EPIDURAL ANESTHESIA IN PATIENTS WITH ISCHEMIC HEART DISEASE AND LOW EJECTION FRACTION WHO UNDERWENT NON-CARDIAC OPERATION: A CASE REPORT

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ABSTRACT Anaesthetic management of patients with cardiac comorbidities who underwent non-cardiac surgery has always been challenging. The goal of anaesthesia management is to keep the myocardial oxygen supply greater than the demand to avoid ischemia. In this case report, anaesthetic implications included preoperatively assessing the patient’s cardiovascular status with selecting epidural anaesthesia (EA) and analgesia techniques. Incremental doses of local anaesthetic were given to maintain myocardial oxygen demand. We reported a case of 52 years old female with nephrolithiasis dextra, severe hydronephrosis dextra, mild hydronephrosis sinistra, neglected DJ Stent dextra and chronic kidney disease stage V on regular hemodialysis who underwent percutaneous nephrolithotomy dextra and retrograde pyelogram dextra and sinistra. Pre-anaesthesia evaluation showed patients with the physical status of ASA III, CHF functional class II, low ejection fraction of 22%, regional wall motion abnormality and inferior ischemia. We performed successful anaesthetic management of a patient with ischemic heart disease and low ejection fraction 22% who underwent percutaneous nephrolithotomy using epidural anaesthesia and analgesia.

KEYWORDS Cardiac disease, low cardiac function, ischemic heart disease, Non-cardiac Surgery, Regional Anesthesia, Epidural anaesthesia

Introduction

Patients undergoing major cardiac and non-cardiac surgery have a high risk of complications from perioperative morbidity and mortality through heart, lung, kidney dysfunction and infection. Doctors are constantly working to speed up patients’ recovery times and provide cost-effective medical care by reducing the metabolic/neuroendocrine response to surgical stress, which is a source of many complications.[1]

General anaesthetic techniques with high-dose opioids alone or in combination with other pharmacological agents (statin and ganglion blockers, a2 agonists) have shown an inability to attenuate the stress response of major surgery. Without the inhibition of this response, hemodynamic, metabolic, immunological and hemostatic changes will be detrimental and may lead to several complications. In contrast, regional anaesthetic techniques demonstrate a physiological state characterized by adequate analgesia, sympatholytic and attenuated surgical stress response.[1]

The decision to use regional anaesthesia depends on many factors. Patient characteristics, the type of surgery to be performed, and the potential risk of anaesthesia impact the choice of anaesthetic type and its perioperative management. In patients with cardiovascular disease, regional anaesthetic techniques (either alone or in combination with general anaesthesia) can offer
potential perioperative benefits of attenuation of the stress response, cardiac sympathectomy, faster extubation, shorter hospitalizations and more intense postoperative analgesia. However, the decision to use regional anaesthesia must be made with caution in some circumstances.[2]

Coronary heart disease (CHD) is the leading cause of worldwide morbidity and perioperative complications in cardiac patients. Patients with CHD require identifying risk factors, preoperative evaluation and optimization, medical therapy, monitoring, proper anaesthesia and drug techniques. Risk factors that affect perioperative cardiac morbidity are new myocardial infarction, congestive heart failure, peripheral vascular disease, angina pectoris, diabetes mellitus (DM), hypertension, hypercholesterolemia, dysrhythmias, age, kidney dysfunction, obesity, lifestyle and smoking.[3]

General anaesthesia is preferred to achieve the goal of keeping myocardial oxygen supply greater than demand, which can be achieved by preventing the occurrence of tachycardia and extreme elevations in blood pressure, which can occur during laryngoscopy and intubation, leading to ischemia. On the other hand, epidural anaesthesia may also reduce cardiac morbidity and mortality in CHD patients planned for non-cardiac surgery.[3]

Case Report

A 52-year-old female with right pyelum stones, right severe hydronephrosis, left moderate hydronephrosis, neglected DJ stent in the right kidney, and chronic renal failure underwent right percutaneous nephrolithotomy and right and left retrograde pyelograms. She presented with a complaint of pain in the right and left waist since ± 4 years before admission. Low back pain was intermittent. Her low back pain got worse about ± 4 months before admission. History of shortness of breath and chest pain during activity was denied. The patient had a history of reduced urination and urine mixed with blood. The patient also had a history of surgical removal of left kidney stones and DJ stent on the right kidney in 2016 with general anaesthesia without complications. The patient had hypertension since ± 3 years ago and routinely took amlodipine 5 mg every 24 hours. The patient had a known history of heart disease since 4 months before admission and received aspirin therapy 80 mg every 24 hours (stopped 5 days before surgery), simvastatin 20 mg every 24 hours, Ramiplril 5 mg every 24 hours, Furosemide 40 mg, carvedilol 3.125 mg q12hr. Patients have routinely had hemodialysis since ± 2 years ago as much as 2 × a week. The patient could bathe herself, climb stairs and go to the market alone. Patients could also sleep on their back using one pillow without any chest pain or shortness of breath.

