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PERIOPERATIVE MANAGEMENT OF A CARCINOMA OF STOMACH CASE PRESENTING WITH GASTRIC OUTLET SYNDROME AND RECENT MYOCARDIAL INFARCTION-ASSESSMENT, RISK STRATIFICATION, OPTIMISATION AND ANAESTHETIC MANAGEMENT

Anesthesiology

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ABSTRACT

The patients with perioperative myocardial infarction (PMI) have increased risk of myocardial ischemia, myocardial infarction (MI), conduction disturbances, cardiac failure, morbidity and mortality. The risks of these events are even higher in patients with recent MI. Here, we report 53year old female diagnosed with carcinoma of stomach presenting with gastric outlet obstruction symptoms. The surgery planned was distal gastrectemy, lymhadenectomy and feeding jejunostomy. During preoperative assessment detailed history, physical examination was carried out. She gave a history of chest discomfort and breathlessness along with presenting complaints. Her ECG showed ST/T wave changes. Cardiologist opinion was obtained. The Troponin I was positive. A diagnosis of NSTMI was made. The Echocardiogram revealed Ejection Fraction of 45% and regional wall motion abnormality. She was started on blood thinners, unfractionated heparin, anti-angina drugs, anti diuretics, beta blockers and statins .The cardiologist gave moderate to high risk for surgery. The deranged coagulation parameters and electrolyte imbalance were corrected. The blood thinners were stopped five days before surgery. Anaesthesiologist reviewed the patient and gave fitness for surgery under ASA classification IV. A high risk written informed consent, repeat serum electrolytes, coagulation profile and 12 lead ECG on day of surgery were asked. Heparin was stopped 4-6 hours before surgery. Patient underwent a high risk procedure (calculated RCRI of ≥ 2) with an elevated risk of adverse perioperative cardiac outcome (MACE-moderate risk score). The perioperative management of this patient is reported.

KEYWORDS

INTRODUCTION

Patients undergoing non cardiac surgery with Ischemic heart disease are at an increased risk for perioperative complications such as myocardial infarction, myocardial ischemia, cardiac failure, arrhythmias, cardiac arrest and increased morbidity and mortality. These complications are much higher in patients coming for urgent or emergency surgery with recent MI or unstable angina.[1, 2] Cardiac complications constitute the most common cause of post -operative morbidity and mortality having considerable impact on length and cost of hospitalisation.[3] The main objective is to minimise hemodynamic changes with appropriate monitors and anaesthetic techniques to avoid morbidity and mortality in patients with ischemic heart disease.

CASE REPORT

After obtaining, institutional scientific review board and ethical committee clearance, informed consent was obtained from the patient for presenting the case report.

Here, we report 53year old female diagnosed with carcinoma of stomach presenting with gastric outlet obstruction symptoms. During preoperative assessment detailed history, physical examination was carried out. She gave a history of chest discomfort and breathlessness along with presenting complaints. She has no co morbid diseases. There was no significant family history.

The cardiovascular and respiratory system examination was normal. Her breath holding time was 28 seconds and showed functional activity of >4 METs. Her airway assessment was adequate.

Investigations showed Haemoglobin of 13.4 gm%, deranged coagulation profile and low potassium levels with normal renal and liver function test. Chest radiograph was normal. Her ECG showed ST segment depression in V4-V5 and T wave inversion in all chest leads. The Troponin I was significantly positive. A diagnosis of NSTMI was made. The Echocardiogram revealed Ejection Fraction of 45%, hypo-kinetic apical and mid septum with grade I LVDD.

Cardiologist and pulmonologist opinion was sought and obtained .She was started on loading dose of blood thinners followed by daily OD dose and Inj. Heparin 5000 IU IV tid. She was put on anti-angina drugs, anti diuretics, beta blockers and statins .The cardiologist gave moderate to high risk for surgery.

