

***Preoperative and Postoperative Management of
Acute Coronary Syndrome in I.C.U. in patient
undergoing Non-Cardiac Surgery***

Essay

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List of abbreviations

AAA	Abdominal aortic aneurysm
ACA.....	American College of Cardiology
ACE.....	Angiotensin converting enzyme
ACS.....	Acute coronary syndrome
AF.....	Atrial fibrillation
AHA.....	American Heart Association
BNP.....	Brain natriuretic peptide
CABG.....	Coronary artery bypass grafting
CAD.....	Coronary artery disease
CARP	Coronary artery revascularization prophylaxis
CASS.....	Coronary artery surgery study
COPD.....	Chronic obstructive pulmonary disease
COX-2.....	Cyclooxygenase-2
CPET.....	Cardiopulmonary exercise testing
CRP	C-reactive protein
cTnI.....	Cardiac troponin I
cTnT.....	Cardiac troponin T
CVD.....	Cardiovascular disease
DECREASE.....	Dutch Echocardiographic Cardiac Risk Evaluating Applying Stress Echo
DES.....	Drug-eluting stent
DSE.....	Dobutamine stress echocardiography
DTS.....	Dipyridamole Thallium Scintigraphy
ECG.....	Electrocardiography

ESC.....European Society of Cardiology

HF.....Heart failure

HMG-CoA.....Hydroxymethyle Glutaryl Coenzyme-A

ICD.....Implantable cardioverter-defibrillator

ICU.....Intensive care unit

IHD.....Ischaemic heart disease

IHD.....Ischemic heart disease

INR.....International normalized ratio

LAD.....Left anterior descending

LCA.....Left coronary artery

LMWH.....Low molecular weight heparin

LV.....Left (ventricle-ventricular)

MET.....Metabolic equivalent

MI.....Myocardial infarction

NSTEMI.....Non-ST-segment elevation myocardial infarction

NT-proBNP.....N-terminal pro-brain natriuretic peptide

PACU.....Post anesthesia care unit

PCA.....Patient's-controlled analgesia

PCI.....Percutaneous coronary intervention

RCA.....Right coronary artery

RCRI.....Revised Cardiac Risk Index

SVT.....Supraventricular tachycardia

WHO.....World Health Organization

List of contents

	Page
• List of tables.....	iv
• List of figures.....	v
• Introduction.....	1
• Aim of the work.....	2
• Myocardial blood supply.....	٤
• Pathophysiology and diagnosis of MI.....	١٢
• Preoperative risk evaluation and management of cardiac risk.....	٢٣
• Postoperative management	٦٢
• Summary.....	٧٠
• Reference.....	٧٢
• Arabic summary.....	---

List of tables

	Page
١- Blood supply of the heart.....	٨
٢- Classification of risk factors for preoperative cardiovascular evaluation of patients with non-cardiac surgery.....	٢٥
٣- Surgical risk ^a estimate.....	28
4- Goldman & Detsky Clinical indices.....	٣١
٥- Revised Cardiac Risk Index.....	٣٢
٦- Recommendations on ECG.....	٣٥
٧- Recommendations on resting echocardiography.....	38
8- Recommendations on stress testing prior to surgery.....	38
9- Recommendations/statements on biomarkers.....	40
10- Recommendations on timing of non-cardiac surgery in cardiac-stable/asymptomatic patients with prior revascularization.....	47
11- Recommendation for prophylactic revascularization in stable/asymptomatic patients.....	50
12- Recommendations on prophylactic myocardial revascularization in patients with unstable IHD.....	52
13- Recommendations on β -blockers.....	54
14- Recommendations on statins.....	55
15- Recommendations on α_2 receptor agonists.....	56
16- Recommendations on ACE inhibitor use.....	57
17- Recommendations on calcium channel blockers.....	58
18- Recommendations on diuretics.....	60
19- Recommendations on aspirin.....	60

List of figures

	Page
1- Arterial supply of the heart.....	7
2-Cardiac veins.....	10
3-Cardiac evaluation and care algorithm for patients undergoing noncardiac surgery.....	33
4-ECG of Acute inferior and right myocardial infarction.....	36
5-Timing of release of various biomarkers after acute myocardial infarction.....	40
6-Proposed approach to the management of patients with previous PCI who require non-cardiac surgery, based on expert opinion.....	45

Classes of recommendations

Classes of recommendations	Definition
Class I	Evidences and/or general agreement that a given treatment or procedure is beneficial, useful, and effective.
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy.
Class IIb	Usefulness/efficacy is less well established by evidence/opinion.
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and some cases may be harmful.

Level of evidence

Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

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Introduction

Undoubtly cardiac disease are considered potential source of complications during surgery. The risk of perioperative complications depends on the condition of the patient prior to surgery. Cardiac complications can arise in patient with documented or asymptomatic ischemic heart disease (IHD), who undergoes procedures that are associated with prolonged hemodynamic and cardiac stress.

Ischemic cardiac events are a major cause of perioperative morbidity and mortality in non-cardiac surgery; 10 – 40% of the perioperative deaths are due to Myocardial Infarction (MI) (**Poldermans et al., 2009**).

