Combined Robotic Radical Prostatectomy and Robotic Radical Nephrectomy

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ABSTRACT

A 60-year-old man with prostatic adenocarcinoma and an enhancing left-sided renal mass underwent successful combined robotic radical prostatectomy and robotic radical nephrectomy. We describe the initial report of this combined robotic procedure to remove 2 synchronous urological malignancies and describe our technique. An analysis was conducted of the operating room and post-anesthesia care unit charges of this procedure compared with the 2 procedures performed independently.

Key Words: Robotics, Radical prostatectomy, Radical nephrectomy.

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INTRODUCTION

The adoption of robotic-assisted laparoscopic prostatectomy (RALP) has permitted the performance of concurrent robotic procedures with a minimal increase in morbidity. Previous cases of RALP combined with robotic partial nephrectomy[1] and nephroureterectomy[2] have been reported. To the best of our knowledge, we present the first case of RALP combined with robotic radical nephrectomy.

CASE REPORT

A 60-year-old man with no significant prior medical or surgical history was referred for an elevated PSA of 8.4ng/dL. A left-sided prostatic nodule (T2a) was palpable upon digital rectal examination. Prostate biopsy revealed prostatic adenocarcinoma in 2 of 12 core biopsies. Left lateral apex core biopsy showed Gleason 4+3=7 adenocarcinoma involving 70% of the sample, and left mid gland core biopsy showed Gleason 3+3=6 adenocarcinoma involving approximately 5% of core tissue. A bone scan was negative. A staging computed tomography (CT) scan incidentally revealed a 4-cm heterogeneously enhancing centrally located mass in the mid pole of his left kidney, suggestive of renal cell carcinoma **(Figure 1)**. Urine cytology was negative. His serum creatinine was 1.0mg/dL.

The patient was consulted regarding the various treatment options available to him for both malignancies. He was most interested in radical prostatectomy for his prostate cancer and partial nephrectomy for the renal mass. We presented the possibility of being able to perform a combined robotic procedure for the excision of both the prostate and the renal mass. The patient was receptive of the benefits of a definitive combined procedure due to the potential for reduced morbidity compared with 2 independent procedures. Eliminating the inconvenience and cost associated with 2 independent hospital admissions was a major factor in his decision.

The patient was thus consented for a combined RALP and robotic partial nephrectomy, with the understanding of the possibility of conversion to a radical nephrectomy if intraoperative assessment necessitated it.

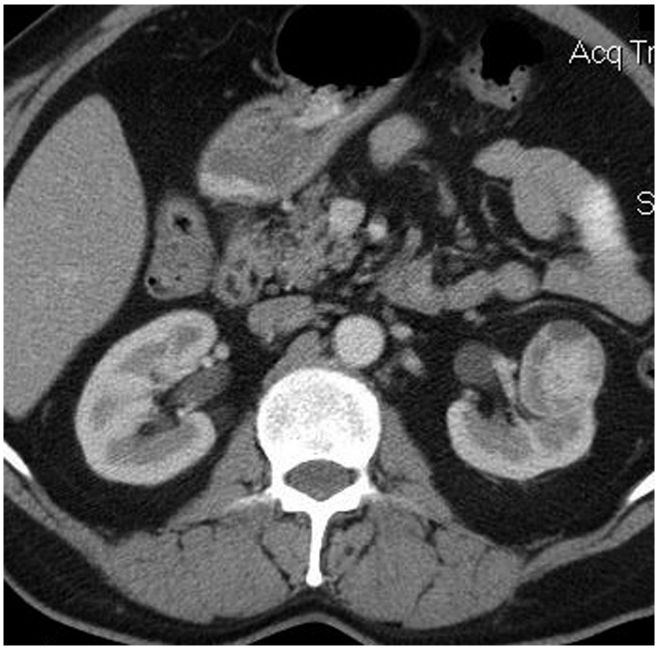

Figure 1. Computed tomographic (CT) scan showing a 4-cm heterogeneously enhancing centrally located mass in the mid pole of the left kidney.

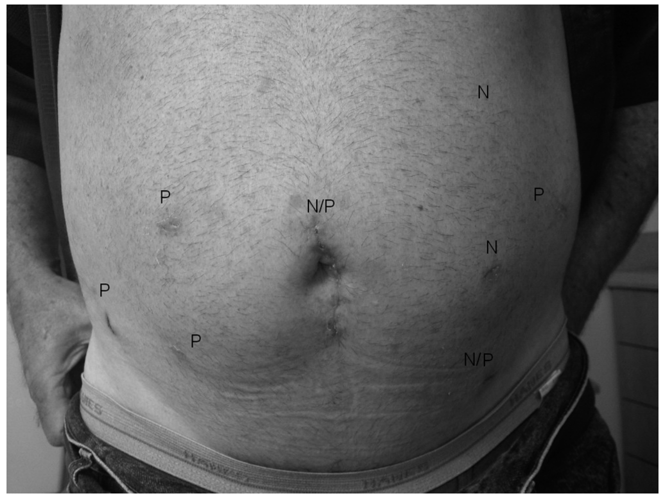

Figure 2. Port placement for robotic prostatectomy.

