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CASE REPORT

Hemiparesis after robotic laparoscopic radical cystectomy and ileal conduit formation in steep Trendelenburg position

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Abstract Robotic surgery is becoming popular for minimally invasive surgical procedures as robotic devices allow unprecedented control and precision. We report a case of robotic radical cystectomy with ileal conduit urinary diversion surgery having perioperative neurological complications related to prolonged surgery in the steep head-down position. There was a neurological deficit in the form of hemiparesis, which resolved with conservative management. We suggest that duration and positioning should be optimized for such prolonged surgery in the steep head-down position, and make some recommendations. Moreover, in such surgeries great vigilance must be observed in the perioperative period.

Keywords Robotic surgery · Urinary bladder carcinoma · Anaesthesia · Hemiparesis · Cerebral edema

Introduction

Conventional laparoscopic surgery is gradually being replaced by robotic surgery because of its benefit of unprecedented control and precision in minimally invasive procedures [1]. However, it is prudent to be aware of some unexpected complications associated with the procedure. Here, we report a case of transient hemiparesis following robotic radical cystectomy with ileal conduit formation.

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Case report

A 65-year-old male, weighing 68 kg, diagnosed with urinary bladder (UB) carcinoma, was scheduled for robotic radical cystectomy with ileal conduit urinary diversion. Preanaesthetic evaluation of the patient revealed a pulse rate of 72 beats/min and blood pressure (BP) of 140/78 mmHg. Routine blood investigations including haemogram, liver, renal functions, chest X-ray and electrocardiogram (ECG) were within normal limits.

In the operating room, ECG, non-invasive blood pressure (NIBP) and pulse oximeter were attached. After insertion of an epidural catheter in the L2–3 intervertebral space, anaesthesia was induced with intravenous fentanyl (100 μg), thiopentone (250 mg) and vecuronium (7 mg), and the lungs were ventilated with isoflurane (1–2%) in oxygen and nitrous oxide (50:50). Tracheal intubation was achieved with an 8-mm ID endotracheal tube. The right internal jugular vein (IJV) and left radial artery were cannulated. The patient was positioned in lithotomy and the upper limbs placed beside the torso, and shoulder braces were applied for support. Trocars were inserted after the creation of pneumoperitoneum. The patient was placed in steep Trendelenburg position (45°) for the entire surgical procedure. Anaesthesia was maintained on isoflurane (1–2%), keeping the minimum alveolar concentration at 1–1.2, and neuromuscular monitoring guided top-ups of vecuronium. Perioperative analgesia was maintained with infusion of 0.1% bupivacaine mixed with 2 μg/mL of fentanyl at 4–5 mL/h, administered epidurally with top-ups of intravenous fentanyl (0.5 μg/kg). The patient remained haemodynamically stable. Peak airway pressure ranged from 25 to 28 cmH_2O, central venous pressure (CVP) ranged between 8 and 16 cmH_2O and temperature remained ~36°C. Total blood loss of 750 mL was

replaced with balanced salt solution and packed red blood cells. The total duration of surgery was 6 h. At the end of surgery, residual neuromuscular blockade was reversed with neostigmine (2.5 mg) and glycopyrrolate (0.4 mg) and the trachea was extubated when the patient was fully awake and had achieved adequate ventilatory parameters. He was shifted to the postanesthaesia care unit. After 90 min, the patient suddenly became unconscious and responded to deep painful stimuli only. His vital signs were within normal limits. Arterial blood gas (ABG) analysis revealed pH 7.4, pCO_2 24.2 mmHg, pO_2 98.5 mmHg, Na 148 mEq/L, and K 3.55 mEq/L. His blood sugar was 120 mg/dL. The patient regained consciousness in about 20–30 min. Neurological examination revealed motor power of grade 2/5 in the right upper limb and grade 0/5 in the right lower limb. Muscle tone was decreased in the right lower limb. However, his sensory system examination was normal with no autonomic system involvement. Transthoracic echocardiography revealed no cardiac abnormality. Non-contrast and contrast-enhanced computed tomography (NCCT, CECT) of the head revealed age-related mild cerebral atrophy without any fresh event. Conservative management was started with oral aspirin 150 mg once a day. Magnetic resonance imaging (MRI) of the head did not reveal any pathological findings. His neurological dysfunctions improved significantly in the following days and on postoperative day 12 he was discharged from the hospital. He was followed by the neurologist and complete resolution of motor deficit was confirmed by 2 weeks.

Discussion

Various urological surgeries are increasingly being performed with robotics [2]. Recently, major procedures such as radical cystectomy and ileal conduit formation are being attempted using the robot [2, 3]. Though various surgical advantages have been well documented, this procedure should not be considered without any concern. We report the occurrence of hemiparesis during prolonged robotic surgery in steep Trendelenburg position.

In our case, surgeons operating with the da Vinci Robotic System took approximately 6 h for radical cystectomy and intracorporeal ileal conduit urinary diversion with increased morbidity. For such surgery, the patient is placed in steep Trendelenburg position for docking of the robot and movement of its arms. Patient position for surgery is frequently a compromise between what the anaesthetized patient can tolerate (structurally and physiologically) and what the "robotic surgeon" requires to perform the surgery [4]. Initially we considered cerebral edema leading to unconsciousness in our patient, but when he regained consciousness we observed the decreased motor power on one side of the body. Considering a differential diagnosis of any cerebrovascular accident, CECT and MRI was done but was found to be normal.

As far as we know, unexplained reversible unilateral paralysis following robotic cystectomy and ileal conduit formation has not been reported in the literature. Reversible motor paralysis is not a known complication of laparoscopic surgery. However, there have been reports of specific neurological deficits including paraplegia in the literature that were attributed to cerebral air embolism [5]. Paradoxical embolism is a rare phenomenon and is usually associated with intracardiac septal defects or patent foramen ovale, which exists in about 20–30% of the general population [6]. At times, venous gas may enter the arterial circulation by overwhelming the mechanisms that normally prevent arterial embolism. If intracardiac right-to left shunt is excluded as the cause of paradoxical gas existence, there remains extracardiac right-to-left shunt, with transpulmonary passage of the venous emboli being the most likely mechanism. Marquez et al. [7] reported autopsy-proved cases of fatal venous embolism associated with paradoxical cerebral air embolism perioperatively without intracardiac septal defect. Although the lung is considered to be an effective physiological filter for pulmonary gas emboli, the filtering capacity may be interfered with by an overwhelming amount of gas in the pulmonary circulation and the use of various anaesthetic agents, especially volatile anaesthetics [8]. The lung is usually an effective filter for air bubbles greater than 22 μm in diameter. A bolus injection of air of more than 1.5–3 mL/kg exceeds the filter capacity of the lungs and produces embolization through the left heart into the arterial circulation until it blocks arterioles 30–60 μm in diameter. Regardless of the accurate aetiology of the paralysis, we want to stress here the importance of early multidisciplinary evaluation to rule out any cerebrovascular accident.

We conclude that prolonged robotic surgery in steep Trendelenburg position requires not only meticulous intraoperative management but also great vigilance in the postoperative period. To avoid neurological complications such as hemiparesis, recommendations should be made regarding the positioning, duration and pneumoperitoneum pressures of such prolonged surgeries in exaggerated Trendelenburg position.

Conflict of interest None.

Consent section Written informed consent was obtained from the patient for publication of this Case Report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

References

1. Hashizume M, Tsugawa K (2004) Robotic surgery and cancer: the present state, problems and future vision. Jpn J Clin Oncol 34:227–237
2. Al-Othman KE, Al-Hellow HA, Al-Zahrani HM, Seyam RM (2008) Techniques in endourology: robotic augmentation enterocystoplasty. J Endourol 22:597–600
3. Balaji KC, Yohannes P, McBride CL, Oleynikov D, Hemstreet GP (2004) Feasibility of robot assisted totally intracorporeal laparoscopic ileal conduit urinary diversion: initial results of a single institutional pilot study. Urology 63:51–55
4. Cherian VT (2006) Anesthetic implications of urologic surgery. Indian J Urol 5:194–200
5. Deem S, Davis CR, Tierney JP (2008) Transient paralysis after robotic prostatectomy. J Robot Surg 2:45–46
6. Huang YY, Wu HL, Tsou MY, Zong HJ, Guo WY, Chan KH, Ting CK (2008) Paradoxical carbon dioxide embolism during pneumoperitoneum in laparoscopic surgery for a huge renal angiomyolipoma. J Chin Med Assoc 71:214–217
7. Marquez J, Sladen A, Gendell H, Boehnke M, Mendelow H (1981) Paradoxical cerebral air embolism without an intracardiac septal defect. J Neurosurg 55:997–1000
8. Yahagi N, Furuya H, Sai Y, Amakata Y (1992) Effect of halothane, fentanyl and ketamine on the threshold for transpulmonary passage of venous air emboli in dogs. Anesth Analg 75:720–723