CASE REPORT

ANESTHESIA AND ANESTHESIOLOGICAL STRATEGIES IN A PATIENT WITH SEVERE LEFT VENTRICULAR DYSFUNCTION UNDERGOING PROSTATECTOMY

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Abstract

This case describes the perioperative management of a 62-years-old male with a complex medical history, including ischemic heart disease (IHD), type 2 diabetes, hypertension, hyperlipidemia, chronic heart failure and a prior myocardial infarction (MI), requiring stenting. He was scheduled for prostatectomy due to prostate cancer and had a left ventricular ejection fraction (LVEF) of 37%, reflecting chronic dilated cardiomyopathy.
The patient was transitioned from oral anticoagulants to low-molecular-weight heparin preoperatively, and his glycemia was well-controlled. A carefully tailored anesthetic plan was implemented. The patient's vital signs remained stable throughout the three-hours surgery, with no immediate postoperative complications, and pain control was effectively managed.
Despite the patient's complex medical background, he emerged from surgery in stable condition and is currently recovering well, with ongoing radiation therapy for his prostate cancer. This case highlights the vital importance of thorough preoperative assessment, careful anesthetic management and continuous postoperative monitoring, in high-risk patients with cardiovascular comorbidities, underscoring the need for tailored treatment to prevent complications like MACE and MINS and to improve overall outcomes.

Key Words: *Anesthesia for high-risk patients; chronic dilated cardiomyopathy; mortality risk.*

Introduction

Ischemic heart disease (IHD) is becoming more common. There is also an increase in the number of ischemic heart disease patients getting non-cardiac surgical procedures, whether or not they have interventions. Patients are more susceptible to cardiac ischemia, myocardial infarction (MI), conduction abnormalities, and increased morbidity and mortality during the perioperative period. Patients who have recently suffered a myocardial infarction are at much higher risk for these occurrences (1). Current Hospital Episode Statistics indicate that over 35,000 people in the UK die within 30 days of surgery each year. Major adverse cardiac events (MACE) are the primary cause of perioperative mortality, representing at least 30% of deaths (2).

We present a case of a 62-years-old male with significant cardiovascular comorbidities who underwent prostatectomy for cancer, highlighting the challenges and considerations in perioperative management of high-risk patients.

Case Presentation

A 62-years-old male patient, obese, non-smoker, with a significant medical history, was scheduled for prostatectomy due to prostate cancer diagnosed in 2024. The patient had multiple comorbidities, including type 2 diabetes mellitus regulated with insulin injections, hypercholesterolemia with high LDL levels, hypertension, a history of acute myocardial infarction in 2017 which required LDA stenting, chronic ischemic dilated cardiomyopathy with recurrent episodes of pulmonary edema, and chronic renal disease characterized by mild elevations in creatinine and urea levels despite the absence of a history of dialysis. He had been on long-term oral anticoagulant therapy since his myocardial infarction. A 2023 cardiac MRI revealed a left ventricular ejection fraction (LV EF) of 18.59%. A preoperative echocardiography in 2024 showed an improved EF of 37%, though he remained in chronic dilated cardiomyopathy with severe left ventricular systolic dysfunction. Additional findings included mild ascending aortic dilatation and moderate aortic valve insufficiency.

Due to initially reduced ejection fraction, the patient was initiated on guideline-directed medical therapy comprising agents from several therapeutic classes, including anticoagulants, beta blockers, ACE inhibitors, calcium channel blockers, statins, diuretics, SGLT2 inhibitors, antiplatelets, and antidiabetics; follow-up after treatment optimization revealed marked improvement in cardiac function.

Oral anticoagulant therapy was discontinued two weeks before surgery and transitioned to low-molecular-weight heparin via subcutaneous injections. Preoperative glycemia was controlled at 5mmol/L. Chest X-ray revealed cardiomegaly accompanied by chronic signs of pulmonary congestion, and hemostasis parameters were within normal limits. Given his compromised cardiac function, a detailed anesthetic plan was formulated to minimize perioperative cardiovascular risks.

