Introduction: Successful perioperative management of patient with cardiac disease for elective noncardiac surgery requires multidisciplinary action. Most important is stratification and classification of patients to understand risk involved, optimization of patients with preoperative investigations and medications in order to reduce the risk of morbidity and mortality associated with major surgery. Methods and Materials: Hundred patients with cardiac disease were divided into 3 groups, Group A – Patients with only ECG changes, Group B – Patients with ischemic heart disease and Group C – Patients with valvular heart disease. These patients were studied for preoperative investigations required, time required for optimization, choice of anaesthesia plan and suitable technique used along with required monitoring and complications were treated. Results: Patients who were classified as ASA grade III and IV were having more risk involved for perioperative complications, especially patients who were given combined spinal epidural anaesthesia and general anaesthesia. Conclusion: Planning anaesthesia for cardiac patients undergoing non-cardiac surgery helps in decreasing morbidity associated in perioperative period by giving only epidural anaesthesia or supplementing epidural with general anaesthesia helps in maintaining vital parameters by preventing pain and its associated detrimental effects.

Different methods are used to assess cardiac risk viz. Goldman cardiac risk Index which was modified by evidence based simple index for the prediction of cardiac complications in major elective noncardiac surgery by American Heart Association ACC/AHA guideline of 2009.1,4,7

Aims and Objectives:
1. Preoperative risk stratification of cardiac patient for elective noncardiac surgery by application of ACC/AHA guidelines and Goldman cardiac risk index.
2. To study evaluation of patient with non-invasive and invasive methods for optimization of the patient before surgery.
3. To study effects of preoperative medications like Beta Blockers, statins and alpha-2 agonists in decreasing risk involved.5,6
4. Intraoperative choice of anaesthesia plan.
5. To study postoperative management, monitoring required and complications including morbidity and mortality associated with major noncardiac surgery.
Materials and Methods:

Patient population: 100 patients aged 50 years and above with pre-existing cardiac disease who underwent elective noncardiac surgery like ENT, Orthopaedic, General Surgery and Gynaecological procedures.

Data Collection: Clinical data were obtained from the structured evaluation provided by the anaesthesiologist in the Medical Record Department (MRD). This data was also used to obtain American Society of Anaesthesiologist (ASA) class for all the patients.

Inclusion criteria:
1. Patients with ASA grade I, II, III & IV Above 50 years
2. Patients with HT, DM, IHD, ECG changes
3. Patients with valvular heart disease

Exclusion criteria:
1. ASA grade I patients with normal ECG
2. Pregnant patient

Preoperative optimization of patient:

Physician should assess patient’s risk factors associated with preoperative morbidity and mortality. They are classified as having minor/intermediate and high risk factors depending upon the cardiac status as well as the type of the surgery. The main aim of the preoperative testing is to measure the functional capacity, identification of presence of myocardial ischemia or cardiac arrhythmias by ECG, 2 DECHO. Exercise tolerance test is most important determinant of risk. It is documented that serious complications associated with surgery were inversely proportional to flights of stairs that could be climbed.7

Once patient is classified for the risk involved further medications considered were beta blockers, statins and alpha2-agonists by the cardiologist. Patients who were already on the beta blockers were continued for the same. Patients undergoing high risk surgery were started on beta blockers to reduce the risk of ischemia or infarction in perioperative period.8,9

Patients with uncontrolled hypertension were given additional antihypertensive agents or given Labetolol in perioperative period to maintain blood pressure and to reduce the risk of stroke or ischemia.

Diabetic patients were carefully investigated to rule out silent ischemia and blood sugar was controlled before surgery with oral hypoglycaemic agents. Inj. Insulin was started in major surgery with postoperative prolonged fasting state. Hb1Ac was maintained up to 6 to 7%.

In our 100 patients coronary revascularization was advised in one patient only. But as this patient was for minor surgery which was relatively low risk, surgery was decided to perform before he was sent for CABG.10

Patients with valvular heart disease were started on endocarditis prophylaxis. Patients who were on antiplatelet agents like Clopidogrel was discontinued 7 days prior to surgery. Patients on low molecular weight heparin were discontinued only 12 hours before surgery. Warfarin was changed over to heparin at least 7 days before surgery. Aspirin was continued in minor surgeries for patients having high perioperative risk for ischemia.

