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Case Report

Continuous Spinal Anaesthesia for Hip Fracture Surgery in a High-Risk Patient

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Abstract

Elderly patients have increased risk for perioperative mortality and morbidity due to additional comorbidities, such as cardiac diseases. Regional anaesthesia techniques are usually preferred in high-risk patients due to some advantages, such as the maintenance of cardiovascular stability and early postoperative mobilisation. This case presents the anaesthetic approach in a 55-year-old male patient with low ejection fraction that underwent hip fracture surgery. In this present case, continuous spinal anaesthesia with low-dose hyperbaric bupivacaine provided safe and effective anaesthesia during surgery with minimal haemodynamic changes and adequate analgesia during the first 24 hours after surgery.

Key Words: Continuous spinal anaesthesia, surgery, hip fracture, high-risk patient

Introduction

Hip replacement surgery is common among elderly patients. These patients have increased risk for perioperative mortality and morbidity due to additional comorbidities, such as cardiac, endocrine, renal, cerebral and respiratory diseases (1). Spinal anaesthesia provides nerve blockade in a large part of the body during surgery with a smaller dose of local anaesthetic and shorter surgery onset time. However, spinal anaesthesia may lead to adverse haemodynamic changes, such as severe and prolonged hypotension in high-risk patients (2). Continuous spinal anaesthesia (CSA) provides extending blockade during surgery and versatile pain management during the postoperative period via an indwelling catheter, allowing intermittent injection of local anaesthetic into the subarachnoid space. Better cardiovascular stability, less local anaesthetic requirement, better control of anaesthesia level and lower risk of local anaesthetic toxicity were reported in the CSA technique compared with a single-dose spinal anaesthesia technique (3). We reported a high-risk patient who underwent successful hip fracture surgery under CSA.

Case Presentation

Written informed consent was obtained from the patient for publication of this case report. This is a 55-year-old male, 75 kg, 168 cm, American Society of Anaesthesiologists (ASA) III, with coronary heart disease admitted for hip fracture surgery: erythrocytes 4,790,000/mm^3, haemoglobin 14.1 g dL^{-1}, haematocrit 42.7%, platelets 184,000/mm^3, prothrombin time 15.1 seconds, partial thromboplastin time 64.8% and international normalised ratio 1.27. Preoperative other laboratory findings, including urine examination, blood urea, blood sugar and serum electrolytes, were within normal limits. His blood pressure was 100/70 mm Hg, and heart rate was 90 bpm. The general physical examination of him was normal. He gave a history of exertional dyspnea and coronary artery disease. Chest radiography showed cardiomegaly, and echocardiography revealed a dilated left ventricle and low ejection fraction (EF) (15%-20%). The cardiologist treated him with nitroglycerin transdermal therapeutic system 25 mg, carvedilol 3.125 mg, furosemide 20 mg, losartan 25 mg and trimetazidine 35 mg. Anticoagulant medication was provided using low-molecular-weight heparin 4 hours prior to surgery with repeated doses every 8 hours.

Continuous spinal anaesthesia was planned for the procedure, and written informed consent was obtained from the patient after informing him in relation to the high-risk anaesthetic procedure. Before the procedure of anaesthesia, the patient was

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premedicated with intravenous (iv) midazolam (2 mg). Ringer's lactate solution was given intravenously at 1 to 2 mL kg^{-1} $hour^{-1}$ via an 18-gauge cannula in a forearm peripheral vein, and standard monitoring, including non-invasive arterial pressure, electrocardiography and pulse oximetry, was established in the operating room. His baseline blood pressure was 107/70 mmHg, pulse was 90/minute and SpO_2 was 94%. The patient was placed in the lateral position, and CSA was performed in the L_3-L_4 interspace after cleaning and draping. The epidural space was identified with a Crawford needle, and a 22-G (Spinocath®, B. Braun, Melsungen, Germany) catheter with a 27-G Quincke spinal needle was advanced through the epidural space until cerebrospinal fluid was observed in the catheter. Then, the spinal catheter was advanced into the intrathecal space and fixed using sterile tape. After the cerebrospinal fluid was aspirated, 7.5 mg hyperbaric bupivacaine was injected while the patient was in a supine position. The sensory block level was tested using pinprick tests, and motor block level was evaluated with the Modified Bromage scale (scale 0=full flexion of foot, knee and hip, i.e., no motor block; scale 1=full flexion of foot and knee, unable to perform hip flexion; scale 2=full flexion of foot, unable to perform knee and hip flexion and scale 3=total motor block, unable to perform foot, knee and hip flexion) two times with an interval of 5 minutes. Sensory block (a loss of pin prick sensation) reached the level of T_{12} within 10 minutes, and surgery was initiated. Nasal oxygen (1 L/minute) was applied during the operation.