The correction of coagulation parameters and electrolyte imbalance was done. The blood thinners Asprin and Clopidrogel were stopped five days before surgery. Anaesthesiologist reviewed the patient and gave fitness for surgery under ASA IV. A high risk written informed consent, repeat Troponin I, serum electrolytes, coagulation profile and 12 lead ECG on day of surgery were asked. She was asked to continue her cardiac medication on day of surgery. Heparin was stopped 4-6 hours before surgery. Two units of PRBCs and ICU bed with ventilator were reserved. The RTPCR for Covid-19 was negative 2 days before surgery. The preoperative Troponin I was negative. Patient was planned for a high risk procedure (calculated RCRI of ≥ 2) with an elevated risk of adverse perioperative cardiac outcome (MACE-moderate risk score).

Intraoperative Period

After confirming adequate starvation and compliance with preoperative orders, IV line started. She was connected to non invasive blood pressure monitoring, temperature probe, continuous ECG, and pulseoximeter.

At T12-L1 level epidural space a 20 G epidural catheter advanced 8cm into the epidural space through 18 G Tuhoy needle. A test dose of 4ml of 2% lignocaine, 1 in 200000, adrenaline was used. After adequate premedication and preoxygenation, she was induced with IV Etomidate 0.2 mg per kg. The intubation was facilitated by IV Vecuronium 0.08 mg per kg. She was attached to a Capnography monitor. The bilateral air entry was equal and adequate.

The General anaesthesia was maintained with 2:1 ratio of N2O and O2 and inhalational agent Isoflurane at 1 volume %. After securing airway IV Hydrocortisone 100 mg was given. A CVP line cannulation and Ryles tube insertion carried out. The muscle relaxant was maintained with 0.5 mg incremental dose of vecuronium. Epidural infusion of 0.125% bupivacaine was started 30 minutes into the surgery after assuring stable haemodynamic parameters. The patient remained hemodynamically stable throughout the procedure. Radical distal gastrectomy, D2 lymphadenectomy with feeding jejunostomy was completed uneventfully. Patient was reversed with 0.04 mg per kg Neostigmine and 0.002 mg per kg IV Glycopyrolate. The hyperdynamic response during extubation was blunted by IV Xylocard 1.5 mg per kg. Duration of surgery was 300.minutes and 2 Litres of crystalloid given intraoperatively. The intraop urine output was 500 ml. The blood loss was about 400 ml.

Postoperatively she was shifted to SICU with monitor and O2 mask. In

ICU, 12 lead ECG and post operative troponin I done postoperatively was normal. With the cardiologist review, Unfractionated Heparin was started 4 hours after surgery.and antiplatelets were restarted 24 hours after surgery. The epidural infusion of 0.125% bupivacaine at 5 ml per hour was continued for 48 hours post op. The break through pain was managed with IV Paracetemol 1 gm. The vitals were stable throughout ICU stay. After 24 hours of ICU care he was transferred to ward. During postoperative period daily 12 lead ECG was done and at the time of discharge on 4 th postoperative day the troponin I was negative. At the time of discharge, advice for follow up at cardiology OP was given,

DISCUSSION

Ischaemic heart disease (IHD) is the leading cause of morbidity and mortality all over the world. The 30-day mortality associated with moderate- to high-risk noncardiac surgery exceeds 2% and surpasses 5% in patients at high cardiac risk.[4] These complications are much higher in patients with recent MI or unstable angina who require urgent or emergency cardiac surgery.[1,2]

The recent universal definition of MI is based on a rise and/or fall of cardiac biomarkers (preferably troponin- higher than the 99thpercentile of the upper reference limit (UNL) (0.014 ng/ml). in the setting of myocardial ischemia: cardiac symptoms, ECG changes, or imaging findings.[5] Most PMIs start within 24 to 48 hours of surgery during the greatest postoperative stress. Acute Coronary Syndrome (Type 1 PMI) occurs when an unstable or vulnerable plaque undergoes spontaneous rupture, fissuring, or erosion, leading to acute coronary thrombosis, ischemia, and infarction. The Myocardial Oxygen Supply-Demand Imbalance (Type 2 PMI) results in a silent, heart rate–related ST-segment depression which is common postoperatively. The ST elevation type a rare cause of PMI occurred in 2% of postoperative ischemic events. An anaesthesiologist should be aware of pathophysiology and need to thoroughly evaluate the patient for peri-operative management.[6]