METHODS

Robotic Prostatectomy

The procedure began as a standard robotic prostatectomy. Following the induction of general anesthesia, the patient was placed in the lithotomy position and prepped and draped in standard fashion. Pneumoperitoneum was achieved with a Veress needle. Port placement is depicted in **Figure 2**. A 12-mm trocar was inserted into the peritoneal cavity via a supraumbilical incision. Two 8-mm robotic trocars were placed lateral to the rectus sheath in each lower quadrant, and an additional 8-mm robotic trocar was placed in the left lateral flank. A 12-mm trocar was placed in the right pararectal area superior to the umbilicus, and another 12-mm trocar was placed in the extreme right lateral flank.

The patient was placed in a steep Trendelenburg position, and the da Vinci S surgical robot (Intuitive Surgical, Sunnyvale, CA) was docked. A standard robotic radical prostatectomy with bilateral "curtain"-type nerve sparing and bilateral pelvic lymph node dissection was performed.[3] The prostate was placed in an EndoCatch sac (Covidien AG, Norwalk, CT) and positioned in the pelvis to be removed at the conclusion of the operation. All trocars were then removed under laparoscopic guidance, and the port sites were covered with sterile adhesive dressings, maintaining the possibility of their reuse during the next stage of the procedure.

Robotic Nephrectomy

The patient was then moved to the left flank position and secured to the table, which was flexed and slightly rotated. All pressure points were padded. The patient was reprepped and draped in a sterile fashion. A 5-mm trocar was reintroduced into the periumbilical incision for the purpose of reobtaining pneumoperitoneum. Two trocar sites from the previous procedure were reused **(Figure 2)**. The 5-mm trocar in the periumbilical incision was swapped for a 12-mm trocar as an assistant port, and an 8-mm robotic trocar was introduced at the previously utilized left lower quadrant site. Additionally, 2 new trocars were inserted: an 8-mm robotic trocar in the subcostal region and a 12-mm trocar lateral to the umbilicus in the midclavicular line as a camera port. The adhesive dressings on the port sites that were not reused successfully maintained the pneumoperitoneum.

The robot was then docked, and the surgery was begun by opening the white line of Toldt from the level of the upper sigmoid to the splenic flexure. The renal hilum was exposed, and dissection continued in a cephalad direction. Further dissection exposed the renal vein and the adrenal and gonadal vessels. The gonadal vein and a lumbar vein coursing posteriorly were clipped and divided. The renal artery and vein were identified and dissected free from the surrounding tissue.

At this time, a laparoscopic ultrasound probe was placed into the abdomen to aid in the assessment of the renal mass. Careful inspection revealed that the endophytic mass appeared to be invading into the collecting system and occupied approximately 25% to 30% of the kidney volume. It was centrally located, and there was concern regarding our ability to safely perform renorrhaphy. Given the location and potential level of invasion of the tumor, we felt that performing a partial nephrectomy would not be feasible, and the decision was made to proceed with a radical nephrectomy. This was discussed intraoperatively with the patient's family, who concurred.

The renal artery, vein, and ureter were subsequently clipped and divided. The adrenal gland was dissected free and left in situ. The kidney and perinephric fat were dissected from the retroperitoneum outside of Gerota's fascia and placed in an EndoCatch sac. The periumbilical incision was extended around the umbilicus, and both the prostatectomy and nephrectomy specimens were removed via this incision. The fascia of the extraction excision and remaining 12-mm ports was closed with O polyglactin suture in a running fashion. A suction drain was placed in the left lower quadrant as per the protocol following prostatectomy.

RESULTS AND FOLLOW-UP

The total time of the patient under anesthesia for the procedure was 300 minutes, with an operative time of 278 minutes (prostatectomy, 120 minutes; nephrectomy, 158 minutes) and 22 minutes required for repositioning. Estimated blood loss was 200mL (prostatectomy, 100mL; nephrectomy, 100mL). Postoperatively, the patient's hospital course was unremarkable, and he was discharged on postoperative day 2. Serum creatinine prior to discharge was 1.3mg/dL. Final histopathology of the prostate revealed Gleason 3+4=7 prostatic adenocarcinoma, stage pT2c. Surgical resection margins and lymph nodes were negative. Final histopathology report of the kidney demonstrated a 4.0-cm clear-cell renal-cell carcinoma, Fuhrman grade 2. The mass did not invade the renal sinus fat, or renal capsule, rendering it stage pT1a. Surgical resection margins were negative.

The patient had no postoperative complications and did not require readmission. His Foley catheter was removed on postoperative day 8. He was seen in follow-up on postoperative day 15, at which point he had fully regained continence (he had stopped using pads) and was having spontaneous erections. Serum PSA was undetectable. A photograph of his abdomen at this follow-up visit is shown in **Figure 2**.

Total operating room (OR) charges for this procedure, including postanesthesia care unit (PACU) charges, were $19,017. This compares favorably for the 2 procedures performed independently. A representative, uncomplicated RALP at Mount Sinai resulted in $13,397 in OR and PACU charges, while a converted robotic partial to radical nephrectomy led to $16,147 in charges. Thus when performed independently, the 2 procedures resulted in $29,544 charges, $10,527 more than the combined approach.