The induction protocol was weight-based and consisted of fentanyl at 1μg/kg, lidocaine at 1mg/kg, propofol at 2mg/kg and atracurium at 0.5mg/kg. Maintenance of anesthesia was achieved with remifentanil at infusion via perfusion pump at 0.25-0.5mcg/kg/min IV and sevoflurane administered at a MAC of 0.5-0.7%. Perioperative medications included antibiotics, antiemetics and analgesics.

The patient's vital signs remained stable throughout the three-hours procedure, with continuous invasive arterial blood pressure monitoring and standard electrocardiographic, capnography and pulse oximetry surveillance. Hemodynamic parameters remained within normal limits, with no episodes of hypotension or tachycardia. Fluid therapy was carefully tailored to support physiological stability, using balanced crystalloids at a rate of approximately 8mL/kg/h to maintain adequate intravascular volume and tissue perfusion. The patient responded well to volume administration, and there was no need for vasopressor support.

The emergence from anesthesia was smooth and uneventful. The patient regained consciousness with stable respiratory and hemodynamic status, and no signs of agitation or discomfort. Pain was effectively managed from the immediate postoperative period, and the patient did not report any pain upon waking. Postoperative analgesia continued to be successful over the following days, with minimal pain scores and no requirement for rescue analgesics. There were no signs of postoperative nausea, vomiting or other complications.

Now, nearly five months after surgery, the patient remains in stable condition and has entered the next phase of oncological treatment. He is recovering well, with good functional status, and has commenced adjuvant radiation therapy under close outpatient follow-up. The patient admits to episodes of incontinence.

Discussion

Dr. Jessica Spence from the Population Health Research Institute in Hamilton, Canada, pointed out that patients often assume the danger has passed once surgery is complete. However, this isn't always the case, as recent findings show that many postoperative deaths after non-cardiac procedures are primarily due to cardiovascular complications (3).

Reducing the patient's perioperative anesthetic and surgical morbidity and mortality, as well as facilitating a prompt return to optimal functioning, are the primary objectives of preoperative medical evaluation. It is important to note that "perioperative" risk is complex and varies depending on the kind of anesthetic used, the degree of invasiveness of the surgical procedure, and the patient's health prior to the procedure (1).Three primary mechanisms can lead to perioperative myocardial ischemia: coronary artery stenosis, which can cause an imbalance between oxygen supply and demand and become flow-limiting during perioperative hemodynamic fluctuations; acute coronary syndrome (ACS), which is brought on by stress-induced rupture or erosion of vulnerable atherosclerotic plaques, along with the pro-inflammatory and hypercoagulable states brought on by surgery, as well as hemodynamic stress from fluid shifts and anesthesia; and increased bleeding risks during surgery, which may require stopping anti-platelet therapy and possibly result in stent thrombosis in patients who have recently had coronary stent placements prior to non-cardiac surgery (4). A comprehensive history and physical examination, with an emphasis on risk factors for heart and lung issues, as well as an evaluation of the patient's functional ability, must be part of any preoperative evaluation (1).

Hofmann degradation, a spontaneous process of breakdown at body temperature and pH (45%), and metabolism by non-specific esterases in the plasma (45%) are both processes that atracurium endures. In healthy patients, only approximately 10% of a bolus dose is excreted in the urine over a 24-hours period. The chronic kidney disease does not affect the pharmacokinetics and pharmacodynamics of atracurium (5). Sevoflurane does not exacerbate epinephrine-induced cardiac arrhythmias and reduces myocardial contractility similarly to equianesthetic doses of isoflurane and desflurane. Like other volatile anesthetics, sevoflurane decreases baroreflex function. The incidence of myocardial ischemia, infarction and cardiac outcomes, did not differ between treatment groups in a number of multicenter studies that randomly assigned patients with CAD or patients at high risk for CAD to receive either sevoflurane or isoflurane during cardiac or noncardiac surgery. Therefore, as compared to other volatile anesthetics, sevoflurane has not been linked to undesirable cardiovascular alterations in volunteers or in patients undergoing elective surgery. Additionally, it seems to provide more stable heart rate profile than either isoflurane or desflurane (6). Compared to other volatile anesthetics, postoperative AKI in patients undergoing noncardiac surgery was not linked to intraoperative exposure to sevoflurane anesthesia for longer than three hours. Selecting a particular volatile anesthetic drug for patients undergoing noncardiac surgery is not as crucial in preventing postoperative renal injury as predicting high-risk patients and improving intraoperative renal perfusion (7). Remifentanil possesses a distinctive pharmacokinetic profile characterized by a fast onset and cessation of activity, along with plasma metabolism. Its application is advisable even in patients with renal impairment, hepatic dysfunction, or compromised cardiovascular function. A possible cardioprotective preconditioning effect has been proposed. Adverse effects associated with the drug appear to be similar to those of other opioids. Numerous randomized controlled trials in cardiac surgery have shown that the advantages of remifentanil encompass significant protection against intraoperative stressors, as well as expedited postoperative recovery, prompt weaning from mechanical ventilation and early extubating (3).

