# PERIOPERATIVE MANAGEMENT OF CARDIAC PATIENT

**Essay**

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| *ACC/ AHA* | American college of cardiologists/American heart association |
| *ACE* | Angiotensin converting enzyme |
| *ACS* | Acute coronary syndrome |
| *AMI* | Acute myocardial infarction |
| *ASA* | American society of anesthesiologists |
| *ATP* | Adenosine triphosphate |
| *AV node* | Atrioventricular node |
| *CABG* | Coronary artery bypass graft surgery |
| *CAD* | Coronary artery disease |
| *CCBs* | Calcium channel blockers |
| *CHF* | Congestive heart failure |
| *CK* | Creatine phosphokinase |
| *CNS* | Central nervous system |
| *COPD* | Chronic obstructive pulmonary disease |
| *DES* | Drug eluting stent |
| *DSE* | Dobutamine stress echocardiography |
| *ECG* | Electrocardiograph |
| *EF* | Ejection fraction |
| *HMG-CoA* | Hydroxy-methyl-glutamyl co-enzyme A |
| *ICU* | Intensive care unit |
| *IHD* | Ischemic heart disease |
| *ISA* | Intrinsic sympathetic activity |
| *LDH* | Lactate dehydrogenase |
| *LDL* | Low density lipoprotein |
| *LVH* | Left ventricular hypertrophy |
| *MAC* | Minimum alveolar concentration |
| *MACE* | Major adverse cardiac events |

| | |
|---|---|
| *MI* | Myocardial infarction |
| *NSTEMI* | Non ST-elevation myocardial infarction |
| *PCI* | Percutaneous coronary intervention |
| *PCWP* | Pulmonary capillary wedge pressure |
| *PMI* | Postoperative myocardial infarction |
| *SGOT* | Serum glutamate O transaminase |
| *STEM* | ST-elevation myocardial infarction |
| *TEE* | Transeosophageal echocardiography |
| *VLDL* | Very low density lipoprotein |
| ***WHO*** | World health organization |
| $\alpha$ | Alpha receptors |
| $\beta$ | Beta receptors |

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# ABSTRACT

Proper anesthetic management of IHD patients undergoing noncardiac surgery needs careful preoperative evaluation of the patient which involves risk stratification, evaluation of functional capacity, and evaluation of the surgical intervention which includes the urgency of the operation and the surgical risk. Some patients may need further diagnostic interventions (such as stress ECG, DSE and Radionuclide myocardial perfusion imaging) and therapeutic procedures (such CABG and PCI with or without stents). The decision to stop or continue antiplatelet therapy with aspirin with or without clopidogrel should be weighed carefully and discussed with the surgeon, cardiologists, and anesthesiologist so as to avoid major intraoperative bleeding and in the same time avoid the risk of stoppage of antiplatelet drugs especially in patients with Drug Eluting Stents. Avoiding perioperative tachycardia by the use of beta blockers and clonidine and also by achieving proper depth of anesthesia is more important than choice of the anesthetic technique and anesthetic agent. Monitored anesthesia care was proved to have the highest incidence of postoperative cardiac events in IHD patients while no difference between general and regional anesthetic techniques. Perioperative pain management, perioperative control of blood glucose, avoidance of anemia (hematocrit 28-30%), and avoidance of hypothermia are important aspects of perioperative management of IHD patients undergoing noncardiac surgery.

Keywords:

Cardiac Patient

Perioperative management

Anesthesia

CABG

# INTRODUCTION

The pathophysiological events that occur with the trauma of surgery and the perioperative administration of anesthetic and pain-relieving drugs often affect the physiology of cardiac function and dysfunction to great degrees. Specific integration of these changes with the consultative evaluation is a field into itself and beyond the scope of these guidelines. The information provided by the cardiovascular consultant needs to be integrated by the anesthesiologist, surgeon, and postoperative caregivers in preparing an individualized perioperative management plan, Successful perioperative evaluation and management of high-risk cardiac patients undergoing noncardiac surgery requires careful teamwork and communication between surgeon, anesthesiologist, the patient's primary caregiver, and the consultant **(Takagi et al., 2002)**.

There are many different approaches to the details of the anesthetic care of the cardiac patient. Each has implications regarding anesthetic and intraoperative monitoring. In addition, no study has clearly demonstrated a change in outcome from the use of the following techniques: a pulmonary artery catheter, ST-segment monitor, transesophageal echocardiography (TEE), or intravenous nitroglycerin. Therefore, the choice of anesthetic and intraoperative monitors is best left to the discretion of the anesthesia care team. Intraoperative management may be influenced by the perioperative plan, including need for postoperative monitoring, ventilation, and analgesia. Therefore, a discussion of these issues before the planned

surgery will allow for a smooth transition through the perioperative period **(Smith et al., 2006)**.

Multiple studies have examined the influence of anesthetic drugs and techniques on cardiac morbidity. In a large-scale study of unselected patients, coexisting disease and surgical procedure were the most important determinants of outcome **(Mcfadden et al., 2004)**.

All anesthetic techniques and drugs are associated with known effects that should be considered in the perioperative plan. Opioid-based anesthetics have become popular because of the cardiovascular stability associated with their use. The use of high doses, however, is associated with the need for postoperative ventilation. Because weaning from the ventilator in an intensive care setting has been associated with myocardial ischemia, this feature is important in the overall risk-benefit equation.