Risk factors for coronary ischemic disease are as important as symptoms of ischemia because it is not diagnosed in 40 % of men and 60 % of women before an acute coronary syndrome (Unstable Angina , Acute M.I.) , or sudden death occur (**Fisher et al., 2009**).

There is no accepted gold standard for diagnosis of myocardial ischemia e.g. (ECG, Echocardiography, etc). As all techniques has considerable limitations regarding sensitivity and specificity. However, perioperative myocardial ischemia has predominantly been detected and defined by ECG (**Priebe , 2009**).

The goal in giving anesthesia to patients with ischemic heart disease is to achieve the best preoperative condition obtainable by treating conditions that correlate with perioperative risk. The next step is to monitor the conditions that correlate with perioperative risk and, by careful attention to detail, avoid circumstances that lead to perioperative risk (**Fleisher and Roizen, 2009**).

Successful preoperative and postoperative evaluation and treatment of cardiac patients undergoing non cardiac surgery requires careful framework and communication between the patients, primary care physician, anesthesiologist, and surgeon (**Berger et al., 2009**).

Aim of The Work

Currently there are no official ESC guidelines on preoperative risk assessment and perioperative cardiac management. The objective is to endorse a standardized and evidence-based approach to perioperative cardiac management. The guidelines recommend a practical, stepwise evaluation of the patient, which integrates clinical risk factors and test result with the estimated stress of the planned surgical procedure. This result in an individualized cardiac risk assessment, with the opportunity to initiate medical therapy, coronary intervention, and specific surgical and anesthetic techniques in order to optimize the patient's perioperative condition.

Myocardial Blood Supply

Anatomical considerations:

The heart is the pump of the systemic and pulmonary circulations. Irregular in shape; it lies obliquely across the mediastinum behind the sternum, suspended by the great vessels (*Ellis and Feldman, 2007*).

Vasculature of the heart:

The blood vessels of the heart comprise the coronary arteries and cardiac veins, which carry blood to and from the myocardium [Fig 1 and 2]. The endocardium and some subendocardium tissue located immediately external to the endocardium receive oxygen and nutrients by diffusion or microvasculature directly from the chambers of the heart. Occasionally parts of the vessels become embedded within the myocardium. The blood vessels of the heart receive both sympathetic and parasympathetic innervation (*Moore and Dalley, 2007*).

1-Arterial supply of the heart:

The coronary arteries-the 1st branch of aorta – supply the myocardium and epicardium of the heart. The right and the left coronary arteries arise from the corresponding aortic sinuses at the proximal part of ascending aorta, just superior to the aortic valve [fig 1 and 2] [table 1]. The coronary arteries supply both the atria and ventricle; as there is no sharp demarcation line exists between the ventricular distribution of coronary arteries (*Moore and Dalley, 2007*).

Dominance of the coronary arterial system is defined by which artery give rise to the posterior interventricular artery [posterior descending artery]. Dominance of the right coronary artery is typical [Fig. 1-A], where the right coronary artery is supplying most of diaphragmatic surface (*Moore and Dalley, 2007*).

The right coronary artery [RCA] arises from the right aortic sinus of the ascending aorta and runs in the coronary groove [L. sulcus]. Near its origin, the RCA usually gives off an ascending sinuatrial [SA] nodal branch that supply the SA node [fig 1-A]. The RCA then descends in the coronary groove and gives off the right marginal branch that supply the right border of the heart as it run toward [but does not reach] the apex of the heart. After giving off this branch, the RCA turns to the left and continues in the coronary groove to the posterior aspect of the heart. At the cross of the heart-the junction of the septa and the walls of the four heart chambers – the RCA gives rise to the AV nodal branch, which supplies the AV node. The RCA then gives off the large posterior interventricular artery that descends in the posterior inter-ventricular groove toward the apex of the heart. The posterior interventricular branch supplies both ventricles and sends perforating interventricular septal branches to the IV septum. Near the apex of the heart, the RCA anastomoses with the circumflex and anterior interventricular branches of the left coronary artery (**Moore and Dalley, 2007**).

Typically the RCA supplies;

- The right atrium.
- Most of right ventricle.
- Part of the left ventricle [the diaphragmatic surface].
- Part[usually the posterior third] of the AV septum.
- The SAN [in approximately 60% of people].
- The AVN [in approximately 80% of people].

(**Moore and Dalley, 2007**).

The left coronary artery [LCA] arises from the left aortic sinus of the ascending aorta [fig 1] and passes between the left auricle and pulmonary trunk in the coronary groove. In approximately 40% of people, the SA nodal branch arises from the circumflex branch of the LCA and ascends on the posterior surface of the left atrium to the SAN. At the left end of the coronary groove [Fig. 1], the LCA divides into two branches, an anterior interventricular branch [left anterior descending branch, LAD] and a circumflex branch. The anterior interventricular branch passes along the interventricular groove to the apex of the heart and anastomoses with the posterior interventricular branch of the right coronary artery (**Moore and Dalley, 2007**).