The incorporation of procedure-specific hazards into preoperative patient’s evaluation and optimization is essential to perioperative treatment (8). Perioperative myocardial infarction (PMI) is a possible outcome for people having major non-cardiac surgery. The frequency of postoperative myocardial infarction was significantly underestimated since it was only recognized by clinical symptoms and electrocardiographic changes before the development of ischemic damage biomarkers like troponin. Often, analgesia masks discomfort. Additionally, because postoperative ECG monitoring is rarely used, transient ischemic changes may go undetected, which could result in a missed diagnosis. MINS (Myocardial Injury after Non-cardiac Surgery) is the term used to describe myocardial injury that occurs after non-cardiac surgery. According to the IV global definition of myocardial infarction, a troponin reading that is higher than the 99th percentile of the upper reference limits, indicates myocardial injury (9).

40,004 patients, 45 years of age or older, who had noncardiac surgery and spent at least one night in the hospital were included in the VISION study. Patients from 27 sites across 14 countries (covering regions of North and South America, Europe, Asia, Africa and Australia) were followed up for 30 days after surgery to check for complications. The researchers discovered that 715 (1.8%) of the patients passed away within 30 days following noncardiac surgery. Out of these, 505 (71%) died in the hospital, including four [0.6%] in the operating room, while 210 (29%) died after being released. "Almost all patients passed away after leaving the operating room, one in 56 patients passed away within 30 days following noncardiac surgery, and over a quarter passed away after being released from the hospital," Dr. Spence stated. Eight perioperative problems, including five cardiovascular occurrences, were linked to death within 30 days following surgery (10).
Nearly 75% of all deaths were caused by the three primary outcomes: infection (20%), severe hemorrhage (25%), and myocardial damage following noncardiac surgery (MINS; 29%). Myocardial ischemia is believed to stem from an imbalance between oxygen supply and demand in the heart, occurring during an acute sickness episode. The precise process by which this occurs remains mostly unidentified. Recent investigations indicate that acute postoperative endothelial dysfunction contributes significantly, particularly through decreased endothelial nitric oxide generation. Vagal dysfunction, resulting in failure to acclimatize to the physiological demands of surgery, has been proposed as a potential etiology of MINS. MINS is generally recognized as linked to elevated 30-days mortality; however, research on effects extending beyond this period is limited (11).

Implications for Anesthesia Practice:

Patients identified with elevated cardiovascular risk might utilize perioperative methods to reduce the likelihood of postoperative Major adverse cardiac events (MACE) and Myocardial damage following noncardiac surgery (MINS). [12]

1. Preoperative Risk Assessment:
The VISION trial showed that a simple blood test measuring high-sensitivity troponin T can detect MINS early, enabling timely intervention to prevent complications (10).

Optimization of Comorbid Conditions:
While clinicians aim to provide effective and equitable care, delays in surgery can lead to deconditioning and increased risk of complications postoperatively. Chronic diseases may stem from behavioral risk factors (e.g., poor nutrition, frailty, smoking, alcohol use) or medical comorbidities. Both affect perioperative outcomes, and patients often present with conditions from both groups. Identifying and managing these factors can help improve patients' ASA scores preoperatively (13).

Recent recommendations suggest that even patients not previously on statins - regardless the cholesterol levels - may benefit from perioperative statin therapy to reduce cardiovascular risk. Elevated cholesterol also affects anesthetic metabolism, such as slowing propofol clearance (14).

Our understanding of hypertension's role in cardiovascular disease has led to improved blood pressure management, contributing to a 60% drop in cardiovascular mortality from the mid-1950s to the mid-1990s. This decline is linked to better awareness and control of hypertension, dyslipidemia and smoking (15).

