Case Report

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Safety of Robotic Surgery in Urological Cancers in Patients with Ventriculoperitoneal Shunt: A Report of Two Cases

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Abstract

Patients with a ventriculoperitoneal shunt (VPS) are at risk for shunt infection and failure during laparoscopic and robotic abdominal surgeries due to pneumoperitoneum. Herein, we present the first-ever report of robotic surgery in two uro-oncological cases with VPS *in situ*.

The first patient underwent robotic radical cystectomy with intracorporeal ileal conduit formation for bladder cancer, whereas the second underwent radical prostatectomy for localized prostate carcinoma. Surgeries were performed in Trendelenburg position and intra-abdominal pressure of 10-12 mm Hg. Pneumoperitoneum time was 210 and 165 min, respectively. Both patients had an uneventful intraoperative and postoperative course, without any urological or neurological sequelae at 1 and 7 years follow-up, respectively.

Prolonged robotic surgeries were safely performed with less insufflation pressure in the Trendelenburg position in patients with VPS. The shunt did not affect the oncological outcomes, operative time, blood loss, or rates of conversion to open procedure during robotic surgeries.

Keywords: Robotic surgery, ventriculoperitoneal shunt, urological cancers, radical prostatectomy

Introduction

Ventriculoperitoneal shunt (VPS) was described as a treatment for increased intracranial pressure (ICP), resulting from different causes, such as trauma, tumors, infections, and hemorrhage (1). Contamination during abdominal surgeries is possible in patients with VPS, thus various techniques are used, such as shunt externalization or conversion to ventriculoatrial shunt (2). More concerns are noted in laparoscopic/robotic cases due to the retrograde travel of carbon dioxide to the central nervous system, shunt infection, and malfunction due to a high-pressure pneumoperitoneum (3). Published literature described robotic surgeries in patients with VPS (4), but none for urological malignancies. To the best of our knowledge, this is the first-ever case report about robot-assisted uro-oncology cases, namely radical cystectomy with intracorporeal ileal conduit (RCIIC) and radical prostatectomy (RP) in patients with VPS.

Case Presentation

Case 1: A 76-year-old male patient, with a history of VPS surgery in 2006 for obstructive hydrocephalus secondary to arteriovenous malformation, presented with a large bladder mass and biopsy report of muscle-invasive transitional cell carcinoma. In 2012, he underwent an open extraperitoneal RP with pelvic lymph node dissection (PLND) for prostate cancer. Now, RCIIC was performed with care to reduce the contamination from bowel and urine spillage. The total console time was 210 min, which is the average time in our institution for this surgery. Postoperatively, the abdominal drain was removed on day 5, when its output reduced to <50 mL. All blood parameters and biochemical investigations were within normal range. At the 1year follow-up, the patient has no recurrence on positron emission tomography (PET) scan.

Case 2: A 64-year-old male patient presented to us in 2014 with localized prostatic adenocarcinoma (cT2b) and Gleason's score of 4+3=7. He had VPS inserted for traumatic hydrocephalus 5 years ago. The patient underwent robotic RP with PLND. Urinary contamination was experienced upon bladder neck incision during prostatectomy. The total console time was 165 min and surgery was uneventful. The latest prostate-specific membrane antigen PET scan at 7 years follow-up was normal.

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Preoperatively, neurosurgeon's opinion was sought for both patients. They were fully conscious and obeyed commands with normal higher mental functions, without any focal neurological deficit. Intraoperatively, patients were placed in Trendelenburg position at 30°-35° and the pneumoperitoneum pressure was maintained at 10-12 mm Hg. In both cases, shunts were visualized in the right pelvic region (Figure 1) and placed away from the operative field in the upper abdomen. Signs of increased ICP, such as hypertension or bradycardia, were not noted intraoperatively. Minimal intestinal adhesions from the previous VPS surgery required adhesiolysis. Blood loss was minimal. In the end, the shunt was placed back in the pelvic cavity. As per hospital protocol, second-generation cephalosporin was administered. Both patients had a normal postoperative hospital stay, without any neurological or urological sequelae.