The anterior interventricular branch supplies both ventricles and the interventricular septum. In many people, the anterior interventricular branch gives rise to a lateral [diagonal] branch, which descends on the anterior surface of the heart. The smaller circumflex branch of the LCA follows the coronary groove around the left border of the heart to the posterior surface of the heart. The left marginal artery, a branch of the circumflex branch, follows the left margin of the heart and supplies the left ventricle. The circumflex branch of the LCA terminates on the posterior aspect of the heart and often anastomoses with the posterior interventricular branch of the RCA (**Moore and Dalley, 2007**).

Typically, the LCA supplies;

- The left atrium.
- Most of the left ventricle.
- Part of the right ventricle.
- Most of the IV septum [usually its anterior two-thirds], including the AV bundle of conducting tissue, through its perforating IV septal branches.
- The SAN [in approximately 40% of people].

The left coronary artery is dominant in approximately 70% of people [Fig. 1-B], and there is codominance in 10% of people (**Moore and Dalley, 2007**).

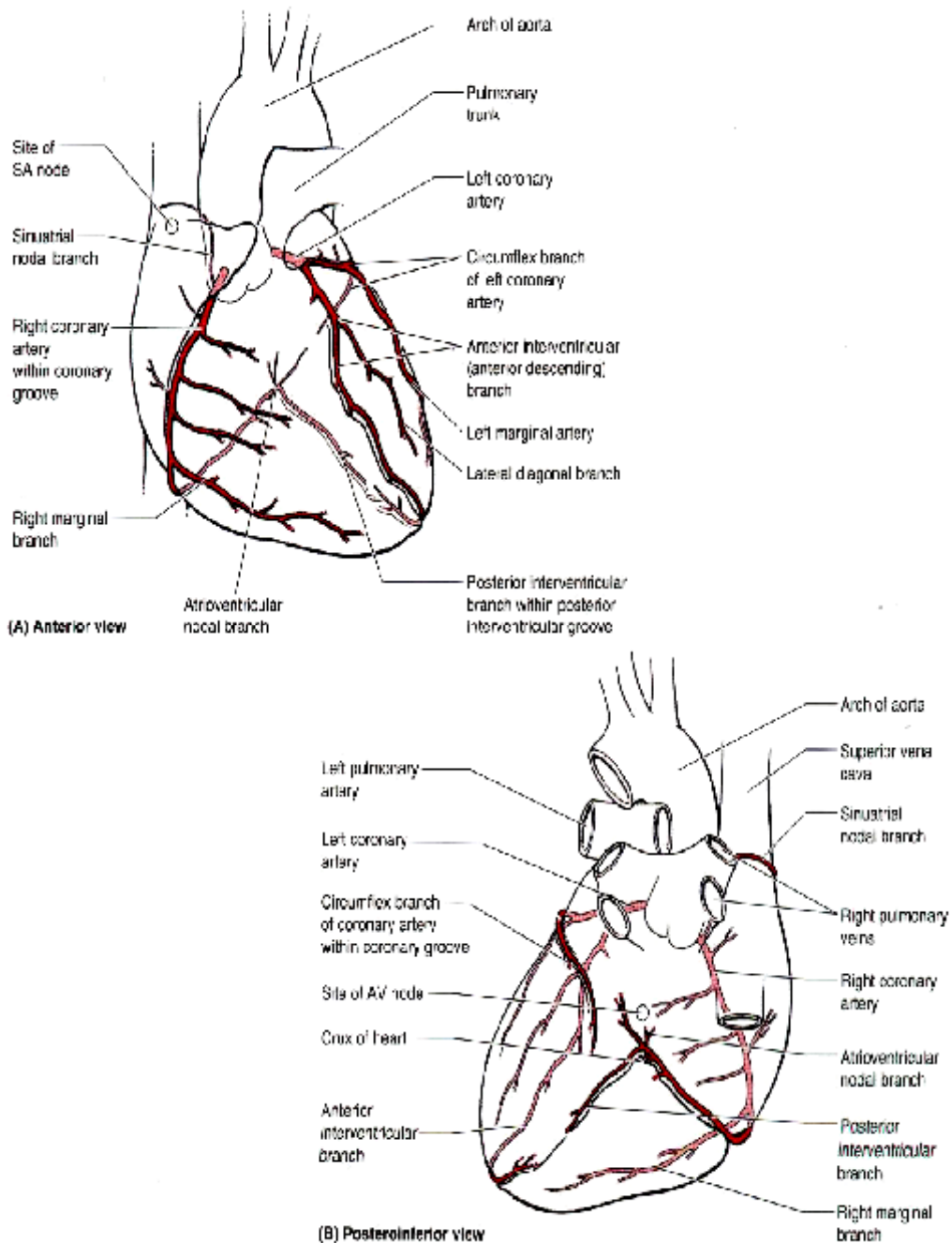


Figure (1): Arterial supply of the heart

A [Anterior view], B [Posterior view](Moore and Dalley, 2006).