If the non-cardiac surgery is an emergency, clinical risk stratification can be done and proceed to surgery. If it's non-emergency and the patient has risk factors for stable CAD, then estimate the perioperative risk of MACE on the basis of the combined clinical/surgical risk. If the patient has a low risk of MACE (<1%), then no further testing is needed. If the patient is at elevated risk of MACE, then determine functional capacity. If the patient has poor (<4 METs) or unknown functional capacity, then the clinician should consult with the patient and perioperative team to determine whether further testing will impact patient decision making (e.g., decision to perform original surgery or willingness to undergo CABG or PCI, depending on the results of the test) or perioperative care. If yes, then pharmacological stress testing is appropriate. In those patients with unknown functional capacity, exercise stress testing may be reasonable to perform. If the stress test is abnormal, consider coronary angiography and revascularization depending on the extent of the abnormal test.[7,8,9]

Patient was labelled as high risk procedure (calculated RCRI of ≥ 2) with an elevated risk of adverse perioperative cardiac outcome (MACE-moderate to severe risk score). The functional capacity assessment showed >4 METs. The surgery is of urgent and is of high risk type. The perioperative period was managed as per practise guidelines to prevent Myocardial Injury in non cardiac surgery (MINS).

The preoperative investigation includes 12 Lead Electrocardiogram, Echocardiogram, Exercise Testing or Non-invasive Pharmacological Stress as per guidelines. Routine preoperative coronary angiography is not recommended. Patient already on beta blockers, statins are continued in the perioperative period. Typically Asprin and Clopidrogel stopped 5 days before surgery where as unfractionated Heparin is stopped 6 hours before surgery.[7,8,9]

The Anaesthetic goal is to optimizing myocardial oxygen (O2) supply and minimizing demand by avoiding tachycardia, hypertension, hypotension, anaemia, hypoxia ,hypothermia and hypercarbia (to avoid increase in pulmonary vascular resistance).

Premedication should aim at avoiding hyperdynamic response with the use of fentanyl and/or Xylocard. Preoxygenation with 100% FIO2 for 3 to 5 minutes is vital. Induction agent of choice is Etomidate 0.3 mg per kg .The muscle relaxant IV Vecuronium 0.08 to 0.1 per kg is preferred. The inhalation agent of choice is either Isofurane or Sevoflurane. The monitors include continuous ECG monitoring, ideally with computerized ST-segment analysis, IABP/NIBP, CVP line, HR, Temperature, pulseoximetry and End tidal CO2. Combining ECG leads II, V4 and V5, can detect 96% of ischemic events. In order avoid extremes of BP and HR during emergence IV Xylocard 2.5mg per kg should be considered.

Major adverse cardiac events (MACEs) are relatively common in patients undergoing noncardiac surgical procedures. The incidence of perioperative myocardial infarction (PMI) is about 0.9%. Factors associated with an increased risk of MACE are patient specific (advanced age, high American Society of Anesthesiologists (ASA) class, kidney disease, anemia) and surgery specific (type of procedure, urgency, complexity, intraoperative complications). Several scoring systems allow clinicians to predict, both preoperatively (e.g., Revised Cardiac Risk Index, National Surgical Quality Improvement Program) and intraoperatively (e.g., ANESCARDIOCAT) [10], the risk of cardiac adverse events and to identify patients who need preventive measures and strict intraoperative and postoperative monitoring.[11]

For patients with ischemic heart disease at high cardiac risk, reasonable precautions include continuous electrocardiography (ECG) monitoring and troponin measurements if needed in the postanesthesia care unit. Epidural anaesthesia for preemptive postoperative analgesia is a better choice.

