CASE REPORT

Modifications to Facilitate Extraperitoneal Robot-Assisted Radical Prostatectomy Post Kidney Transplant

Ahmed Ghazi, MD, FEBU, Erdal Erturk, Jean V. Joseph

ABSTRACT

Introduction: Renal transplantation is the treatment of choice for patients with end-stage renal failure. With advances in immunosuppression, the short-term and long-term outcome has improved significantly. Subsequently, urologists are encountering more transplant recipients with genitourinary malignancies, and therefore urologists are becoming increasingly compelled to offer curative treatment options.

Materials and Methods: We present modifications to facilitate E-RARP in these patients that include modified trocar arrangement, delayed bladder neck transection, utilizing the robotic Hem-o-lok applier, and posterior reconstruction of the anastomosis using a barbed V-loc suture. A 68-year-old male with a history of polycystic kidney disease, end-stage renal failure, and an allograft renal transplantation in the right iliac fossa, presented with T1c, Gleason 3+4 prostate cancer. He had a preoperative PSA of 6.93ng/mL, ASA score of 3, and a BMI of 26kg/m^2. Follow-up for metastasis (MRI and bone scan) was negative. E-RARP was performed via the extraperitoneal approach using a 5-port 2-arm approach at an insufflation pressure of 10mm Hg.

Results: The radical prostatectomy was successfully performed. Ureterovesical anastomosis was completed, and total console time was 130 minutes, with an estimated blood loss of 125mL. Final pathology was T2bNx, Gleason 3+4 with negative surgical margins. The patient was discharged with no change in serum creatinine or GFR. The catheter was removed on POD 10 with no intraoperative or immediate postoperative complications.

Conclusion: E-RARP in the carefully selected renal allograft recipient is feasible and accomplished safely with technical modifications to avoid injuring the renal allograft, transplanted ureter, and ureteroneocystostomy.

Key Words: Robotic radical prostatectomy, Extraperitoneal approach, Renal transplant recipients.

Department of Urology, University of Rochester Medical Center, Rochester, New York, USA (all authors).

Address correspondence to: Ahmed Ezzat Ghazi, MD, FEBU, Department of Urology, University of Rochester Medical Center, 601 Elmwood Avenue, Box 656, Rochester, New York 14642, USA. Telephone: +001 585.275.4871, E-mail: ahmed_ghazimd@yahoo.com

DOI: 10.4293/108680812X13427982376626

INTRODUCTION

The development of malignancies is one of the leading causes of morbidity and mortality in renal transplant recipients (RTRs).[1] The increased risk of cancer in RTRs has been attributed to the activation of oncogenic viruses, chronic inflammation, and nonspecific immunosupression.[2] Newer and more potent immunosuppressive agents have improved long-term survival but have also raised concern regarding increased rates of cancer. Genitourinary (GU) malignancies have been reported as the second most common malignancies after skin cancer in the RTR population in the United States. As for the general population, prostate cancer (pCA) is the most common GU malignancy seen in posttransplant males.[3] However, with the increased RTR lifespan and recipient age at the time of transplantation, and better screening practices, pCA is seen at a higher frequency in RTRs compared to that in the general population.[4–6]

In addition to data showing an increased incidence of cancer, there is also evidence showing poorer outcomes in posttransplant patients, justifying the need for improved screening and early treatment in that group of patients.[7] Radical prostatectomy (RP) remains the treatment of choice for patients seeking surgical cure. Radical prostatectomy performed via the open retropubic, perineal[8–11] and laparoscopic approaches[12–14] have been reported in RTRs. To date, only one case has been reported in the literature of a robotic prostatectomy in a transplant patient performed using a transperitoneal approach.[15] Herein, we present modifications for performing robotic-assisted radical prostatectomy (RARP) in this patient population using an extraperitoneal (EP) approach.

