

Laparoscopic Radical Prostatectomy in Steep Trendelenburg Position-Harbinger of Unexpected Sequeleae

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Abstract

Robotic surgeries demand challenging positioning and anesthetic management but laparoscopic prostatectomy requiring steep trendelenburg position for prolonged duration is unusually documented. An elderly undergoing radical prostatectomy in steep trendelenburg position by laparoscopic approach with surgery lasting more than six hours duration complicating postoperative recovery by developing cerebral, ocular and airway edema apart from hypothermia, is the point of focus of this case report. The perioperative complications required ICU stay with other prompt management of airway and cerebral edema and elective overnight ventilation, with patient going home without any neurological or respiratory sequelae on fifth postoperative day.

Keywords: Laparoscopic Radical Prostatectomy; Steep Trendelenburg Position

Introduction

Positioning remains an important factor contributing to peri-operative morbidity and with proper padding and cushioning, it prevents majority of neuropathies. Today, laparoscopic and robot-assisted procedures taking centre-stage, the role of anaesthesiologist in proper patient positioning is ever increasing. Different surgical positions have different hemodynamic alterations and systemic effects giving rise to extensive peri-operative implications. This case, particularly, highlights effects of steep trendelenburg position during laparoscopic prostatectomy. Trendelenburg position and pneumoperitoneum together with facial and upper respiratory tract edema cause venous stasis in head and neck region producing mask phenomenon, characterised by lacerated dermal capillaries because of raised intrathoracic and intraabdominal pressures [1]. The evident facial edema alongside cerebral and ocular edema further complicate patient recovery from anaesthesia contributing to peri-operative patient morbidity.

Case Report

A 69 year old male presented with obstructive uropathy symptoms for two months. He was a known type 2 diabetes mellitus patient and hypertensive optimised on pre-existing medications. Prostatectomy for prostatic carcinoma was planned. Complete workup of haemogram, blood urea, serum creatinine, serum electrolytes, liver function tests, ECG, chest x-ray, 2D ECHO, ultrasonography of abdomen and pelvis and positron emission topography scan for other organ involvement was normal. Baseline arterial blood gas was normal. Patient was premedicated with lorazepam 2 mg and lansoprazole 30 mg. Chlorhexidine mouth wash, night before and successive morning prior to shifting patient to OT was advised. In operation theatre (OT), heart rate, non-invasive blood pressure, respiratory rate, oxygen saturation and temperature monitoring were attached. Two large bore IV cannulas were secured. Premedication with intravenous (IV) ondansetron and fentanyl and induction with propofol and rocuronium in appropriate doses was done. Intubation with No. 8.5 Portex endotracheal tube was done and confirmed by auscultation/capnography. Patient was positioned in lithotomy for surgery.

Head and body was wrapped, fluid and hot air warmers were connected. Rectal temperature probe was inserted. Initial core temperature was 36.4 degree Celsius. Sequential compression device were attached to lower limbs for active venous pumping. Eyes were cushioned after applying antibiotic lubricant and pressure points were adequately padded. Foleys catheter was inserted and subsequently

pneumoperitoneum was created. Steep trendelenburg position for laparoscopic prostatectomy with bilateral pelvic lymph node dissection was given. Intra- abdominal pressures were kept around 15 mmHg for pneumoperitoneum in the beginning, later escalated to 20 mmHg for one hour. Maintenance was with oxygen + air + sevoflurane on low flows with rocuronium and dexmedetomidine infusion. Hemodynamics were steady throughout the procedure.