CONCLUSION

Anaesthetic techniques should aim to keep myocardial oxygen supply greater than demand, by avoiding tachycardia and extremes of blood pressure. Proper preoperative assessment, risk stratification, optimization of clinical conditions by good team work among anaesthesiologist, physicians, surgeons, cardiologist and practise guidelines based anaesthetic management with proper understanding of pathophysiology will help as to prevent MINS.

Table:1 Myocardial Infarction(MI) is classically defined as a characteristic rise and fall in Cardiac Troponin levels with atleast one value higher than the 99th percentile of the upper reference limit(UNL) (>0.014 ng/ml) with atleast one of the following features:
• Ischemic nature of the chest pain
• Recent significant ECG findings such as ST segment or T wave alterations,Left bundle branch block(LBBB) or the presence Q waves
• New onset regional wall motion abnormalities (RWMA) on echocardiography
• Demonstration of an intracoronary thrombus on angiography or autopsy

Table 2: The Myocardial infarction (MI) categorization as per the 3rd and 4t Universal definition
• A spontaneous MI (Type 1): denoting the casual association of plaque disruption and the coronary athero thrombosis • MI as a consequence of an ischemic imbalance (Type 2): Oxygen supply demand imbalances un related to the coronary athero thrombosis. • Cardiac death owing to MI (Type 3): Peculiar symptomology of myocardial ischemia, mortality prior to obtainement of the bio markers • Procedure related MI (Type 4 and 5) MI associated with percutaneous coronary intervention PCI (Type 4a) MI associated with sent thrombosis (Type 4b) MI associated with restenosis in a setting of PCI(Type 4c) MI associated with CABGI(Type 5)

Table 3. Predictors of Cardiac Risk
A. Clinical markers
Major predictors (>5%) recent MI, unstable angina, untreated heart failure, significant arrhythmias and severe valvular disease.
Intermediate predictors (<5%): mild angina, history of MI, treated heart failure, and diabetes.
Minor predictors: (<1%) Old age, abnormal ECG, non-sinus rhythm, history of stroke, and uncontrolled hypertension.
B. Functional capacity

A pre-operative functional capacity of less than 4 METs of activity confers a 4% risk of postoperative cardiac events, whereas the risk is 0.7% in patients with greater than 4 METS of capacity. .

C. Type of surgery

- High risk surgery (>5%): major emergencies, aortic and vascular, peripheral vascular, and prolonged procedures particularly with fluid shifts and blood loss.
- Intermediate risk surgery (1– 5%): carotid endarterectomy, head and neck, abdominal, thoracic and orthopaedic.
- Low risk surgery (<1%): cataract, breast, and superficial procedures

Table 4: Revised Cardiac Risk Index (RCRI)[

1.Patient undergoing high risk surgery
2.History of IHD
3.History of heart failure
4.History of stroke/transient ischaemic attack
5.Diabetes mellitus requiring treatment with insulin
6.Renal dysfunction (serum creatinine concentration .170 mmol litre (2.0 mg dl) or a creatinine clearance ,60 ml min

Table :5 MINS] has been defined in the recent universal MI definition as a prognostically relevant postoperative troponin level elevation during or within a period of 30 days after non-cardiac surgery with:

- An underlying ischemic origin of troponin elevation (absence of non-ischemic etiology such as rapid atrial fibrillation, pulmonary embolism, sepsis, etc.)
- Absence of other clinical or ECG criteria of PMI.
- The extent of troponin elevation has been generally defined as greater than 99th percentile of the UNL of the particular assay

Table 6: The seven anescardiocrat scoring factors

1. History of CAD
2. History of chronic CCF
3. History of cerebrovascular disease
4. Chronic kidney disease
5. Preoperative abnormal ECG (LV hypertrophy, LBBB, ST-T abnormalities) 6. Intraoperative hypotension (≥20 mm Hg or ≥20% fall in MAP for >1 h)
7. Blood transfusion

Risk of major adverse cardiac and cerebrovascular events: 0 factors=1.5%; 1 factor=4.5%; 2 factors=8.9%; ≥3 factors=20.6%. CAD: Coronary artery disease; CCF: Chronic congestive failure; LV: Left ventricle; LBBB: Left bundle branch block