On physical examination, the patient’s weight was 43kg, height 150cm and BMI 19.1 kg / m². The patient was fully conscious with a respiratory function RR 18 x / minute saturation obtained 98% with room air, cardiovascular function obtained BP 130/80 mmHg, pulse 78x / minute, with normal neck flexion deflection and Mallampati II. The patient had anaemia (Hb 9.65 g / dl and HCY 28.21%) and thrombocytopenia (PLT 137x10^9 / µL). Other laboratory tests were within normal limits. The EKG showed sinus rhythm and inferior ischemia. Echocardiography examination showed the dilatation of left ventricle, ejection fraction of 22%, grade 2 diastolic dysfunction of the left ventricle, posterior akinetic with other hypokinetic segments, mild aortic regurgitation, moderate tricuspid regurgitation and RWMA (+). Chest radiography revealed cardiomegaly, right pleural effusion and right loculated pleural effusion. BOF examination showed multiple nephrolithiasis right and left with right pyelum stones, attached a DJ stent with a pigtail-shaped tip, with a proximal tip projecting as high as VTH 12-VL 1 right side and a distal tip projecting in the pelvic cavity. Urological ultrasound revealed bilateral chronic renal failure, mild bilateral hydronephrosis with multiple stones in the upper-middle and lower poles of the right kidney.

The patient was subjected to the RA-epidural Anaesthetic technique. The patient was pre-medicated with Midazolam 1 mg IV, Dexamethasone 10 mg IV and Diphenhydramine 10 mg IV. An epidural catheter was placed in L1-L2 with a catheter length of 5 cm in the epidural space. After the epidural was attached, a combined test dose of local Anaesthetic and epinephrine was performed, 3 ml 1.5% lidocaine with epinephrine 1: 200,000 (0.005 mg/ml). After the test dose and patient’s hemodynamics were stable, the regimen of Bupivacaine 0.5% by volume 6 ml was inserted; after that, we waited for 10 minutes, the hemodynamics of the patient remained stable. Therefore we added Bupivacaine 0.5% by volume 6 ml and waited for 20 minutes; after block height is reached and the patient’s hemodynamics stabilizes, surgery is initiated (viserotome target T10-L1, target dermatome T8). The operation lasted for one hour and 15 minutes. There were no hemodynamic fluctuations and complications that occurred during and after surgery. After the surgery, the patient was given Bupivacaine 0.1% + Morphine 1 mg, volume 10 ml every 12 hours and Paracetamol 1000 mg every 8 hours IV. She was then discharged after four days of treatment in good condition.

Discussion

In this case, the patient had ischemic heart disease and an ejection fraction below 30% who underwent non-cardiac surgery. Anaesthesia goals for patients with cardiac comorbidities are to maintain the hemodynamic in stable condition and prevent MI by optimizing myocardial oxygen supply and reducing oxygen demand, monitoring ischemia, treating ischemia or infarction if it develops, maintaining normothermia, and avoiding significant blood loss. This is a challenge for anesthesiologists.[3]

The history shows that the patient complained of low back pain and denied any chest pain. Patients could also sleep on their backs using one pillow without any chest pain complaints or shortness of breath. Patients received amlodipine 5 mg every 24 hours, aspirin 80 mg every 24 hours, simvastatin 20 mg every 24 hours, Ramiplril 5 mg every 24 hours and carvedilol 3.125 mg every 12 hours. The therapy given follows the theory that medical treatment for ischemic heart disease is aimed to reduce the oxygen demand of the myocardium, increase coronary blood flow, stabilize plaque, prevent thrombosis, and change the shape of the affected myocardium. This goal can be achieved using β-blockers, nitrates, statins, antiplatelet drugs, and ACE inhibitors.