CASE REPORT

A 68-year-old male presented with an elevated prostate-specific antigen (PSA) of 6.93ng/mL. His past medical history included a living related kidney transplant at age 28, for end-stage renal disease secondary to polycystic kidney disease. He had a posttransplant lymphocele that was drained via a suprapubic incision. Other open abdominal surgeries **(Figure 1)** included cyst decompression, bilateral nephrectomies via a chevron incision, and bilateral inguinal herniorrhaphy.

A 12-core transrectal ultrasound-guided prostate biopsy revealed Gleason 3+4 and 3+3 prostatic adenocarcinoma in cores from the left and right apical regions, respectively. Further evaluation with a bone scan and CT of the abdomen and pelvis showed no radiologic evidence of regional lymph node involvement or metastatic prostate cancer. A pelvic MRI **(Figures 2 and 3)** was performed in an attempt to visualize the relative location of the renal allograft and the associated ureter. He had had a BMI of 26kg/m^2 and an American anesthesia score of 3. The patient elected to undergo an extraperitoneal robot-assisted radical prostatectomy (E-RARP).

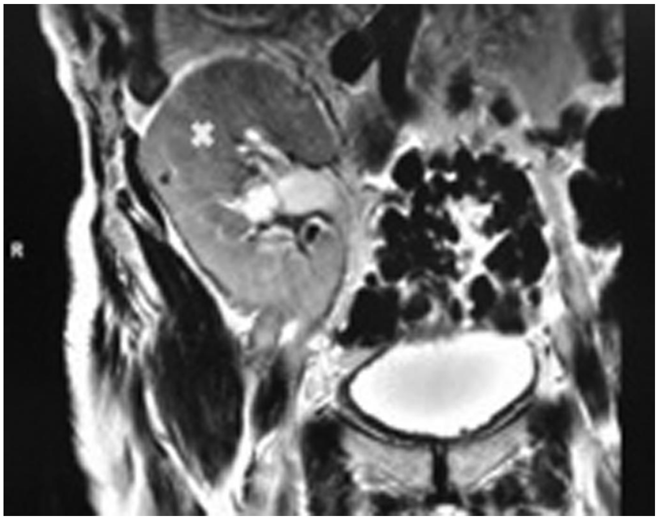

Figure 2. Pelvic-abdominal MRI showing the transplanted kidney in the right iliac fossa.

Figure 1. Patient in supine position before surgery. Arrows indicate scars of previous surgery.

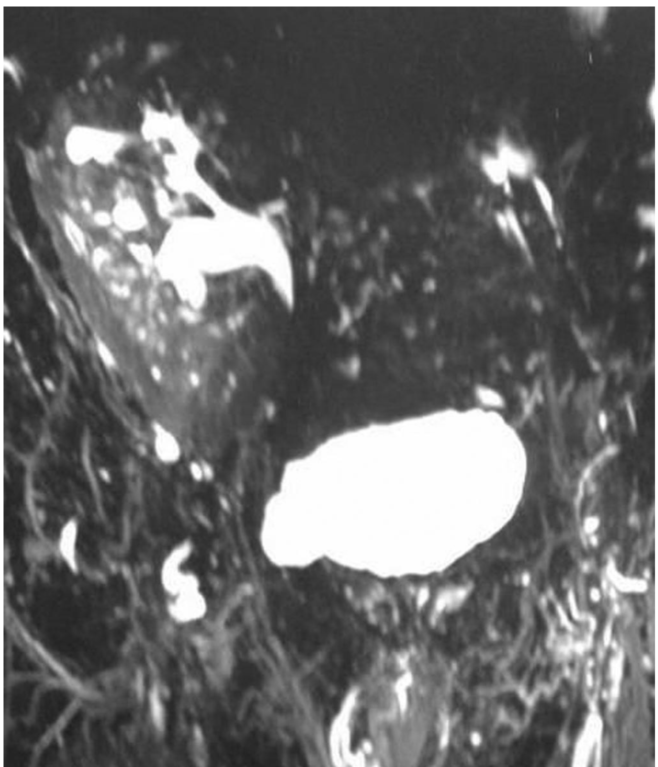

Figure 3. Reconstruction of the MRI images, with failure to visualize the graft ureter.