As this was a retrospective study, informed consent for study participation was not obtained. However, both participants provided written informed consent for undergoing the surgery.

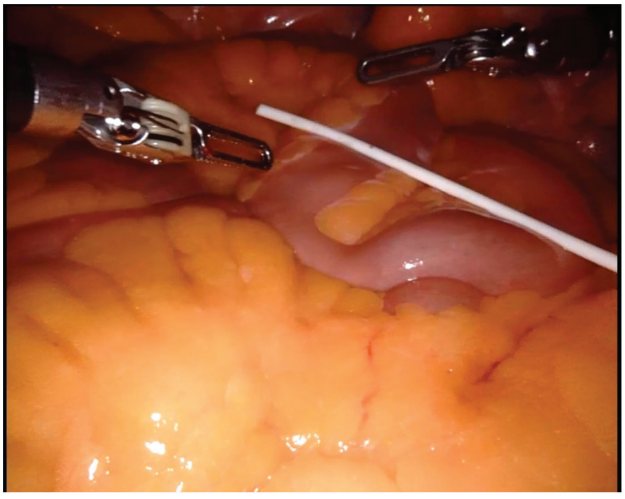

Figure 1. Intraoperative photo of the shunt

Discussion

Laparoscopic and robotic surgeries are well-accepted modalities in managing different abdominal surgical conditions. Traditionally, these are associated with carbon dioxide absorption from the peritoneum, leading to hypercapnia. It causes cerebral vasodilatation and increased ICP. Patients with an incompetent valve in the VPS can experience cerebrospinal fluid backflow in the shunt, thus further increasing ICP (3).

Schwed et al. (5) first reported the case of laparoscopic procedure in a patient with VPS. Their patient underwent laparoscopic cholecystectomy and had massive subcutaneous emphysema intraoperatively, which was attributed to the shunt tract's inability to mature as it was inserted 10 days before surgery. They concluded that laparoscopy should be deferred until maturity and fibrosis of the VPS tract, although the exact timing was not decided. Our patients had VPS surgery 14 and 5 years before undergoing surgery for urological cancers. Li and Dutta (2) performed one of the most extensive case series of 39 abdominal surgeries in patients with VPS. Only seven patients underwent laparoscopic surgeries; however, they concluded that pneumoperitoneum did not pose added risk to the shunt. Bush et al. (4) reported about robotic hysterectomy and mentioned that a pressure up to 25 mm Hg can be safely used in patients with VPS. A French study, which used transcranial Doppler to monitor the intraoperative ICP, also mentioned pneumoperitoneum's safety as long as pressure was not abruptly increased (6). Due to the abdominal wall tenting with robotic arms, the abdomen was gradually insufflated up to a pressure of 10-12 mm Hg using the Airseal Insufflation system (ConMed), which was sufficient to maintain a good vision and working space. Intraoperatively, reflux through the shunt to the intraventricular space is possible. Therefore, various preventive maneuvers are performed, such as temporary clamping using a clip (7), placing the distal end of the shunt in an endopouch bag, placing it away from the operative field (8), or externalizing it in cases of gross purulent contamination (2). We placed away from the surgical field at the beginning of the surgery.

Another study documented the worsening of hydrocephalus, even pneumocephalus, due to carbon dioxide (9). However, our patients had a valved shunt, which was proven to be safe by *in vitro* studies at high pressures (3). Another study noticed a higher conversion to open rates due to adhesions resulting from previous shunt surgery (10). In the present study, the first patient had abdominal adhesions near the tip of the shunt, which was released, and surgery was uneventful, although the patient had undergone an open extraperitoneal RP. Studies mention that laparoscopic surgery of <30 min with low pressures in the Trendelenburg position up to 15° is safe for the shunt (6); however, we experienced no perioperative complications with a pneumoperitoneum time of 210 and 165 min in a Trendelenburg position at 30°-35°. In the past, concerns arose regarding port site metastasis and retrograde spread of cancer due to pneumoperitoneum; however, Emoto et al. (11) have laid to rest all such speculations. Both of our patients were free of any disease recurrence at 1 and 7 years follow-up, confirming the oncological safety of robotic surgery with VPS *in situ*. Literature was against the use of prolonged antibiotic treatment in clean and clean-contaminated surgeries. The shunt infection rates remain the same in intestinal and urological surgeries, even when both systems are breached (2). In the first patient, the antibiotic was administered for 5 days, without adverse effects even after urinary and gastrointestinal contamination.