Choice of anaesthetic plan:

Intraoperative management of patients having cardiac disease requires multidisciplinary team with careful physiological Consideration of following factors:

1. Preload – To maintain cardiac output and oxygen supply to all vital organs to prevent hypoxia and kidney failure.
2. Systemic vascular resistance – It is a major determinant of cardiac output. It is necessary to maintain at normal to high range.
3. Contractility – In many patients cardiac contractility is at risk with Hypokinesia or Akinesia. Avoid drugs which will further decrease contractility for example, level of spinal anaesthesia to be maintained at T8-6 level to prevent direct cardiac compression.
4. Heart rate and Rhythm – maintain sinus rhythm for adequate filling of heart
5. Avoid myocardial ischaemia – maintain myocardial oxygen supply/ demand balance.
6. Pulmonary vascular resistance – in Pulmonary Hypertension, Pulmonary Vascular Resistance is a major factor governing RV after load and cardiac output so prevent increases in PVR. These factors can be easily controlled by prevention of pain, hypoxia, hypercarbia and acidosis.11

Monitoring:

Radial artery cannulation and Central Venous Pressure monitoring allows beat to beat blood pressure monitoring and arterial blood gas (ABG) analysis with continuous monitoring of cardiac filling pressure, Pulmonary artery pressure and for guiding fluid and drug therapy.

Intraoperative Transoesophageal Echocardiography allows continuous assessment of filling of both ventricles. BIS monitoring helps to assess the depth of anaesthesia and subsequently maintaining the same.12

Choice of Anaesthetic Technique:

It depends upon the type of the surgery, major or minor. For all abdominal surgeries as well as orthopaedic and gynaecological surgeries, regional anaesthesia is a choice of anaesthesia.
Continuous epidural technique is preferred over spinal anaesthesia which could be detrimental and contraindicated to many patients having valvular disease and IHD.

In most patients epidural block was preferred as it can be administered in incremental doses with slower onset of action, to achieve desired level of block and adverse hemodynamic effects can be avoided. Additional advantage of epidural technique with epidural narcotics could be obtained for excellent postoperative pain relief and head low can be avoided which can result into chest congestion.

In patients requiring General Anaesthesia, like upper abdominal surgery, epidural analgesia was provided with minimum concentration of local anaesthetics and epidural opioids to decrease the requirement of general anaesthetics.

To decrease stress response associated with intubation, measures were taken like giving Inj. Labetolol or Esmolol, Inj. Lignocaine. Intraoperative hypotension was treated with Phenytoin in increments and volume replacement was solely on CVP measurement.

Ventilator management was dependant on EtCO2, respiratory peak pressure; PEEP was avoided in most patients by keeping high Oxygen concentration and moderate tidal volume.

Management of emergence from anaesthesia required maintaining heart rate and blood pressure. Valvular heart disease and IHD patients, it is important to avoid introduction of air or particulate matter in venous system which was taken care of. In Laparoscopic Surgery, special care was taken to achieve Pneumoperitoneum with slow insufflation of gases only up to 1-2 litre/min, avoiding excessive increase in intra-abdominal pressure (IAP) with its detrimental effects on hemodynamic. Pneumoperitoneum was kept for minimum duration and maintaining pressure up to 10 mm of Hg only.16

**Postoperative Management:**

Most patients under general anaesthesia and ASA class III & IV were shifted to Medical ICU for further monitoring and treatment if required. Good analgesia provided by epidural narcotics prevented complications like Hypertension, Tachycardia, increase in SVR and PVR.16

Oxygen supplementation was given to all the patients.

**Observation and Results:**

This was a retrospective study of 100 patients with Cardiac disease undergoing noncardiac surgery.

