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Original Article

Retrospective study of perioperative management of cardiac patients for noncardiac surgery

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ABSTRACT

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.

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Introduction

Successful perioperative management of patients with cardiac disease for noncardiac surgery requires multiple steps viz. recognising disease, diagnosing aetiology, assessing severity of the disease, assessing risk and benefits of the surgery, developing anaesthesia plan and managing the complications in perioperative period.

These patients may come for minor to major surgeries and they may have cardiac disease of mild to moderate to severe status. Incidence of perioperative complications depends upon the cardiac status of the patient and Anaesthesiologist plays a major role in this multidisciplinary approach. The main aim in patient management is to evaluate the risk associated with surgery1 which will help in preventing complications, immediate diagnosis and prompt treatment of complications to reduce morbidity and mortality which considerably high in these patients.[2]

The main risk involved in cardiac patients is development of myocardial ischemia and infarction in perioperative period.

Evaluation of patients, even though it may take longer time, is helpful in decreasing perioperative morbidity. Exercise tolerance is one of the most important predictors of perioperative risk and need for invasive monitoring like Central venous pressure or Arterial line which itself is associated with increased risk. Detailed cardiac studies and intervention before surgery should be avoided.[3]

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.

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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 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

Statins which are supposed to act by decreasing plaque stability and leucocytes adhesions were used in patient with risk of development of deep vein thrombosis. The drugs were used in high risk patients were Alpha -2 agonist like Clonidine, Calcium channel blockers and nitrates in order to maintain blood pressure and heart rate near normal. Heart rate was maintained around 60/min. and blood pressure upto140/90 mm Hg.3

Patients with preoperative chest congestion were started on nebulisation, bronchodilators, antibiotics and steroids. They were advised Inj. Deriphylline half an hour prior to surgery.

Patients with high serum creatinine value were treated by the Nephrologist with diuretics and were monitored for electrolyte imbalance, which was treated accordingly.

Patients with uncontrolled hypertension were given additional antihypertensive agents or given Labetelol 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 discontinue 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 canulation 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. Labetelol or Esmolol, Inj. Lignocaine. Intraoperative hypotension was treated with Phenylephrine 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.[13]

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.[14]

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 1: Characteristics of the Patient

Surgery	Cardiac disease			NYHA Classification	ASA grade		
	A	**B**	**C**		**II**	**III**	**IV**
Orthopaedic Surgery	**12**	**5**	**2**	Class I-17 Class IV -2	**4**	**12**	**3**
Gynaecology	**3**	**2**	**2**	Class II-5 Class IV-2		**5**	**2**
General Surgery	**27**	**25**	**8**	Class II-30 Class III-20 Class IV-10	**10**	**30**	**20**
ENT /Plastic	**4**	**4**	**1**	Class II-5 Class III- 4		**8**	**1**
Oncology	**4**	**1**	**0**	Class II- 5		**5**	

A – Patients having only ECG changes.

B – Patients having Ischemic heart disease.

C – Patients having valvular heart disease

Table 2-Monitoring Required

Surgery	**Non-invasive Monitoring only (SPO_2,NIBP,$EtCO_2$,BIS,12 lead ECG)**	**Invasive Monitoring (Invasive BP, CVP)**
Orthopaedic Surgery	9	10
Gynaecology	6	1
General Surgery	30	30
ENT Surgery	8	1
Oncology	0	5

Table 3: Type of Anaesthesia

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

Surgery	Hypotension (SBP< 60 mm Hg)	Hyper–tension (MAP>110)	Bradycardia (PR <50)	Tachycardia /Arrhythmia (PR<120)	Ischemia's	Pulmonary Oedema	Cardiac arrest
Orthopaedic Surgery	10		4			1	
Gynaecology	1		1				
General Surgery	10	12	10	3	4	2	1
ENT/Plastic Surgery		4				1	
Oncology		2		1			

Table 7: Postponement of surgeries and reasons

These patient were excluded from studies

Surgery	Severe Hypertension	Ischaemia in preinduction	Presence of CCF	Other Co-morbities
Orthopaedic surgery			2	10
Gynaecology		3	1	12
General Surgery	20			24
ENT/Plastic Surgery	10			5
Oncology	10	2	2	2

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 physician's intensive care as chances of complications were very high in these patients (more than 20%)

Results-

Hundred patients were studied for validation of ASA class, NYHA classification, type of surgery ,anaesthesia pattern and rate of complications

The combination of variables that preoperative cardiac diseases with highest correlations with major cardiac complications were history of myocardial infarction, positive exercise test ,current complaints of chest pain ,serum creatinine more than 2 mg %and patient on insulin therapy. One patient from orthopaedic surgery had developed congestive cardiac failure which was defined by the presence of pulmonary oedema, paroxysmal nocturnal dyspnoea, and pulmonary vascular congestion. Out of 19 patient 15 were for major surgery 14 were given combined spinal epidural,10 (71%) patient developed severe hypotension and 4 (28 %)had bradycardia.

Gynaecology and obstetrics had 7 patients out of which 5 were given CSE and 1 (20%) patient developed hypotension and bradycardia.

Nine patients were from ENT /plastic out of which 8 were of ASA class III and 1 of class IV all of them were given general anaesthesia and had developed severe hypertension and required treatment with inj.Labetelol.

Oncology surgery had 5 patients with radical neck dissection. 2 developed hypertension and 1 had tachyarrhythmia. All these patients were ASA grade III because of nature of supramajor surgery.

60 patients were from general surgery. 27 patients had only ECG changes in pre-op period. 4 of them developed peri-induction chest pain and required treatment with sorbitrate and aspirin and Troponin Test was performed 6 hours afterwards which came to be negative.

30 patients were given GA+epidural. In these patients, vital parameters were maintained near normal.

One patient from general surgery who classified as ASA grade IV and also had CKD with creatinine level of 3.3 mg% and severe diabetes went into cardiac arrest and was successfully resuscitated with D.C. shock and Inotropes.

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.15

The main aim of our Retrospective study was to evaluate these patients and optimize them before they proceed for the surgery. Investigations which were carried out before surgery whether invasive or non-invasive were studied.

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 patient 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.

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