DISCUSSION

The management of multiple primary urological malignancies with combined minimally invasive procedures is not unprecedented,[4–6] yet reports of combined robotic procedures in the treatment of urologic malignancies is limited. Cases of robotic-assisted radical prostatectomy combined with partial nephrectomy[1] and nephroureterectomy have been previously reported.[2] To the best of our knowledge, this is the first documented report of a combined robotic radical prostatectomy and robotic radical nephrectomy for the treatment of primary prostatic adenocarcinoma and renal cell carcinoma.

Robotic-assisted laparoscopic surgery offers patients a minimally invasive option for the treatment of their malignancy. Combined procedures offer the further advantage of avoiding the morbidity associated with multiple operations and eliminating the time, cost, and convalescence associated with a second operative procedure and hospital admission. As many of the same trocar sites (2 of 4 for the nephrectomy) and the extraction site can be used for both procedures, the additional morbidity compared with one procedure alone is minimal.

These benefits of combined robotic procedures are not without possible limitations and drawbacks. As the operative length is significantly longer (5 hours in this case) than either procedure alone, the patient must be able to tolerate general anesthesia for a greater amount of time. This could conceivably lead to a longer postoperative recovery. The steep Trendelenburg necessary to perform a RALP and the flexed lateral decubitus position of a nephrectomy result in the patient's head being below his heart. Prolonged surgeries in this position increase the risk of complications, especially those related to venous stasis, such as deep venous thrombosis and pulmonary embolism, and even compartment syndrome of the leg.[7] Ophthalmologic complications due to prolonged steep Trendelenburg and a resultant increase in intraocular pressure have been reported, although only in cases longer than 5 hours.[8] In this case, the patient was repositioned halfway through the procedure, briefly returning to a neutral position. Such a "positional holiday" may be adequate to alleviate the risks of a prolonged head-down position.

Given the limited number of combined robotic procedures that have been documented, the true impact of the potential risks and benefits has not been described. However, considering that both procedures are well described and were performed in a timely manner, it is unlikely that a higher complication rate would be expected than for either surgery alone. Larger case series will aid in defining the extent of the risks and benefits of combined procedures. Such case series, however, will likely take a long time to accrue given the rarity of 2 synchronous urologic malignancies.

A technical point that merits discussion is the issue of port placement in combined robotic procedures. Through our port placement strategy, we were able to use an 8-mm robotic trocar site in the left lower quadrant and a periumbilical 12-mm trocar site for both procedures **(Figure 2)**. Therefore, only 8 port sites were needed for the completion of both procedures as opposed to the creation of 9 or 10 port sites had the procedures been performed separately. This presumably reduces operative morbidity and pain.

The reuse of port sites requires planning by the surgical team, especially if different surgeons are performing the different surgeries. The strategy for potential reuse of port sites should be a part of the preoperative discussion for any combined robotic procedure. Consideration of the ideal port placement for the second procedure should be given when ports are being placed for the first procedure. Ideally, the port sites should be chosen that permit the safe performance of both procedures through the same ports without compromising the ability to perform either. This often necessitates slightly modifying standard port placement for the first procedure. For example, we placed our 8-mm left lower quadrant incision slightly caudal to our normal placement to increase the triangulation for the nephrectomy. Such modification may increase intraoperative efficiency and minimize the necessity of making additional abdominal incisions.

The intraoperative decision to convert from partial to radical nephrectomy was a critical step in our procedure. It should be stressed that this decision was made for oncologic and not procedural reasons. Given recent reports associating lower rates of overall mortality with nephron-sparing surgery (NSS) compared with radical nephrectomy in the treatment of small renal malignancies,[9] we perform NSS whenever oncologically feasible. However, the CT revealed a centrally located endophytic mass, close to the collecting system, and intraoperative ultrasound suggested that it invaded the collecting system. At the time, we felt that the best course of action for the patient was to proceed in favor of a radical nephrectomy, and the patient's family concurred.

Robotic radical nephrectomy has been shown to be safe and effective in the treatment of renal malignancy.[10] The same instruments are used for robotic radical and partial nephrectomy, thus the required instrumentation was readily available. Conversion to a laparoscopic or open procedure would have unnecessarily prolonged the case without a significant benefit and would have required the use of additional instruments. Accordingly, little consideration was given to these options.

The financial benefits of combining the procedures are substantial. Our approach likely resulted in a cost savings of over $10,000 in OR and PACU charges compared with 2 independent procedures. When including the additional costs of an additional hospitalization and the associated services (laboratory, pharmacy, and other services) the savings would be even greater.

CONCLUSION

We present a successful combined robotic prostatectomy and robotic radical nephrectomy for the treatment of synchronous prostatic adenocarcinoma and clear-cell renal cell carcinoma. We believe that in the carefully selected patient, combined robotic procedures can offer many benefits. Such benefits include reduced morbidity and a shortened hospitalization, convalescence and reduced cost compared with 2 separate procedures and hospital admissions. The potential risks involved in combined operations may be minimized through careful preoperative planning and execution.

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