Table: 7 Cardiac Risk classification of noncardiac surgical procedures (ACC/AHA guidelines for peri-operative cardiovascular evaluation for noncardiac surgery)

Elevated risk (>1%)

- Emergent major operations, particularly in the elderly
- Aortic and other major vascular surgery Peripheral vascular surgery
- Anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss.
- Carotid endarterectomy
- Head and neck surgery
- Intraperitoneal and intrathoracic
- Orthopaedic surgery Prostate surgery

Low risk (<1%)

- Endoscopic procedures
- Superficial procedures
- Cataract surgery
- Breast surgery

Table 8:Intra-operative ischemia monitoring: Combining ECG leads II, V4 and V5, can detect 96% of ischemic events.The ECG criteria for ischemia are:

- Horizontal or down-sloping ST-segment depression at least 0.1 mV at 0.06 second from J-point,
- Upsloping ST-segment depression at least 0.2 mV at 0.08 second from J-point, and
- ST-segment elevation at least 0.15 mV (1 mV = 10 mm).
- Other ECG signs of ischemia include inverted T waves and a new onset of arrhythmias or conduction abnormalities

Table 9:The American College of Cardiology (ACC)/American Heart Association (AHA) practice guidelines

The period within 6 weeks of acute MI as a period of high risk for a peri-operative cardiac event, as it is the mean healing time of the infarcted myocardium.

The period from 6 weeks to 3 months is of intermediate risk. This period is extended beyond 3 months in cases with complications such as arrhythmias, ventricular dysfunction or continued medical therapy.

Patients who have undergone coronary revascularisation procedure within 5 years and are asymptomatic have low perioperative risk surgery and can undergo surgery without any further evaluation.

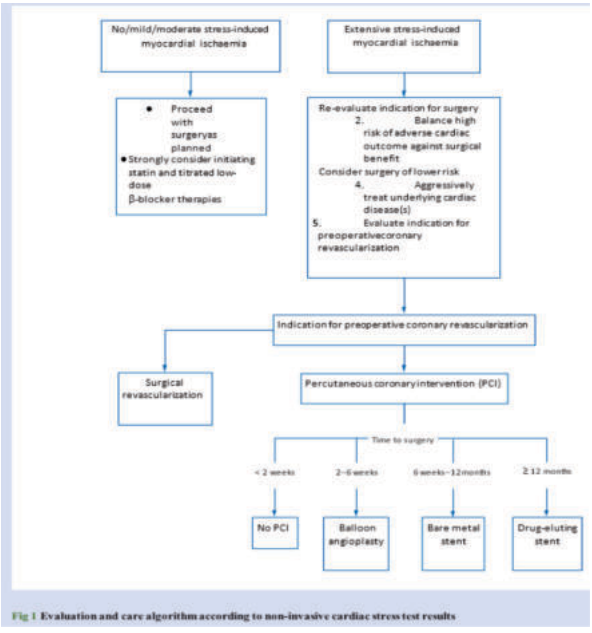


Fig 1 Evaluation and care algorithm according to non-invasive cardiac stress test results

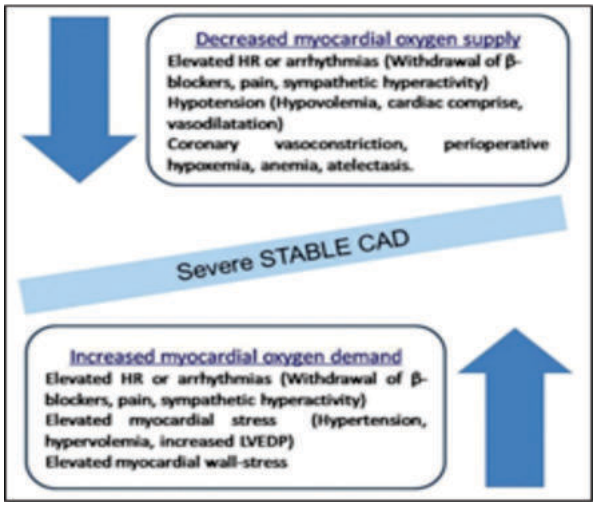


Figure 2: The pathogenesis of a type 2 PMI. (CAD: Coronary artery disease; HR: Heart rate; LVEDP: Left ventricle end diastolic pressure)