The patient was haemodynamically stable during surgery, and there was no bradycardia (heart rate below 60 bpm) or hypotension (a decrease of >30% in MAP) requiring ephedrine, dopamine or atropine. The operation continued for 120 minutes without complication, and 5 mg hyperbaric bupivacaine was administered through the spinal catheter close to the end of surgery. During surgery, blood transfusion was not required and the total amount of fluid given was 1000 mL of crystalloids and 500 mL of Ringer's lactate solution. At the end of surgery, the patient's blood pressure was 115/75 mm Hg and pulse was 96 bpm; the patient was conscious without pain. The patient was transferred to the intensive care unit, and 5 mg hyperbaric bupivacaine was administered through the catheter twice within 24 hours postoperatively to provide postoperative analgesia. No anaesthetic complications, including postdural puncture headache (PDPH), were observed in the patient during surgery and postoperative period. After he was observed for 24 hours in the intensive care unit, the patient, with a stable clinical status, was transferred to the orthopaedic ward following the removal of the spinal catheter. He was discharged from hospital 10 days after his operation.

Discussion

This case report demonstrates that CSA with low doses of hyperbaric bupivacaine may be safe and effective for hip surgery in a patient with an ejection fraction of 15%-20%.

Patients undergoing hip replacement surgery are usually elderly. These patients have increased morbidity and mortality for orthopaedic surgery due to co-morbidities, such as cerebral, cardiac, renal and respiratory diseases (1, 4). Regional anaesthesia techniques are usually preferred in high-risk patients due to some advantages, such as the maintenance of cardiovascular stability and early postoperative mobilisation (4). CSA was preferred in this present case with an ejection fraction of 15%-20%. CSA allows the administration of local anaesthetics in small incremental doses titrated to the patient's requirements, has minimal cardiovascular and respiratory side effects and provides postoperative analgesia, allowing the application of intrathecal local anaesthetics postoperatively (5). Kilinç et al. (6) compared the haemodynamic consequences and the effectiveness of CSA with unilateral spinal anaesthesia in elderly patients undergoing hip surgeries. They reported similar sensory and motor blocks, haemodynamic changes and ephedrine requirements in two techniques. Conversely, Michaloudis et al. (7) investigated the safety and efficacy of CSA for elderly or high-risk surgical patients undergoing major prolonged surgical procedures. They concluded that CSA provides safe intraoperative anaesthesia and effective postoperative analgesia with minimal side effects in elderly or high-risk surgical patients.

During surgery and the procedure of CSA, hypotension and bradycardia may be observed due to a reduction in systemic vascular resistance and central venous pressure caused by sympathetic blockade (2). In this present case, we did not observe hypotension or bradycardia during the anaesthesia and surgery procedure. Because, hyperbaric bupivacaine was used in a lower amount; normovolemia was maintained; medication improving systolic function was administered to the patient before surgery and CSA was applied in the lateral decubitus position in this present case. Indeed, it was reported that hypotension was more common during spinal anaesthesia in a supine position compared to the lateral decubitus position in elderly patients with low ejection fraction (8). Also, in a study (9) investigating the effect of spinal block on patients with low cardiac output who underwent lower limb surgery, hypotension and the need for vasopressor support due to spinal anaesthesia were not observed in any of the patients. Moreover, Lux et al. (5) analysed 1212 cases who underwent surgery of the lower extremities with continuous spinal anaesthesia using a 28-gauge microcatheter. They reported no major complications in any of these patients, and they concluded that continuous spinal anaesthesia using a 28-gauge microcatheter appears to be a safe and appropriate anaesthetic technique in lower leg surgery for aged patients. In this presented high-risk patient, CSA was applied using a 22-gauge microcatheter, and no major complications or puncture headaches were observed.

Conclusion

We reported the successful anaesthetic management of a patient with coronary artery disease and low ejection fraction

undergoing hip fracture surgery. CSA technique with low-dose hyperbaric bupivacaine provided safe and effective anaesthesia with minimal haemodynamic changes for hip fracture surgery in this present case.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

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