Neuraxial anesthetic techniques include spinal and epidural approaches. Both techniques can result in sympathetic blockade, resulting in decreases in both preload and after-load **(Park WY et al., 2001)**.

From the cardiac perspective, pain management may be a crucial aspect of perioperative care. Because the majority of cardiac events in noncardiac surgical patients occur postoperatively, the value of prophylactic nitroglycerin infusions for high-risk patients, Heart failure (HF) is one of the few cardiac conditions that is increasing. Despite a better understanding of how hormones and other signaling systems underlie the pathophysiology, and despite improved outcomes from pharmacologic therapy, many HF patients receive no effective

treatment. Patients with HF commonly require medical diagnosis and management in operating rooms and critical care units; thus anesthesiologists are obliged to remain up-to-date both with advances in outpatient (chronic) medical management and with inpatient treatments for acute exacerbations of HF. Angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, ß-adrenergic receptor blockers, and aldosterone antagonists usually included in treatment for patients with chronic HF. implications of chronic HF for patients undergoing surgery and anesthesia and how best provide intensive treatment for acute exacerbations of symptoms, such as might be caused by excessive intravascular volume, inappropriate drug or worsening of the underlying cardiac disease **(Mangano, 2002)**.

Coronary artery disease, hypertension, valvular heart disease, supplemental preoperative evaluation, perioperative therapy including preoperative coronary revascularization with coronary artery bypass grafting or PCI, perioperative medical therapy, intraoperative electromagnetic interference with implanted pacemakers and cardioverter defibrillators, anesthetic considerations and intraoperative management will be discussed as intraoperative management, perioperative pain management, management of patients must continue after risk assessment to the postoperative setting **(Mangano, 2002)**.

# AIM OF THE WORK

Lowering the immediate perioperative cardiac risk, as well as assessing the need for subsequent postoperative risk stratification and interventions directed at modifying coronary risk factors value of routine prophylactic medical therapy versus more extensive diagnostic testing and interventions.

# ANATOMY OF THE CORONARY CIRCULATION

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, 1996)**.

**Blood supply:**

Arterial supply to the heart is via the left and right coronary arteries, so termed because they form a circle (corona) around the atrioventricular groove. While these arteries and their branches do anastomose with each other, the anastomoses are not sufficiently large to maintain a collateral circulation if a major branch is occluded. They are therefore functional end arteries. Thus the sudden occlusion of a major artery may result in sudden death, but more slowly developing occlusion of smaller branches may allow time for a collateral circulation to develop **(Ellis and Feldman, 1996)**.

**Arterial blood supply:**

The right coronary artery arises from the anterior aortic sinus or right sinus of Valsalva, just above the anterior cusp of the aortic valve. It passes forward between the right atrium and pulmonary trunk and descends along the right atrioventricular groove to the inferior border of the heart where it turns round to the posterior surface and anastomoses with the left coronary artery at the posterior interventricular groove. It gives a marginal branch at the lower border of the heart, which runs to

the left towards the apex, and in 80% of cases it terminates as the posterior interventricular branch, which supplies the interventricular septum. In view of the fact that the interventricular septum contains the bundle of His and its branches, the interventricular arteries are of particular importance (especially the inferior one). The right coronary artery supplies the sinoatrial node in 60% of individuals and, in 85%, the atrioventricular node and the posterior and inferior parts of the left ventricle. Conduction abnormalities are commonly associated with the occlusion of the right coronary artery **(Moffat, 1993)**.

The left coronary artery arises from the posterior aortic sinus or left sinus of Valsalva. It passes forward behind the pulmonary trunk and then divides in the space between the aorta and pulmonary artery into the left anterior interventricular artery (anterior descending artery) and the circumflex branch. The anterior interventricular artery passes along the anterior interventricular groove towards the apex, turns round the lower border and anastomoses with the posterior interventricular artery. The major branches of the left anterior interventricular artery are the diagonal branches, which supply the free wall of the left ventricle, and the septal branches, which supply the interventricular septum. The diagonal and septal branches are important landmarks in the description of lesions in the left anterior descending artery **(Lumely et al., 1995)**.

The circumflex artery passes laterally around the left border of the heart to reach the posterior interventricular groove. It supplies the

sinoatrial node in 40% of individuals and the lateral wall of the ventricle via the marginal arteries **(Lumely et al., 1995)**.

Generally, therefore, the left coronary artery supplies the left ventricle and the right coronary artery supplies the right ventricle; both supply the interventricular septum and the atria are supplied in a variable manner. Variations in this anatomical pattern do occur. In less than 20% of individuals, the circumflex artery give rise to the posterior descending artery and the left coronary artery supplies the whole of the interventricular septum and atrioventricular node. Thus, the left coronary artery is the most important supply for the left ventricle unless the posterior descending artery arises from the right coronary artery **(Lumely et al., 1995)**.

**Venous drainage:**

The veins of the heart follow the pattern of the arteries although they have different names. Approximately two-thirds of the myocardial venous drainage is via the coronary sinus and anterior cardiac veins into the right atrium. The remaining blood drains by means of small veins (venae corde minimae) that open directly into the cavities of the heart. The coronary sinus, a continuation of the great cardiac vein, is formed at the left border of the heart and passes to the right in the posterior interventricular groove. It enters the right atrium near the orifice of the inferior vena cava **(Lumely et al., 1995)**.

The coronary sinus receives the following:

- Great cardiac vein drains both ventricles.