Patients also had chronic renal failure who have undergone hemodialysis since ± 2 years ago. This increases the risk of perioperative heart disease, where according to the theory of renal insufficiency (creatinine level > 2.0 mg / dL) is one of the factors that exist. In this patient, the creatinine level increased to 3.94 mg / dL (0.50-0.90).[5]

From the physical examination, there were no signs of heart problems. Her blood pressure was 130/80 mmHg, pulse 78x / min, regular, without murmurs, but on ECG support, there was an ST-T change (+), Inversion of III, aVF, which suggests inferior
ischemia. On echocardiography, examination showed the dilatation of left ventricle, ejection fraction of 22%, grade 2 diastolic dysfunction of the left ventricle, posterior akinetic with other hypokinetic segments, mild aortic regurgitation, moderate tricuspid regurgitation and RWMA (+) and on chest X-ray showed an impression of enlarged heart with a CTR of 67%. This is following the perioperative management of heart disease patients with non-cardiac surgery, where special pre-operative heart tests are performed, including ECG and echocardiography.[6]

The choice of anaesthesia technique in this patient is based on the patient’s condition, and the surgical technique performed allows epidural anaesthesia to be performed. In patients with cardiovascular disease, regional anaesthesia techniques (either alone or in combination with general anaesthesia) can offer potential perioperative benefits of attenuation of the stress response, cardiac sympathectomy, faster extubation, shorter hospitalizations. Other potential benefits of using regional anaesthesia include excellent pain control, decreased incidence of deep vein thrombosis in some patients, and the opportunity to continue the block into the postoperative period. General anaesthesia has been associated with hypotension due to intravenous induction agents, tachycardia, and hypertension because sympathetic stimulation can lead to myocardial ischemia due to direct laryngoscopy and endotracheal intubation, leading to cardiac morbidity, which can be prevented by epidural anaesthesia.[3,4] Epidural anaesthesia can be an alternative to general anaesthesia in the anaesthetic management of cardiac patients who undergo non-cardiac surgery because it can reduce preload and afterload, stress response, coagulation response, coronary vasodilation, coronary analgesia, perioperative and postoperative MI events, maintain myocardial oxygen supply, and reduce oxygen demand as well as the harmful effects of general anaesthesia.[3]

While in the reception room, the patient was pre-medicated with Midazolam 1 mg IV, Dexamethasone 10 mg IV, Diphenhydramine 10 mg IV to reduce anxiety before entering the operating room and reduce the risk of postoperative nausea and vomiting. Once the artery line is in place, the patient is positioned for epidural anaesthesia.

An epidural catheter was placed in L1-L2 with a catheter length in the epidural space of 5 cm; after the epidural was attached, a combination test dose of local anaesthetic with Midazolam 1 mg IV, Dexamethasone 10 mg IV, Diphenhydramine 10 mg IV to reduce anxiety before entering the operating room and reduce the risk of postoperative nausea and vomiting. Once the artery line is in place, the patient is positioned for epidural anaesthesia.

During the intraoperative period, the patient was hemodynamically stable, and she breathed spontaneously. The operation lasted for one hour, 15 minutes, 500 ml of crystalloid fluid and intraoperative bleeding was 100 ml. Epidural administration was no longer performed intraoperatively because the block was still sufficient, and the patient did not feel pain during the operation. This is following the existing theory where it is said that the duration of action of 0.5% plain bupivacaine is about 4-6 hours after infiltration.[8]

The postoperative analgesia was Bupivacaine 0.1% + Morphine 1 mg, volume 10 ml every 12 hours and Paracetamol 1000 mg every 8 hours IV. During the postoperative care, the patient had no complaints of chest pain or shortness of breath. The patient also did not complain of postoperative pain. This suggests that local epidural anaesthetics compared to systemic opioids is better for postoperative analgesia suppressing the stress response to surgery and reducing the incidence of MI and dysrhythmias.[3]

Conclusion

Patients undergoing major cardiac and non-cardiac surgery have a high risk of morbidity and mortality complications from perioperatively via cardiac, pulmonary, kidney dysfunction and infection. Initial challenges during induction and maintenance of anaesthesia in patients with ischemic heart disease are (1) preventing myocardial ischemia by optimizing myocardial oxygen supply and reducing myocardial oxygen demand, (2) monitoring ischemia, and (3) treating ischemia if it develops. The decision to use regional anaesthesia depends on many factors. Patient characteristics, the type of surgery to be performed, and the potential risk of anaesthesia will impact the choice of anaesthetic type and its perioperative management. Other potential benefits of using regional anaesthesia include excellent pain control, decreased incidence of deep vein thrombosis in some patients, and the opportunity to continue the block into the postoperative period.

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Conflict of interest

There are no conflicts of interest to declare by any of the authors of this study.

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