Multimodal analgesia was achieved with IV paracetamol and diclofenac. Antibiotics were administered pre-procedural and intra-operative after a five hour interval. Surgical time exceeded well above six hours of which trendelenburg position was maintained for five hours. Fluids were administered judiciously after considering fasting/maintenance, haemodynamics, blood loss and insensible losses along with one packed cell volume. Furosemide 20 mg IV was given to regulate urine output to match the fluid administration and blood loss. Active warming was continued throughout and steep trendelenburg position reversed after removal of ports. Cushioning and padding were removed and lithotomy position converted to supine position. Reversal of neuromuscular blockade was planned after return of adequate respiratory attempts. However, spontaneous attempts at respiration were absent and hypothermia with conjunctival edema was present. Fundoscopy confirmed papilledema. Chemosis was visible suggesting underlying ocular and high possibility of cerebral edema. Despite active warming efforts since beginning these adverse effects were observed possibly because of surgical time exceeding four hours in the trendelenburg position, increased intra-abdominal pressures and the ambient operating room temperatures. Considering these factors, plan for extubation was postponed until next morning with elective mechanical ventilation in intensive care unit (ICU), with continuance of active re- warming methods. Arterial blood gas sampling revealed adequate oxygenation but respiratory acidosis and normal anion gap metabolic acidosis. PCO_2 levels being 70 mm Hg causing concern about extubation, though ET CO_2 monitor reflected CO_2 levels at 40 mm Hg. This discrepancy was attributed to the large gradient created between arterial CO_2 levels and ET CO_2 levels by steep positioning that causes venous congestion and ventilation perfusion mismatch in the lungs. Overnight mechanical ventilation and continuous active re- warming, with measures to reduce cerebral edema, helped improve patients neurological condition. Extubation was done subsequent day after performing Leak test to confirm absence of laryngeal edema. On 5th postoperative day patient was discharged with no neurological or cognitive deficit or complaints of neuropathy. Early ambulation with appropriate IV analgesics and a course of steroids with other measures to reduce airway inflammation were administered.

Discussion

Anaesthetic management in laparoscopic radical prostatectomy surgeries is related to the pneumoperitoneum in steep trendelenburg position. This combination affects cerebrovascular, cardiac and respiratory systems. The range of nonsurgical complications is quite large [2]. Cardiovascular complications, corneal abrasions, and pulmonary embolism occur in 0 - 0.56%, 3%, and 0.2% patients respectively [2-4]. Gastric reflux [5] with heartburn and compartment syndrome [6] form other minor complications. Most of the complications that make the peri-operative period look grave are rather self-limiting with resolution within 24 hours with simple management and vigilance. What makes the situation look complicated is the difficult access to the patient in such positions by the anaesthesiologist. Extreme positions place patient at risk of movement on table, meticulous attention must be paid to ensure patient position with vulnerable pressure points and eyes being protected throughout the procedure.

Prolonged steep trendelenburg position increases risk of cerebral and airway oedema which may present with stridor after operation. Functional residual capacity, and ventilation perfusion (V/Q) mismatch are worsened, and with cephalad movement of the lungs, the tracheal tube may migrate endobronchially [7]. Another rare but devastating complication of steep trendelenburg is 'well leg compartment syndrome', combination of impaired arterial perfusion to raised lower limbs, compression of venous vessels by lower limbs supports and reduced femoral venous drainage due to pneumoperitoneum. Presentation is similar to compartment syndrome of lower limbs with pain, rhabdomyolysis, and myoglobin-associated acute renal failure [8]. Prevention is by intermittent compression stockings, moving the patient's legs at regular intervals, and using heel/ankle supports instead of calf/knee supports (Lloyd-Davies stirrups). Pulse oximeter placed on the great toe throughout surgery assesses adequacy of pulsatile flow to distal areas of lower limbs.

Intra-abdominal insufflation of carbon dioxide to enable sufficient visualization for laparoscopy increases intra-abdominal volume and pressure and decreases abdominal compliance with intra-abdominal pressure (IAP) exceeding physiological thresholds and individual organ system compromise. Cardiovascular effects include increase systemic vascular resistance (SVR) due to mechanical compression of the abdominal aorta and release of vasopressin and renin-angiotensin-aldosterone system (RAAS) activation, inferior vena cava compression with reduction in preload, decreasing cardiac output and arterial pressure. Reduced pulmonary compliance and functional residual capacity with pulmonary atelectasis and altered V/Q relationships and hypoxaemia is observed. Perfusion to kidney and liver is compromised. Persistent IAPs over 20 mm Hg reduce mesenteric and gastrointestinal mucosal blood flow up to 40% with tissue acidosis. Acute kidney injury with decrease in glomerular filtration rate (GFR) by ~25% develops at IAP > 20 mmHg. Raised intra-cerebral pressure due to limited cerebral venous drainage as a consequence of raised intra-thoracic pressure, contributes to temporary neurological dysfunction.

Conclusion

Laparoscopic prostatectomies do not require extreme trendelenburg positioning with prolonged operative times, but this case in particular demanded steep trendelenburg contributing to venous congestion in head and neck region and thus its sequelae. Insight into complications pertaining to positioning can help anticipate problems and troubleshoot them. Herein, despite best efforts some unavoidable complications of steep trendelenburg position did play role for delayed post-operative recovery but vigilant management peri-operatively promoted early patient recovery with bare minimal patient morbidity. We recommend intermittent neutral position or reversing trendelenburg position every two hours for better patient outcomes.

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