Journal of Clinical Anesthesia (2014) **26**, 383–389

Journal of Clinical Anesthesia

Original Contribution

Cardiac and hemodynamic consequences during capnoperitoneum and steep Trendelenburg positioning: lessons learned from robot-assisted laparoscopic prostatectomy

Christian Rosendal MD (Staff Anesthesiologist)[a,b,*], Sergei Markin (Staff Anesthesiologist)[b], Maximilian D. Hien (Resident)[c,d], Johann Motsch MD (Professor of Anesthesiology)[b], Jens Roggenbach MD (Staff Anesthesiologist)[b]

[a]*Hirslanden Clinics Berne, Klinik Beau-Site, Schänzlihalde 11, 3000 Bern 25, Switzerland*
[b]*Department of Anesthesiology, University of Heidelberg, INF 110, 69120 Heidelberg, Germany*
[c]*Research Training Group 1126, University of Heidelberg, German Research Foundation (DFG), INF 110, 69120 Heidelberg, Germany*
[d]*Department of Pediatrics, University of Heidelberg, INF 430, 69120 Heidelberg, Germany*

Received 19 February 2013; revised 1 January 2014; accepted 19 January 2014

Keywords:
Cardiac output: afterload, preload;
Robot-assisted laparoscopic prostatectomy;
Transpulmonary thermodiluation

Abstract
Study Objective: To determine and interpret the changes in preload, afterload, and cardiac function in the different phases of robot-assisted laparoscopic prostatectomy.
Design: Prospective, observational monocenter study.
Setting: Operating room at a university hospital.
Patients: 31 consecutive, ASA physical status 1, 2, and 3 patients.
Interventions: Observations were made at 5 distinct time points: baseline after induction of anesthesia, after initiation of capnoperitoneum, immediately after a 45° head-down tilt, 15 minutes after the 45° head-down tilt was established, after the release of the capnoperitoneum, and 5 minutes after the patient was returned to a horizontal position (end).
Measurements: Transpulmonary thermodilution and pulse contour analysis were used to record hemodynamic changes in preload, afterload, and cardiac function.
Main Results: While central venous pressure increased threefold from baseline, none of the other preload parameters showed excessive fluid overload or demand. There was no significant change in cardiac contractility over time. Afterload increased significantly during the capnoperitoneum and significantly decreased compared with baseline after the release of abdominal pressure at the end of the procedure. Heart rate and cardiac index increased significantly during robot-assisted laparoscopic prostatectomy.

* Correspondence: Dr. Christian Resendal, Department of Anesthesiology and Intensive Care Medicine, Klinik Beau-Site, Berne Schänzlihalde 11, CH 3000 Berne, Switzerland. Tel.: +41 31 335 3333; fax: +41 31 335 3772.
E-mail address: chh7@gmx.de (C. Rosendal).

http://dx.doi.org/10.1016/j.jclinane.2014.01.014
0952-8180/© 2014 Elsevier Inc. All rights reserved.

Conclusions: Selective arterial vasodilation at the time of capnoperitoneum may normalize afterload and myocardial oxygen demand.
© 2014 Elsevier Inc. All rights reserved.

1. Introduction

Robot-assisted laparoscopic prostatectomy offers numerous benefits over open radical retropubic prostatectomy, including less operative trauma, less postoperative disability, and shorter hospital stays [1]. However, various risks and disadvantages of the laparoscopic approach result from the use of a capnoperitoneum and the extreme head-down tilt required during the longest portion of the surgery. Decreased venous outflow from the head with the development of laryngeal edema [2], high positive inspiratory pressures, pulmonary edema [3], and frequent intraoperative use of cardiovascular active drugs have been reported [4]. Cardiopulmonary compromised patients in particular may be affected by hemodynamic changes due to the increases in CO_2, intraabdominal pressure, and position-dependent disturbances.

Several studies have attempted to understand the hemodynamic changes that occur during robot-assisted laparoscopic prostatectomy [4–8]. However, the effects determined by the extreme positioning and capnoperitoneum have been largely contradictory. While central venous pressure (CVP) increases between 80% [8] and more than 200% [7], cardiac output (CO) increases [6], remains stable [7], or decreases [5] during robot-assisted laparoscopic prostatectomy. Unsurprisingly, the use of catecholamines and vasodilators in these studies varied significantly [4,6,8].

This pilot study aimed to improve understanding of the hemodynamic changes during robot-assisted laparoscopic prostatectomy, which would enable both a risk classification for patients and an evidence-based application of vasoactive drugs. Data were obtained regarding cardiac contractility, CO, and cardiac preload and afterload immediately after patient positioning, during the capnoperitoneum phase, and after the patients' positions were changed.

2. Materials and methods

Ethical approval for this study (Ethical Committee no. S-350/2010) was provided by the Ethical Committee of Heidelberg Medical Faculty, Heidelberg, Germany (Chairperson Prof T. Strowitzki) on 22 October 2010. Thirty-one consecutive patients scheduled for robot-assisted laparoscopic prostatectomy were enrolled in this study between February and November 2011. The sole exclusion criterion was failure to obtain written, informed patient consent.

2.1. Surgical technique

Robot-assisted laparoscopic prostatectomy was performed by three different surgeons using a robotic system (da Vinci®; Intuitive Surgical, Inc., Sunnyvale, CA, USA). After the patient was prepared and draped in sterile fashion, a capnoperitoneum was created at 20 mmHg and the trocars for the camera and instruments were inserted. Then the abdominal insufflation pressure was reduced to 15 mmHg. For the steep Trendelenburg position, the lower extremities were placed in stirrups, which were spread apart and lowered so that the thighs came in line with the patient's corpus. The operating table was then tilted to a 45° head-down position over a 30-second period. Lymphadenectomy preceded resection of the prostate gland, which was then removed via the paraumbilical port site.

2.2. Anesthesia

All patients received oral midazolam at an appropriate dose for age and weight prior to preparation for surgery. Standard monitoring, including electrocardiography, pulse oximetry, and noninvasive blood pressure monitoring, was established before anesthesia. Induction was performed with sufentanil (0.5 μg/kg), propofol (2 mg/kg), and rocuronium (0.6 mg/kg). Patients were intubated and ventilated (volume-controlled) with an inspired oxygen concentration (FIO_2) of 0.4 and a positive end-expiratory pressure (PEEP) of 5 cm H_2O. Respiratory rate (RR) was adjusted to achieve normocapnia. Desflurane and sufentanil were used for the maintenance of anesthesia, and Bispectral Index (BIS; Aspect Medical Systems, Norwood, MA, USA) monitoring was used to achieve a comparable depth of anesthesia between patients with target values of 40-50. Rocuronium was administered to suppress a response to train-of-four (TOF) throughout capnoperitoneum. Mean arterial pressure (MAP) $>$ 65 mmHg was maintained by the administration of Akrinor (no more than one ampoule containing 200 mg of cafedrine and 10 mg of theodrenaline) followed by a continuous infusion of norepinephrine. Blood losses were substituted with balanced colloids (Voluven or, in patients with renal impairment, Gelafundin). Balanced crystalloids were continuously infused to replace estimated other losses (urine, respiration, perspiration).

Patients were extubated in the Postanesthesia Care Unit (PACU). This action allowed the depth of anesthesia to be maintained at constant levels until the last measurement was completed.

Download English Version:

https://daneshyari.com/en/article/2762916

Download Persian Version:

https://daneshyari.com/article/2762916

Daneshyari.com