Surgical Technique

Access to the extraperitoneal space and trocar introduction. The patient was placed in a mild Trendelenburg position (<10 degrees). Our routine 6-port, 4-arm arrangement for E-RARP was modified to a 5-port, 3-arm approach **(Figure 4 A and B)**. A 3-cm left paraumbilical incision was performed to expose the anterior rectus sheath where a 1-cm transverse incision was made. The rectus muscle was retracted laterally to visualize the posterior rectus sheath, gaining access to the EP space. A balloon dilator (OMS-XB2 Extraview or a Spacemaker) mounted on a zero-degree lens was introduced in the EP space towards the symphysis pubis in the midline. Meticulous, partial insufflation under vision was performed avoiding excess pressure on the transplanted kidney **(Figure 5)**. The EP space was only partially developed on the right side due to pre-existing adhesions at the side of the graft. The balloon was replaced by a 150-mm long, smooth trocar (10/12 mm 512 XD, Ethicon Endo-Surgery, Cincinnati, OH) and pneumoretroperitoneum maintained by carbon dioxide insufflation at a pressure of 10mm Hg. The beveled tip of this trocar was used to push the peritoneum cephalad expanding the EP space, to allow placement of 2 assistant trocars, on the side opposite to the transplant.

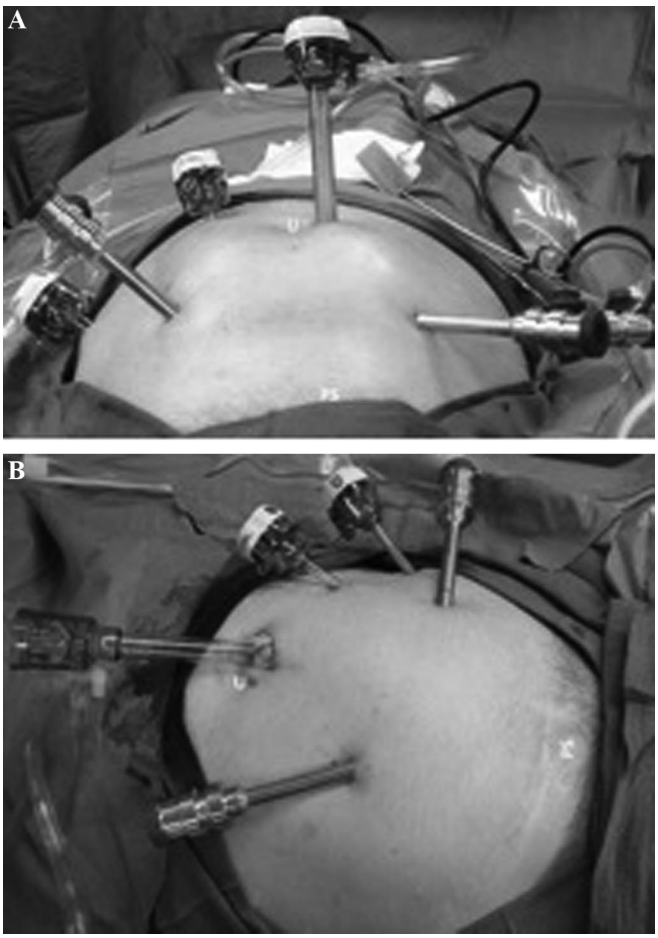

Figure 4. A. Routine 6-port, 4-arm trocar arrangement for E-RARP. PS=pubic symphysis, U=umbilicus. Figure 4B. Modified 5-port, 3-arm trocar arrangement used during E-RARP in RTRs. PS=pubic symphysis, U=umbilicus.

Procedural steps. The endopelvic fascia was incised and the dorsal venous complex ligated in a routine fashion. The bladder was dissected off the prostate, leaving the bladder neck attached, while the seminal vesicles were dissected from the left lateral aspect of the bladder. Preserving the vesico-prostatic junction enabled suspension of the prostate cephalad and to the right. This facilitated dissection of the left seminal vesicle, prostatic pedicle, neurovascular plane, and the posterior rectal plane, without the need of an assistant port on the right side, which could lead to injury to the graft ureter, during passage of laparoscopic or robotic instruments. Vascular

Figure 5. Balloon insufflation of the extraperitoneal space. Excessive insufflation at the site of the graft (marked) was avoided. PS=pubic symphysis, U=umbilicus, G=Renal graft.

pedicles were controlled using the robotic Hem-o-lok applier, avoiding the need for a large assistant port. After complete dissection of the left side of the prostate and both seminal vesicles, the bladder neck was divided exposing the right prostatic pedicle and neurovascular bundle. The right bundle was preserved via a combined antegrade and retrograde approach. Retraction cephalad and to the left during dissection on the right was achieved by a grasper via the left lateral 5-mm assistant trocar. Apical dissection, urethral division, and the urethrovesical anastomosis were completed in a routine fashion. Posterior reconstruction of the rhabdosphincter prior to the urethrovesical anastomosis was performed using a V-Loc suture (Covidien, Mansfield, MA). This allowed approximation of the bladder neck and urethral stump without the need to maintain tension on the suture, due to the inherent properties of the barbed suture. A Jackson Pratt drain was placed in the space of Retzius. The rectus sheath incision was enlarged to remove the specimen.

The procedure was completed with no intraoperative or perioperative complications. Estimated blood loss was 125mL. The patient was discharged home on postoperative day one. Creatinine was 1.24mg/dL, GFR 58mL/min/m. Final histopathology was 3+4 adenocarcinoma with negative surgical margins. On POD 10, the Foley catheter was removed with no complications.

DISCUSSION

Genitourinary malignancies are the second most common malignancies in the RTR population,[2] with pCA being the most frequent, having a 3-year cumulative incidence of 2.5%.[3] The presence of pCA in an immunosuppressed transplant recipient poses a therapeutic dilemma. It is not infrequent for these patients to have co-morbid conditions related to the previous end-stage organ dysfunction. However, observation or expectant management of patients with ongoing immunosuppression poses a theoretical risk of progressive malignant growth in the setting of a suppressed immune system. Therefore, aggressive treatment for pCA in RTRs has been recommended.[7] Therapeutic options for localized pCA in renal transplant patients include RP via the retropubic, perineal, laparoscopic, or robot-assisted approaches and radiotherapy. The most commonly reported surgical approach in RTRs is the classic open retropubic approach, with many centers reporting satisfactory outcomes. However, this approach carries the risk of graft injury during abdominal wall retraction, with difficulty in the dissection to gain access to the iliac fossa and the lateral wall of the bladder. The only reported ureteral resections during radical prostatectomy in RTRs occurred during retropubic RP. These injuries in 2 cases were diagnosed and repaired intraoperatively.[16] The perineal approach poses minimal risks to the graft, as it avoids any manipulation of the renal graft or transplant ureter. This approach also preserves the bladder and contralateral iliac fossa in the case of a future transplant. The perineal approach, although better suited for this cohort of patients, is only mastered by a few surgeons, with only a handful of cases being reported.[10,11] The laparoscopic and robot-assisted approaches have emerged as minimally invasive alternatives to open surgery, with several cases reported using a transperitoneal approach.[12,13,15] Jhaveri et al[15] advocated the use of an extended length bariatric port to bypass the allograft site and deliver the ipsilateral robotic instrument directly into the pelvis and development of the retropubic space from the contralateral side using the robot-assisted approach. Recently, Robert et al[14] reported on 9 cases of extraperitoneal laparoscopic RP in RTR. While surgical time, blood loss, transfusion rate, and bladder injury were similar in comparison to their experience in non-RTR patients, the incidence of rectal injury was 22.2%. Also one patient had thrombosis of the iliac vein with extension into, and loss of, the renal allograft.

We introduce modifications to better customize the EP approach to RARP in RTRs. First, the approach was modified to a 3-arm, 5-trocar arrangement rather than our routine 4-arm, 6-port technique. A single robotic trocar was placed medial to the right epigastric vessels, which avoided passage of instruments across the path of the nonvisualized graft ureter. All other trocars were placed on the contralateral side. This modified arrangement avoids dissection over the transplanted kidney. With an intact EP space, we maintained the pressure at 10mm Hg, to avoid impairing venous drainage from the renal allograft. The bladder neck dissection technique, with transection of the bladder neck after the seminal vesicle dissection, facilitated retraction of the prostate, and avoided possible injury to the transplant ureter **(Fig 6)**. We used the da Vinci Hem-o-lok applier for control of vascular pedicles, allowing a precise application of clips within a confined pelvic space, without the need of a 10-mm, laparoscopic applier. The V-Loc Wound Closure Device (Covidien, Mansfield, MA) was used to complete the posterior reconstruction prior to the anastomosis. This monofilament, unidirectional barbed self-anchoring suture does not allow the suture to be retracted, thereby maintaining tension without the need of further assistance to hold the bladder in place until the knot tying is complete.

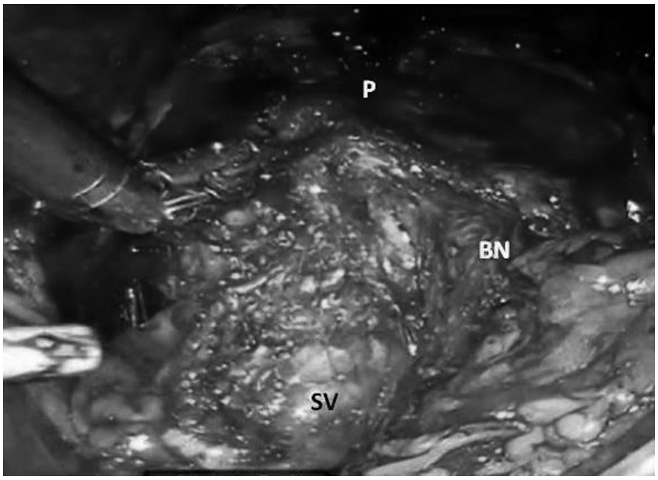

Figure 6. Bladder neck preservation technique. BN=preserved bladder neck, SV=dissected left seminal vesicle, P=prostate.

The implemented modifications allow minimally invasive urologists to overcome the limitations derived from the EP approach in RTRs. These include a limited working space narrowed by the graft, difficulty in approximation of the anastomotic ends due to restricted bladder mobility, and adhesions in the Retzius space due to the previous surgery. Alternatively, the EP approach is advantageous particularly in RTRs, providing direct access to the Retzius space without an increased risk of injury to the graft ureter during bladder take down. Furthermore, intubation of the transplanted ureter via cystoscopy at the beginning of surgery as recommended in early reports[8,9] is not required. While external beam radiotherapy remains an alternative treatment in patients with localized prostate cancer, it is not the treatment of choice in transplant patients, with only a 50% disease-free rate at 5 years. It also carries a high risk of actinic pyelonephritis and postradiation ureteral stenosis, which can be lessened by applying radiation to a full bladder.[17] Other treatment alternatives such as high-intensity focalized ultrasound[18] and brachytherapy[19] have insufficient follow-up in RTRs.

The natural history of pCA in the immunosuppressed patient is unknown, but there is mounting evidence that immunosuppression may enhance malignant cell growth. A recent study highlighted that prostate cancer appears sooner, with a higher rate of advanced or metastatic disease in RTR than in the general population.[20]

CONCLUSION

Performing radical prostatectomy in renal transplant recipients poses significant risks to the allograft. