

Anaesthetic Management of Ischemic Heart Disease Patients in Noncardiac Surgery

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ABSTRACT

Perioperative myocardial infarction is one of the most important predictors of short and long term morbidity and mortality associated with noncardiac surgery. Myocardial Infarction occurs whenever myocardial oxygen supply does not match myocardial oxygen demand. Intraoperative ischemia can be precipitated by increase in myocardial oxygen demand caused by tachycardia, hypertension, anaemia, stress, sympathomimatic drugs or discontinuation of beta blocker. Clinical predictors of perioperative cardiac morbidity are acute myocardial Infarction or recent myocardial infarction, unstable or severe angina, decompensated heart failure, severe valvular disease, mild angina pectoris, previous myocardial infarction, diabetic mellitus etc. The preoperative history is meant to elicit the severity, progression and functional limitations imposed by ischemic heart disease. Limited exercise tolerance in the absence of significant lung disease is very good evidence of decreased cardiac reserve. The basic challenges during induction and maintenance of anaesthesia in patients with ischemic heart disease are prevent myocardial infarction by increasing myocardial O₂ supply and reducing myocardial O₂ demand & monitor for ischemia and to treat ischemia if it develops.

There are no one best myocardial protective agents or technique. Maintenance of balance between myocardial oxygen supply and demand is more important than the specific technique or drugs selected to produce anaesthesia and muscle relaxation. Potential benefits of a regional anaesthetic include excellent pain control, a decreased incidence of deep vein thrombosis (DVT) in some patients and the opportunity to continue the block into the postoperative period. The postoperative period appears to present the highest risk for cardiac morbidity. It is during this period where 67% of the ischemic events occur. Effective pain management is essential to prevent these adverse outcomes. Successful perioperative evaluation and treatment of cardiac patients undergoing noncardiac surgery requires careful teamwork and communication between patient, anaesthesiologist and surgeon.

Key words: Perioperative, myocardial infarction, Non cardiac surgery.

INTRODUCTION

Perioperative myocardial infarction is one of the most important predictors of short and long term morbidity and mortality associated with noncardiac surgery. It is estimated that 500,000

to 900,000 perioperative myocardial infarction occur annually worldwide. The incidence of perioperative cardiac injury is cumulative result of preoperative medical condition, the specific surgical procedure, expertise of the surgeon and

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the overall anaesthetic care in a particular institution. In the perioperative period ischemic changes are often silent, that is not associated with chest pain.¹ There is pathologic and morphologic evidence that the etiology of perioperative myocardial infarction resembles that in the nonsurgical setting, myocardial O₂ supply/demand mismatch being the main trigger of myocardial injury.² There is a significant association between troponin levels and short and long-term morbidity and mortality in surgical patients. This association exists for cardiac death, myocardial infarction, myocardial ischemia, congestive heart failure, cardiac dysarrhythmia and cerebrovascular accident.

Mechanism of Perioperative Myocardial Infarction

Fifty percent or more of ischemic episodes may be unrelated to the indices of oxygen demand, suggesting decreased oxygen supply as the primary cause. Potential etiologies for decreased supply include external factors, such as hypotension, tachycardia, anaemia, increased filling pressure, hypoxemia and decreased cardiac output. In addition internal factors such as acute coronary artery myocardial infarction occur whenever myocardial oxygen supply does not match myocardial oxygen demand. Intraoperative ischemia can be precipitated by increase in myocardial oxygen demand caused by tachycardia, hypertension, anaemia, stress, sympathomimetic drugs or discontinuation of beta blocker. Thrombosis and spasm also may play a role. Ischemia occurs (67%) at the end of anaesthesia, during a period characterized by high sympathetic output, hypercoagulability, hypertension and tachycardia.¹

Clinical Predictors:

Clinical predictors of perioperative cardiac morbidity are categorized into major, intermediate and minor factors.

Major

Acute coronary syndromes: Acute myocardial infarction or post myocardial infarction angina
 Unstable or severe angina
 Decompensated heart failure
 Severe valvular disease
 Significant arrhythmias
 High grade AV block
 Symptomatic ventricular arrhythmias
 Supraventricular arrhythmias

Intermediate

Mild angina pectoris
 Previous myocardial infarction
 Compensated or previous heart failure
 Diabetes mellitus
 Renal insufficiency

Minor

Advanced age
 Abnormal ECG [Left Ventricular Hypertrophy, Left Bundle Branch Block]
 Rhythm other than sinus
 Low functional capacity
 History of stroke
 Uncontrolled systemic hypertension

Surgery-specific cardiac risk factors:

High-risk surgery (cardiac risk >5%): Major emergency surgery, aortic & other major vascular surgery and prolonged procedures associated with large fluid shifts and/or blood loss.

Intermediate-risk (cardiac risk < 5%): Carotid endarterectomy, head and neck surgery, intraperitoneal and intrathoracic, orthopedic and prostate surgery.

Low-risk (cardiac risk < 1%): Endoscopic and superficial procedures, cataract surgery and breast surgery.¹

Preoperative Management

Goals

Determining the extent of ischemic heart disease or any previous intervention like coronary artery bypass graft, percutaneous coronary intervention.

Determining the severity and stability of the disease.

Reviewing medical therapy and noting any drugs that can increase the risk of surgical bleeding or contraindicate a particular anaesthetic technique.

Preoperative Evaluation

History

The preoperative history is meant to elicit the severity, progression and functional limitations imposed by ischemic heart disease. Limited exercise tolerance in the absence of significant lung disease is very good evidence of decreased cardiac reserve. If a patient can climb two to three flights of stairs without symptoms, it is likely that cardiac reserve is adequate.

Silent Myocardial Ischemia

A history of ischemic heart disease or abnormal ECG suggestive of a previous myocardial infarction is associated with an increased incidence of silent myocardial ischemia.

It is estimated that nearly 75% of ischemic episodes in patients with symptomatic ischemic heart disease are not associated with angina pectoris and 10%-15% of acute myocardial infarctions are silent.¹ There is increased incidence of silent myocardial infarction in diabetic patients.

Previous Myocardial Infarction

A history of myocardial infarction is an important piece of information. It is common practice to delay elective surgery for at least six weeks

following of acute myocardial infarction. Acute and recent myocardial infarction and unstable angina incur the highest risk of perioperative myocardial ischemia, myocardial infarction and cardiac death.

Elective noncardiac surgery should be delayed for 4-5 weeks after coronary angioplasty. It is prudent to delay elective noncardiac surgery for 6 weeks after PCI with bare metal stent placement and as long as 12 months in patients with drug-eluting stent placement.³

Role of Cardiac Intervention

Preoperative intervention is rarely necessary just to lower the risk of surgery. An intervention is indicated or not indicated irrespective of the need for surgery. Preoperative testing should be performed only if it is likely to influence perioperative management.

In a high risk subset of patient:

Left main disease

Severe multivessel disease

Severe aortic stenosis

Ejection fraction of less than 20%

Revascularization/valve replacement may be indicated⁴

Drugs before Surgery

Patient with IHD are usually on a variety of medications. All antianginal drugs, specially beta blocker, should be continued up to the time of surgery. Sudden withdrawal of antianginal drug may produce rebound tachycardia and hypertension that may precipitate acute myocardial infarction beta-blockers and antihypertensive drugs to be continued and aspirin and clopidogrel to be discontinued.

Intraoperative Management

The basic challenges during induction and maintenance of anaesthesia in patients with IHD are:

- To prevent myocardial infarction by increasing myocardial O₂ supply and reducing myocardial O₂ demand.
- To monitor for ischemia and to treat ischemia if it develops.

Monitor

ECG

Blood pressure (Arterial BP, Non invasive BP)

Pulse oximetry

Oxygen analyzer

Temperature probe⁵

General Anaesthetic Agents

There appears to be no one best myocardial protective agents or technique. Maintenance of balance between myocardial oxygen supply and demand is more important than the specific technique or drugs selected to produce anaesthesia and muscle relaxation. Studies of more than 3000 noncardiac surgical patients with ischemic heart disease have concluded that anaesthetic type does not affect outcome. Crucial aspect of perioperative management is heart rate control and maintains adequate coronary perfusion pressure. Avoidance of hypotension and use of vasopressors to sustain coronary perfusion pressure. The use of nitrates is advocated as long as it does not compromise coronary perfusion pressure.⁶ Oxygen demand could be also reduced by correction of hypothermia. Oxygen delivery should be increased by correcting anaemia and increasing the inspired oxygen. Secondary therapies should consider the use of antiplatelet therapy such as aspirin. If necessary even consideration of the use of heparin intraoperative as long as not surgically contraindicated.

Regional Anaesthesia

Regional anaesthesia is an acceptable technique in patients with ischemic heart disease. However

the decrease in BP associated with epidural or spinal anaesthesia must be controlled. Prompt treatment of hypotension that exceeds 20% of preblock BP is necessary. Potential benefits of a regional anaesthetic include excellent pain control, a decreased incidence of DVT in some patients and the opportunity to continue the block into the postoperative period. However, the incidence of postoperative cardiac morbidity and mortality does not appear to be significantly different between general and regional anaesthesia.⁷

Postoperative Management

The postoperative period appears to present the highest risk for cardiac morbidity. It is during this period where 67% of the ischemic events occur. This period is characterized by increase in heart rate, blood pressure, sympathetic discharge and hypercoagulability. Postoperative myocardial infarction has also been associated with other clinical condition as hypothermia, postoperative pain and anemia.

Postoperative Pain Control

Marked changes occur in plasma catecholamine concentration, haemodynamics, ventricular function and coagulation. These stress place the patient at increased risk for development of adverse cardiac outcome. Effective pain management is essential to prevent these adverse outcomes. Patient-controlled intravenous analgesia (PCA) and/or Patient-controlled epidural analgesia are popular method for reducing postoperative pain.⁸

CONCLUSION

Successful perioperative evaluation and treatment of cardiac patients undergoing noncardiac surgery requires careful teamwork and communication between patient, anaesthesiologist and surgeon. Aggressive medical management to provide

myocardial protection during the perioperative period is a very important element in the reduction of cardiovascular complication.

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