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CASE REPORT

Perioperative Management of Chronic Kidney Disease Patients with Bowel Perforation

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ABSTRACT

Background: Anesthesia management applied during surgery in patients with chronic kidney disease (CKD) is different from ordinary anesthetic management. It is known that currently, there are not many case reports discussing anesthetic management in patients with CKD.

Case Illustration: A 70-year-old patient with abdominal colic et causa abdominal perforation complained of abdominal pain accompanied by heavy bowel movements and flatus throughout the abdominal area. The patient was anesthetized by regional anesthesia with local agent bupivacaine and treated with laparotomy. Bupivacaine is the first local anesthetic drug with an acceptable onset of action, long duration of action, and a tendency for the sensory block to be greater than its motor block.

Conclusion: This case report explains the novelty of anesthetic management of CKD patients undergoing exploratory laparotomy surgery using the reported patient cases. Operations in patients with CKD are preferable to regional anesthesia.

Keywords: abdominal colic; bupivacaine; CKD; hemodialysis; laparotomy

INTRODUCTION

The presence of renal damage characterizes CKD for three months or more and can be caused by multiple factors.[1] In most cases, a decrease in GFR to less than 25 mL/min can lead to ESRD. Patients diagnosed with ESRD require hemodialysis (HD) or renal transplantation[2].

Abdominal colic is a disturbance in the normal flow of intestinal contents along the intestinal tract. Obstruction occurs when a disturbance obstructs intestinal flow forward but normal peristalsis. This condition causes severe pain in the abdomen that is intermittent.[3] The underlying cause of abdominal colic is muscle contraction, blockage, or inflammation of organs in the abdominal cavity, such as the intestines, rectum, gallbladder, kidneys, or urinary tract[4].

Laparotomy is one of the major surgical procedures, by making incisions in the abdominal wall layers to reach the part of the abdominal organs experiencing problems. This procedure may be recommended in patients with abdominal pain of unknown cause or experienced abdominal trauma. Exploratory laparotomy is used to determine the source of pain or from trauma and repair if indicated[5].

Bupivacaine is the first local anesthetic drug with an acceptable onset of action, long duration of action, and a tendency for the sensory block to be greater than its motor block[6]. Before anesthesia, a thorough evaluation is necessary to determine that the patient is in good health and in optimal medical condition. The management of anesthesia administered to patients with CKD requires an understanding of the pathophysiology of renal disease and an assessment of renal disease which requires HD[7].

These drugs may decrease renal function, so this organ should be evaluated if CKD is improving, stable, or worsening. Therefore, this case report will explain the anesthetic management of CKD patients undergoing exploratory laparotomy surgery.

CASE ILLUSTRATION

On January 3, 2022, a 70-year-old patient came to the emergency room with cold extremity. The patient complained an abdominal pain throughout the abdominal area accompanied by heavy bowel movements and flatus. He has never had

a similar complaint. His medical history was CKD on routine HD once a week in last three months.

The patient was generally weak during the physical examination with blood pressure 85/64 mmHg and weak pulse. He got loading Ringer Lactate 500 cc and there was an improvement condition marked by blood pressure 131/84 mmHg, pulse 86 beat/minute (bpm), respiratory rate 26 bpm, temperature 37^0C, and SpO_2 94%. The patient suspected sepsis.

On abdominal examination found a distended abdomen, defense muscular, and decreased bowel sounds. On laboratory examination, leukocytosis was found with a critical value of 46.8 $x10^3$, accompanied by increased urea (87 mg/dL) and creatinine (2.57 mg/dL). On BNO IVP examination, intestinal gas was positive. All examination lead to sepsis and colic abdomen et causa bowel perforation with CKD on HD.

The surgeon decided to perform the operation and coordinated with the anesthesiologist. Before surgery, the patient was given dexamethasone 5 mg, diphenhydramine 10 mg, and granisetron 2 mg as aspiration prophylaxis. Surgery was performed under subarachnoid block regional anesthesia at VL 2-3 elevation; we used a 26G spinal needle with a length of 76 mm Bupivacaine 0.5% 20mg as an anesthetic agent. When the injection administered, the patient was in a sitting position and after the patient anesthetized, the laparotomy performed in the supine position.

During the operation, there was bleeding of 80 cc. Intraoperative hemodynamics was stable with systolic blood pressure 110-120 mmHg, diastolic pressure 70-77 bpm, pulse 80-90 bpm, SpO_2 99-100%. The proximal small intestine perforation was found, then sutured and given tranexamic acid 1000 mg and chrome 50 mg.

After surgery, the patient was placed in the ICU for five days. In the ICU, the patient got postoperative intravenous antibiotics ceftriaxone 1gr/12 hr and metronidazole 500 mg/8 hr, ketorolac 30mg/12 hr intravenously as an analgesic, tranexamic acid 500mg/ 8 hr to prevent postoperative bleeding, and ranitidine 150 mg/12 hr regulates gastric acid production during bed rest. After more stable, HD is decided for the patient.

DISCUSSION

Pre-operation

In this case, the administration of dexamethasone, diphenhydramine, and granisetron aims to prevent aspiration of gastric acid into the respiratory tract. Recent studies demonstrated that granisetron effectively prevents vomiting, nausea, and also hypotension when administered spinal anesthesia or afterward.[8] Administration of low-dose perineural dexamethasone as a local anesthetic solution can significantly prolong the duration of analgesia.[9] Dexamethasone intravenous also makes granisentron more effective as antiemetic.