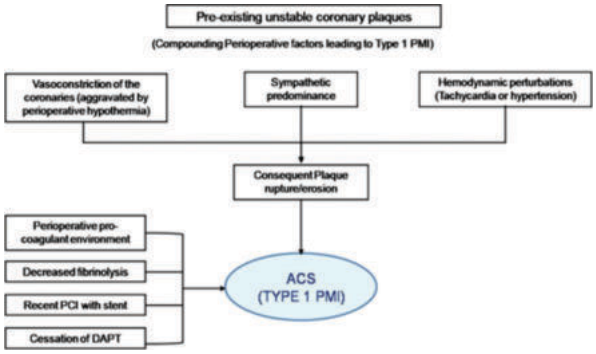


Figure3: The pathogenesis of a type-1 PMI. (ACS: Acute coronary

syndrome; DAPT: Dual anti platelet therapy; PCI: Percutaneous coronary intervention; PMI: Perioperative myocardial infarction)

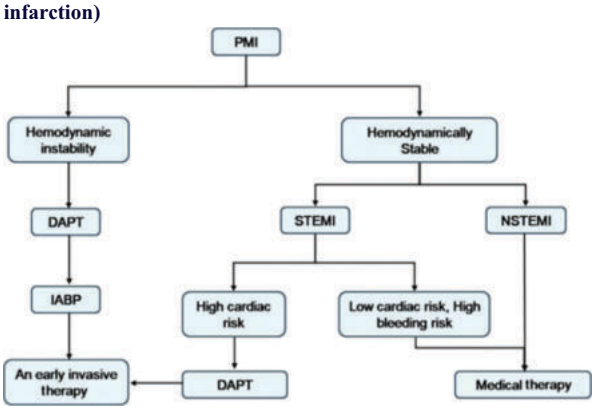
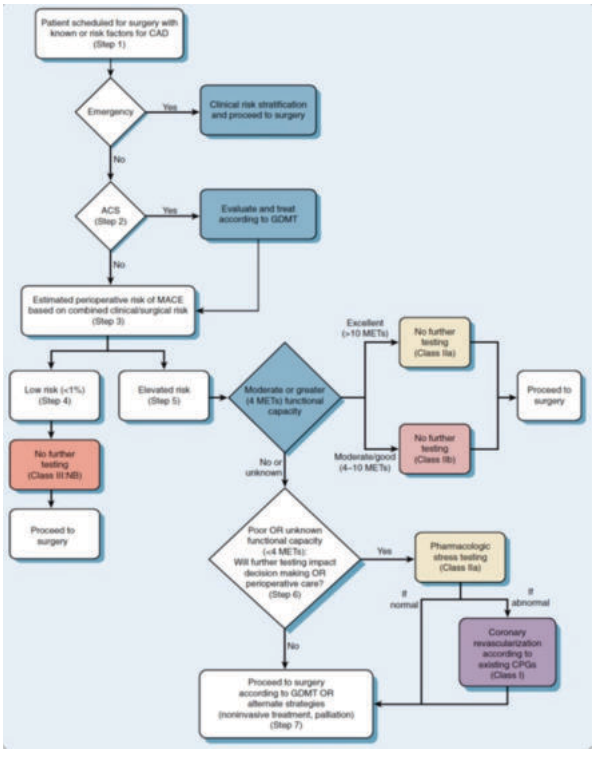


Figure 4: The approach to PM management. (DAPT: Dual antiplatelet therapy; IABP: Intra-aortic balloon pump; PMI: Perioperative myocardial infarction; NSTEMI: Non-ST elevation myocardial infarction; STEMI: ST segment elevation myocardial infarction)



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