NEW TRENDS IN PRE-OPERATIVE ASSESSMENT OF CARDIAC PATIENTS IN NON-CARDIAC SURGERY

An Essay

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وأنزل الله عليك
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✍ **Ahmed S. El Faioumy**

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List of Abbreviations

AAA..... Abdominal aortic aneurysm

ACEI..... Angiotensin converting enzyme inhibitor

ACHD..... Adult congenital heart disease

ACS..... Acute coronary syndrome

AF..... Atrial fibrillation

AR..... Aortic regurgitation

ARB..... Angiotensin receptor blocker

AS..... Aortic stenosis

ASA..... American Society of Anesthesiologists

AVR..... Aortic valve replacement

b.i.d..... bis in diem (twice daily)

BMS..... Bare-metal stent

BNP..... B-type natriuretic peptide

bpm..... Beats per minute

CABG..... Coronary artery bypass graft

CAD..... Coronary artery disease

CAS..... Carotid artery stenting

CHF..... Congestive heart failure

CIEDs..... Cardiovascular implantable electronic devices

COP..... Cardiac output

CPG..... Clinical practice guideline

CT..... Computed tomography

CVD..... Cardiovascular disease

List of Abbreviations (Cont...)

CYP3a4	Cytochrome P3a4 enzyme
DAPT	Dual anti-platelet therapy
DECREASE	Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress Echocardiography
DES	Drug-eluting stent
DSE	Dobutamine stress echocardiography
ECG	Electrocardiography
EF	Ejection fraction
EMI	Electromagnetic interference
ESA	European Society of Anesthesiology
ESC	European Society of Cardiology
EVAR	Endovascular abdominal aortic aneurysm repair
GDMT	Guideline-directed medical therapy
HF	Heart failure,
ICD	Implantable cardioverter defibrillator
ICU	Intensive care unit
IHD	Ischemic heart disease
INR	International normalized ratio
LMWH	Low molecular weight heparin
LV	Left ventricular
LVEF	Left ventricular ejection fraction
MACE	Major adverse cardiac events
MaVS	Metoprolol after Vascular Surgery

List of Abbreviations (Cont...)

METs ..... Metabolic equivalent tasks

MI ..... Myocardial infarction

MICA ..... Myocardial Infarction Cardiac Arrest

MPI ..... Myocardial perfusion imaging

MR ..... Mitral regurgitations

MRI ..... Magnetic resonance imaging

MS ..... Mitral stenosis

NB ..... No benefit

NOAC ..... Non-vitamin K oral anticoagulant

NSQIP ..... National Surgical Quality Improvement Program

NSTE-ACS ..... On-ST-elevation acute coronary syndromes

NT-proBNP ..... N-terminal pro-BNP

O2 ..... Oxygen

PAC ..... Pulmonary artery catheter

PAD ..... Peripheral artery disease

PAH ..... Pulmonary artery hypertension

PARTNER ..... Placement of Aortic Transcatheter Valves

PCI ..... Percutaneous coronary intervention

POBBLE ..... Peri-Operative Beta-BLockadE

POISE ..... Peri-Operative Ischemic Evaluation

POISE-2 ..... Peri-Operative Ischemic Evaluation 2

q.d ..... Quaque die (once daily)

List of Abbreviations (Cont...)

RCRI..... Revised Cardiac Risk Index

RV..... Right ventricular

STEMI..... ST-elevation myocardial infarction,

SVR..... Systemic vascular resistance

SVT..... Supraventricular tachycardia

TAVR..... Trans-catheter aortic valve replacement

TEE..... Transoesophageal echocardiography

TIA..... Transient ischemic attack

UA/NSTEMI..... Unstable angina/non–ST-elevation myocardial infarction

UFH..... Unfractionated heparin

VHD..... Valvular heart disease

VKA..... Vitamin K antagonist

VPB..... Ventricular premature beat

VT..... Ventricular tachycardia

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INTRODUCTION

Worldwide, more than 200 million adults undergo major non-cardiac surgery each year, and the number of such patients is increasing. Both the average age of patients and the risk of cardiac complications are increasing in this group ***(Siddiqui et al., 2012).***