2.Tailored Anesthetic Strategies:
- A thorough preoperative assessment is key in selecting a safe anesthetic technique (16).

- Continuous invasive arterial pressure monitoring helps detect rapid fluctuations in high-risk patients, with careful removal of artifacts like over- or under-damping (13).
- Unless contraindicated, patients should receive a combination of acetaminophen, NSAIDs or COX-2 inhibitors, dexamethasone and a regional analgesic or local anaesthetic (17).

3. Postoperative Monitoring and Management:
- Postoperative vigilance is crucial due to the high risk of myocardial infarction within 72 hours of the surgery, requiring careful management of prescriptions, oxygen, analgesia, DVT prophylaxis, clinical observations, early warning scores and blood reviews (12).
- Managing MINS postoperatively involves minimizing triggers like hemodynamic instability and anemia, with long-term pharmacologic strategies including beta-blockers, statins, antiplatelets and anticoagulants. Research suggests MINS is preventable and that its sequelae can be reduced (11).
- Recent ESC guidelines recommend routine troponin screening for at-risk patients undergoing non-cardiac surgery, reflecting the growing importance of MINS detection. Post-surgery, patients are monitored every 4 to 8 hours in the hospital, with follow-up care after 3 to 4 weeks (18).

Research indicating continuous pulse oximetry and blood pressure monitoring in surgical patients reveals that numerous individuals experience extended periods of hypoxia and hypotension, which often go unrecognized by healthcare professionals. Research indicates that hypoxia and hypotension can precede postoperative complications. Implementing remote automated monitoring technology, coupled with the availability of a healthcare provider to address early signs of potential complications, may enhance postoperative outcomes, akin to the improvements in intraoperative results achieved through the involvement of anesthesiologists and advanced monitoring techniques. Evaluation of these interventions in prospective studies is necessary. Considering that 99.3% of deaths among adults undergoing noncardiac surgery occur postoperatively, enhancing postsurgical care in both hospital and home environments may significantly decrease mortality rates (18).
Since they were first published in 1996, the ACC/AHA recommendations on the perioperative cardiovascular examination and management of patients having noncardiac surgery, have taken into account the growing body of research. Compared to previous iterations, the 2007 revision of these guidelines placed more emphasis on preoperative clinical risk assessment and less emphasis on standard preoperative cardiac testing in patients with suspected or confirmed coronary heart disease. Laboratory tests should be used cautiously before surgery, but only if the findings have the potential to significantly impact patient's care (19). Due to the susceptibility of these patients to myocardial ischemia, infarction, and arrhythmias during the perioperative period, a comprehensive evaluation of their history and tests is essential. Every risk factor that can be changed needs to be taken care of. It is necessary to order additional tests if needed. The involvement of cardiologists, surgeons, treating physicians and patients is essential due to the collaborative nature of this undertaking. During the perioperative period, anti-failure medications such as beta-blockers and statins must be given regularly. Guidelines for anticoagulant medication must be adhered to when using regional anesthesia. Factors that change the myocardial oxygen supply-demand ratio must be addressed. For the early identification of ischemia and irregular heartbeats, monitoring is crucial (20).
Clinicians should advise patients who have radical prostatectomy, that while incontinence is normal in the short term and usually returns to baseline by 12 months following surgery, it may still occur and need to be treated (21).
In addition, randomized research conducted in 2025 on patients having severe cancer surgeries found that compared to usual care, remote perioperative telemonitoring greatly improved functional recovery and decreased major postoperative sequelae.[22] In order to lower perioperative mortality, research on prevention, early detection and therapy should concentrate on these problems. The median time to these events can be used to determine the optimal period to monitor each complication in order to maximize effectiveness. Prioritizing the prevention, early detection, and treatment of sepsis, MINS and substantial bleeding, may reduce perioperative mortality (19).

Conclusion

The substantial risks involved in treating individuals with ischemic heart disease (IHD) having non-cardiac surgery are highlighted by this example. The significant death rate among these patients emphasizes the necessity of thorough preoperative assessment and careful perioperative care. In order to lower risks and enhance results in high-risk surgical patients, this instance highlights the significance of personalized care.

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