<table>
<thead>
<tr>
<th>Table 1: Characteristics of the Patient</th>
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<tbody>
<tr>
<td><strong>Surgery</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Orthopaedic Surgery</td>
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<td>Gynaecology</td>
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<td>General Surgery</td>
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<td>ENT /Plastic</td>
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<tr>
<td>Oncology</td>
</tr>
</tbody>
</table>

**A – Patients having only ECG changes.**

**B – Patients having Ischemic heart disease.**

**C – Patients having valvular heart disease**

**Table 2-Monitoring Required**

<table>
<thead>
<tr>
<th><strong>Surgery</strong></th>
<th><strong>Non-invasive Monitoring only (SPO2, NIBP, EtCO2, BIS, 12 lead ECG)</strong></th>
<th><strong>Invasive Monitoring (Invasive BP, CVP)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthopaedic Surgery</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>General Surgery</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>ENT Surgery</td>
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<td>1</td>
</tr>
<tr>
<td>Oncology</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>
Surgery | General | GA+Epidural | Plain Epidural | CSE
---|---|---|---|---
Orthopaedic Surgery | | 5 | | 14
Gynaecology | | 2 | | 5
General Surgery | 10 | 30 | 10 | 10
ENT/Plastic Surgery | 9 | | | 
Oncology | 5 | | | 

Table 4: Complications in perioperative period

<table>
<thead>
<tr>
<th>Surgery</th>
<th>Hypotension (%)</th>
<th>Hypertension (MAP&gt;110)</th>
<th>Bradycardia (PR&lt;50)</th>
<th>Tachycardia/Arhythmia (PR&gt;120)</th>
<th>Ischemia’s</th>
<th>Pulmonary Oedema</th>
<th>Cardiac arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthopaedic Surgery</td>
<td>10</td>
<td>4</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gynaecology</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
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<td></td>
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<tr>
<td>General Surgery</td>
<td>10</td>
<td>12</td>
<td>10</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>1</td>
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<tr>
<td>ENT/Plastic Surgery</td>
<td>4</td>
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<tr>
<td>Oncology</td>
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</tbody>
</table>

Table 7: Postponement of surgeries and reasons

<table>
<thead>
<tr>
<th>Surgery</th>
<th>Severe Hypertension</th>
<th>Ischaemia in preinduction</th>
<th>Presence of CCF</th>
<th>Other morbidities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthopaedic surgery</td>
<td></td>
<td></td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Gynaecology</td>
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<td>24</td>
</tr>
<tr>
<td>ENT/Plastic Surgery</td>
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<td></td>
<td>5</td>
</tr>
<tr>
<td>Oncology</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Postoperative Requirement of Physician’s care and reasons for the same: Patients with ASA grade III & IV who required general anaesthesia and were for major cardiac surgery were shifted to MICU for further management under physican's intensive care as chances of complications were very high in these patients (more than 20%)

Discussion:

Successful perioperative management of cardiac patients undergoing elective non-cardiac surgery requires team work and communication between patient, cardiologist, surgeon and Anaesthesiologist.

Main risk involved with cardiac patients is development of perioperative ischemia or infarction. In patients with valvular heart disease it can be Congestive Cardiac failure or pulmonary oedema, if not handled carefully. In major surgeries like Laparoscopic surgeries, more risk was involved because of hypercarbia, increased intraabdominal pressure and decrease in cardiac output. In this patient it is necessary to balance postoperative benefit with intraoperative risk involved.

Monitoring required is always more than in ASA grade I patient even though surgery is minor.

Most important factors which requires consideration in these patients is:

1. Invasive/non-invasive monitoring required
2. Choice of anaesthesia and type of surgery
3. Decreasing postoperative pain with adequate analgesia, thereby decreasing postoperative Oxygen demand and its consequences.
It was seen by observations that patients who were given only general anaesthesia and patients with combined spinal-epidural anaesthesia had more risk of cardiac complications like Hypertension, Hypotension, ARF, stroke, desaturation, hypoxia, and hypercarbia.

Advantage of plain Epidural anaesthesia - Slow changes in haemodynamic, incremental doses can be given, systemic vasodilatation, keeping surgical field clean, decreasing requirement of intravenous opioids which prevented postoperative sedation and respiratory depression.

In the postoperative period patients were able to breathe more deeply and maintain saturation as they were pain-free with good physiotherapy. In patients with general plus epidural anaesthesia minimum intravenous agents were given and BIS monitoring was done to measure depth of anaesthesia.

Conclusion:

Patients with cardiac disease have markedly increased morbidity and mortality during anaesthesia and surgery, but management of these patients based on physiologic principles can allow majority of patients safely to undergo surgical procedure. Epidural anaesthesia either alone or combined with general anaesthesia decreases risk of intraoperative and postoperative complications significantly.

References:


