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Original contribution

Comparison of anesthetic management and outcomes of robot-assisted vs pure laparoscopic radical prostatectomy☆

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Abstract

Study objective: Limited data are available regarding the anesthetic management and outcome of patients undergoing pure laparoscopic radical prostatectomy (LRP) and robotic-assisted LRP (RALP). Therefore, our primary objective was to compare the anesthetic management between these 2 groups. Our secondary objective was to determine the incidence of adverse outcomes associated with RALP, which requires an extreme Trendelenburg position.

Design: A retrospective observational study.

Setting: University teaching hospital.

Patients: A total of 223 men, consisting of 97 LRP patients and 126 RALP patients, treated during a 3-year period (January 2010-December 2012) were retrospectively studied.

Interventions: None.

Measurements: Information on patient demographics, type of anesthesia, anesthetic/pneumoperitoneum/surgical times, intraoperative fluids and blood products, estimated blood loss, intraoperative and postoperative opioid use, postoperative analgesic consumption, length of stay in the postanesthesia care unit, postoperative complications, and hospital stays was collected and compared.

Main results: The estimated blood loss was higher in LRP patients than in RALP patients (median, 550 mL vs 200 mL; $P < .001$). Likewise, 24% of the LRP patients received intraoperative transfusions compared with 0.79% of the RALP patients ($P < .001$). The RALP patients had a longer anesthesia time (median, 276 vs 259 minutes; $P = .032$) and a greater intraoperative use of opioids ($P < .001$). The incidence of complications was similar in both groups with the exception of postoperative nausea and vomiting, which were observed more frequently among the RALP patients than among the LRP patients (33% vs 16%; $P = .007$).

Conclusions: This is the first report to compare the anesthetic management of RALP vs LRP. Anesthesiologists can expect RALP surgery to be associated with less blood loss and a need for fewer blood products than traditional LRP surgery. The anesthetic outcome of RALP was generally satisfactory except for a high incidence of postoperative nausea and vomiting.

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1. Introduction

Radical prostatectomy is the standard surgical approach in most men for whom surgery is selected as a definitive treatment for localized prostate cancer. The surgical management of localized prostate cancer has evolved over the last 20 years. Now, a prostatectomy can be performed either using an open approach or via minimally invasive approaches (robotic or laparoscopic). Compared with an open approach, minimally invasive approaches require a smaller incision and provide a magnified surgical field for the operator. Thus, a conventional open radical retropubic prostatectomy for the treatment of localized prostatic cancer has been largely replaced by laparoscopic techniques [1]. A pure laparoscopic radical prostatectomy (LRP), which was mainly developed in Europe [2], was commonly performed before the availability of robotic-assisted LRP (RALP) became widespread. RALP has gained popularity in both the United States and Europe and currently accounts for the majority of radical prostatectomies [1,3]. Although RALP offers better visualization of the surgical field and better operability than LRP, it presents additional challenges to anesthesiologists. RALP requires a thorough knowledge of the physiologic effects of placing a patient in an extreme Trendelenburg ("head-down") position and of prolonged pneumoperitoneum. Although much has been written about the surgical outcomes of RALP and LRP, limited data are available regarding anesthetic management for these procedures and their outcomes. Therefore, our primary objective was to compare the anesthetic management between these 2 groups. Our secondary objective was to determine the incidence of adverse outcomes associated with RALP, which requires an extreme head-down position and prolonged pneumoperitoneum.

2. Materials and methods

2.1. Study design

We conducted this retrospective single-center observational study using the medical records of patients who had undergone a prostatectomy between January 2010 and December 2012. A total of 260 consecutive adult patients who had undergone a prostatectomy were identified through our electrical recording system. Our institute first started performing RALP in May 2011; therefore, we excluded the first 35 patients who received a RALP procedure at our institute (May 2011-December 2011) to allow for the need to develop surgical familiarity with the RALP procedures. Patients who received epidural anesthesia or intravenous patient-controlled analgesia for postoperative pain management were also excluded. The Nagoya City University Hospital Institutional Review Board (IRB) approved this study; the requirement for written informed consent was waived by the IRB because of the retrospective nature of the study. All patient records/information were anonymized and deidentified prior to analysis (IRB no. 937; approved on February 14, 2014).

2.2. Patient characteristics

Data on the patients, including demographic variables, type of anesthesia, anesthetic/pneumoperitoneum/surgical times, intraoperative fluid infusion (crystalloid and colloid), blood products used, blood loss, intraoperative and postoperative opioid use, length of stay in the postanesthesia care unit (PACU), and analgesic use following discharge from the PACU, were collected from the medical records. Additional data on postoperative complications, including postoperative delirium, postoperative nausea and vomiting (PONV), *respiratory complications* (defined as postoperative hypoxemia or postoperative mechanical ventilation), cardiovascular complications (arrhythmia, myocardial infarction, or congestive heart failure), infection, and length of hospital stay, were also collected and compared. A patient was classified as having PONV if he suffered from nausea necessitating treatment with an antiemetic agent(s) and/or vomiting within the first 48 hours after surgery.

2.3. Perioperative management

All the study patients undergoing a prostatectomy were given a balanced general anesthesia. No premedication was administered, according to the department's standard protocol. Upon arrival in the operating room, standard monitoring was undertaken, including an electrocardiogram, pulse oximetry, and noninvasive automated arterial pressure monitoring. After anesthesia was induced with propofol (1-2 mg/kg) and remifentanil (0.2-0.5 μg/[kg min]), rocuronium (0.6 mg/kg) was administered and tracheal intubation was performed. Anesthesia was maintained with volatile agents or total intravenous anesthesia (TIVA). Additional boluses of fentanyl and rocuronium were administered. Fentanyl was administered for postoperative analgesia because of its ability to rapidly control pain and the ease at which it can be titrated. All anesthetic management decisions including type of anesthesia (volatile or TIVA) and the dose of opioid were left to the discretion of the attending physicians. A head-protection pillow was placed under the head, firmly positioned behind the shoulders and immobilized using standard shoulder braces. The same basic surgical technique was used for the RALP and LRP. The patient was placed in the lithotomy position, and the abdominal cavity was insufflated with CO_2 to a pressure of 10 mm Hg (up to 12 mm Hg). Then, the patient was placed in a head-down position, and the trocar cannulas were inserted at the classical points. In the case of RALP, the angle of the head-down position was 30°, whereas in the case of LRP, it was 20°. For RALP, the surgeon performed the procedure using the da Vinci Robot Surgical System (Intuitive Surgical, Sunnyvale, CA). At the end of the procedure, the position of