Although major non-cardiac surgery has the potential to improve the quality and prolong the duration of a patient's life, surgery may also precipitate complications such as death from cardiac causes as myocardial infarction, cardiac arrest, or congestive heart failure ***(Devereaux and Sessler, 2015).***

Each year, more than 10 million adults worldwide have a major cardiac complication in the first 30 days after non-cardiac surgery. If perioperative death was considered as a separate category, it would rank as the third leading cause of death in the United States. Major perioperative cardiac complications are important because they account for at least one third of perioperative deaths, result in substantial rates of complications, prolonged hospitalization, and increase medical costs ***(Botto et al., 2014).***

Surgery and anesthesia are associated with activation of the sympathetic nervous system, inflammation, hypercoagulability, hemodynamic compromise, and hypothermia, all of which can trigger cardiac complications ***(Kamel et al., 2012).***

Accurate preoperative estimation of the risk of perioperative cardiac events is important as it can guide decisions about; treatment (e.g., whether to use an endovascular or an open surgical approach), the location of postoperative care (e.g., recovery in a monitored setting or an unmonitored setting), intensity of postoperative care (e.g., daily troponin measurements or no measurement of troponin levels) and the urgency of surgery (e.g., If the surgery is not an emergency, there is opportunity to consider postponing or cancelling surgery in high risk patients or converting to lower risk procedures such as laparoscopic or less extensive surgery) ***(Greenhalgh et al., 2010).***

Clinical surgical risk and functional capacity are assessed to determine which patients will benefit from further testing and modification of perioperative management. Furthermore, cardiac risk assessment can identify patients who require long term cardiovascular risk management ***(Poldermans et al., 2009).***

Aim of the Work

The aim of the work is to discuss the recent updates in pre-operative assessment and risk reduction strategies of cardiac patients undergoing major non-cardiac surgeries.

Chapter I

RISK FACTORS IN CARDIAC PATIENTS UNDERGOING NON-CARDIAC SURGERY

I. Surgical Risk for Cardiac Events:

Cardiac complications after non-cardiac surgery depend on specific risk factors and the type of surgery with the circumstances under which it takes place. Surgical factors that influence cardiac risk are related to the urgency, magnitude, type, and duration of the procedure, as well as the change in body core temperature, blood loss, and fluid shifts ***(Mangano, 2004).***

Every operation elicits a stress response. This response is initiated by tissue injury and mediated by neuroendocrine factors, and may induce tachycardia and hypertension. Fluid shifts in the perioperative period add to the surgical stress. This stress increases myocardial oxygen demand ***(Poldermans et al., 2010).***

Surgery causes alterations in the balance between prothrombotic and fibrinolytic factors, resulting in hypercoagulability and possible coronary thrombosis

(elevation of fibrinogen and other coagulation factors, increased platelet activation and aggregation, and reduced fibrinolysis). The extent of such changes is proportionate to the extent and duration of the intervention. All these factors may cause myocardial ischemia and heart failure (HF). Certainly in patients with high risk, attention to these factors should be given and lead, if indicated, to adaptations in the surgical plan ***(Poldermans et al., 2010).***

Although patient specific factors are more important than surgery specific factors in predicting the cardiac risk for non-cardiac surgical procedures, the type of surgery cannot be ignored when evaluating a particular patient undergoing an intervention. With regard to cardiac risk, surgical interventions can be divided into low risk, intermediate risk, and high risk groups with estimated 30-day cardiac event rates (cardiac death and MI) of <1, 1–5, and >5%, respectively. This risk stratification provides a good indication of the need for cardiac evaluation, drug treatment, and assessment of risk for cardiac events ***(Fleisher et al., 2008).***