Conclusion

Prolonged robotic uro-oncological surgeries are safely performed with less insufflation pressure in Trendelenburg position in patients with VPS by placing it away from the operative site. VPS did not affect oncological outcomes, operative time, blood loss, or rates of conversion to open procedure in our robotic surgeries. However, further studies with a greater number of patients are needed to validate these outcomes along with the safety of the Trendelenburg position in patients with VPS. This is the first case report highlighting the perioperative and long-term oncological safety of robotic management for urological malignancies in patients with VPS, which can be further ascertained by studies with a larger sample size.

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Ethics

Informed Consent: As this was a retrospective study, informed consent for study participation was not obtained. However, both participants provided written informed consent for undergoing the surgery.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: V.V.A., T.B.Y., S.S.W., P.D., A.P.P., A.A.R., Design: V.V.A., T.B.Y., S.S.W., P.D., A.P.P., A.A.R., Data Collection or Processing: V.V.A., T.B.Y., S.S.W., P.D., A.P.P., A.A.R., Analysis or Interpretation: V.V.A., T.B.Y., S.S.W., P.D., A.P.P., A.A.R., Literature Search: V.V.A., T.B.Y., S.S.W., P.D., A.P.P., A.A.R., Critical Review: V.V.A., T.B.Y., S.S.W., P.D., A.P.P., A.A.R., Writing: V.V.A., T.B.Y., A.P.P., A.A.R.

References

1. Kanev PM, Park TS. The treatment of hydrocephalus. Nerosurg Clin North Am 1993;4:611-619.
2. Li G, Dutta S. Perioperative management of ventriculoperitoneal shunts during abdominal surgery. Surg Neurol 2008;70:492-497.
3. Uzzo RG, Bilsky M, Mininberg DT, Poppas DP. Laparoscopic surgery in children with ventriculoperitoneal shunts: Effect of pneumoperitoneum on intracranial pressure—preliminary experience. Urology 1997;49:753-757.
4. Bush SH, Greg Heywood S, Calhoun BC. Robotic-assisted hysterectomy in a patient with a ventriculoperitoneal shunt. J Robot Surg 2011;5:291-293.
5. Schwed DA, Edoga JK, McDonnell TE. Ventilatory impairment during laparoscopic cholecystectomy in a patient with a ventriculoperitoneal shunt. J Laparoendosc Surg 1992;2:57-59.
6. Ravaoherisoa J, Meyer P, Afriat R, et al. Laparoscopic surgery in a patient with ventriculoperitoneal shunt: monitoring of shunt function with transcranial Doppler. Br J Anaesth 2004;92:434-437.
7. Kerwat RM, Murali Krishnan VP, Appadurai IR. Laparoscopic cholecystectomy in the presence of a lumboperitoneal shunt. J Laparoendosc Adv Surg Tech A 2001;11:37-39.
8. Yoshihara T, Tomimaru Y, Noguchi K, et al. Feasibility of laparoscopic cholecystectomy in patients with cerebrospinal fluid shunt. Asian J Endosc Surg 2017;10:394-398.
9. Raskin J, Guillaume DJ, Ragel BT. Laparoscopic-induced pneumocephalus in a patient with a ventriculoperitoneal shunt. Pediatr Neurosurg 2010;46:390-391.
10. Allam E, Patel A, Lewis G, et al. Cholecystectomy in patients with prior ventriculoperitoneal shunts. Am J Surg 2011;201:503-507.
11. Emoto S, Ishigami H, Yamaguchi H, et al. Port-site metastasis after laparoscopic surgery for gastrointestinal cancer. Surg Today 2017;47:280-283.