acute coronary syndrome); patients are initially managed without emergency reperfusion therapy.**(fig 1-2)**

The main diagnostic categories of acute coronary syndrome, unstable angina and myocardial infarction, are defined by the serum concentration of cardiac enzymes and markers. The cardiac markers, troponin T and troponin I, are extremely sensitive to myocardial injury and damage; Minimal damage can be detected, allowing identification of 'micro- infarcts' where there is an elevation in the troponin concentration without a significant rise in creatine kinase or other cardiac enzymes. One consequence of the use of troponin measurement has been a blurring of the distinction between unstable angina and myocardial infarction.

The European Society of Cardiology (ESC) and American College of Cardiology (ACC) state that any elevation, however small, of a troponin or the creatine kinase MB (muscle, brain) isoenzyme is evidence of myocardial necrosis and that the patient should be classified as having myocardial infarction, however small. ***(Van de Werf F, et al. 2003).***

The global registry of acute coronary events (GRACE) uses these diagnostic criteria for acute myocardial infarction and unstable angina as shown below.

GRACE diagnostic criteria for acute myocardial infarction and unstable angina:

I. Acute myocardial infarction.

Symptoms felt to be consistent with cardiac ischemia within 24 hours of hospital presentation and at least one of the following: increase in cardiac enzymes: Creatine kinase MB fraction >2 times upper limit of the hospital's normal range OR if no creatine kinase MB fraction available, then total creatine phosphokinase >2 times upper limit of the hospital's normal range and/or positive troponin I or T results (if performed). ST segment elevation acute myocardial infarction is defined as persistent ST segment elevation of ≥1 mm in 2 contiguous electrocardiographic leads or the presence of a new left bundle branch block in the setting of positive cardiac enzyme results. Non-ST-segment elevation myocardial infarction is defined as occurrence of acute myocardial infarction in the setting of