Prophylactic diphenhydramine 30 mg at the induction of general anesthesia is known to significantly reduce the severity and incidence of postoperative bladder discomfort without causing side effects[10]. There are some preoperative management in patient with CKD included balance fluid status and electrolyte balance. CKD patients are at risk of developing fluid status abnormalities such as venous congestion, sympathetic nervous system dysfunction, imbalance of the renin-angiotensin-aldosterone system, and disturbances in the hypothalamic-pituitary axis that lead to fluid overload. The principle is to keep the fluid euvolemic. If after fluid administration is still hypotensive, vasopressor administration can be considered.

Electrolyte imbalance especially hyperkalemia is at high risk to occur in this patient. Kalium levels must be carefully monitored because of potential deleterious effects on cardiac conduction. Kalium levels ≥6.5 mEq/L, or <6.5 mEq/L with ECG T tall wave, constitute severe hyperkalemia. In patients without ECG changes, regular insulin, dextrose, or kayexalate should be considered to decrease kalium levels. If ECG changes are present, calcium gluconate can be used.

During the operation

When doctors consider what type of analgesia to use after surgery, pain relief with minimal side effects is the primary goal. Bupivacaine, the most common analgesic, is formulated into an aqueous suspension of multivesicular liposomes that provides long-lasting relief for up to 72 hours while avoiding the side effects of opioids. The higher efficacy of liposome-releasing bupivacaine than bupivacaine hydrochloride has encouraged its use in

various surgical procedures, including laparotomy[11].

These patient did not receive general anesthesia because the use of drugs such as sevoflurane or isoflurane in patients with CKD can alter the production, clearance, and accumulation of active metabolites and exacerbate pre-existing kidney disease. It turns out to break down into inorganic fluorine. Patients treated with sevoflurane and enflurane exhibited renal concentration capacity and transient renal tubular injury because the serum fluoride concentration was maximum nephrotoxic 50 mmol/L[12].

Sevoflurane may interfere with renal function; Inorganic fluorine ion induced by defluorination and production of compound A by reaction with carbon dioxide absorbing agents are associated with nephrotoxicity.

Fluorine levels after isoflurane or halothane administration increased by 3-5 and 1-2 mol/L, respectively, making the risk of nephrotoxicity less. In comparison, the resistance of desflurane to biodegradation allows long-term interactions with normal renal function[13].

Post-operation

Commonly used antibiotics in the perioperative period include cephalosporins, aminoglycosides, and vancomycin. All may be associated with acute interstitial nephritis, and dose adjustment is required in patients with reduced creatinine clearance. Aminoglycosides such as gentamicin accumulate in proximal renal tubular cells and cause acute tubular necrosis (ATN) and ototoxicity. Aminoglycoside dosage should be based on creatinine clearance and peak and drug levels[14].

Some antibiotics, such as tedizolid, do not require dose adjustment in CKD patients as no significant pharmacokinetic changes have been observed in these patients. For other molecules, such as doxycycline, the decrease in renal clearance observed in patients with chronic renal insufficiency is compensated by increased extrarenal clearance. Other antibiotics, such as ceftriaxone, are used in patients with CKD without dose adjustment, at doses up to 4 g/day. Despite the pharmacokinetic changes observed in patients with chronic renal insufficiency, the risk/benefit ratio remains favorable in the event of an overdose. Dosage adjustment for renal

function carries a high risk of ineffectiveness, although overdose is relatively well tolerated[14].

Although patients with advanced CKD are exposed to multiple nonsteroidal anti-inflammatory drugs (NSAIDs), such as ketorolac, from a combination of over-the-counter and prescription drugs, NSAID prescribing by healthcare professionals has recently gradually declined with higher stages of renal failure to the prescribing guidelines. Avoidance of NSAIDs eventually leads to increased administration of opioids and other adjuvant therapies to manage pain. The dose of opioids is commonly too high for the GFR's reduction rate. The use of opioids carries many risks regardless of GFR, and the safety data is apparent even for drugs commonly used in CKD patients.[15] However, compared with NSAIDs, the use of opioids with a dose adjustment in CKD patients are preferable.

Management of perioperative fluids in HD patients requires special attention. The safety margin between insufficient and excessive fluid administration in these patients becomes narrower when renal function is absent. Non-invasive surgery only requires replacing insensible water loss (IWL) with 5% glucose (5-10 mL/kg IV). Small urine outputs may be replaced with 0.45% NaCl. Thoracic and abdominal surgery result significantly loss of intravascular fluid volume in the interstitial. This loss is often replaced by balanced saline or 5% albumin. Hemodialysis may be considered if necessary to increase oxygen-carrying capacity or if massive bleeding occurs[3].

This patient had a risk to have hypotension, leukocytosis, and hyperkalemia postoperative so intensive care is required to improve his hemodynamic before HD. Furthermore, pain management in patients with CKD is also important to be noticed related to his quality of life.

CONCLUSION

Regional anesthesia is a preferable technique in patients with chronic kidney disease. Bupivacaine is a good local anesthetic for laparotomy procedure among those patients since its short acting and limited harmful side effects.

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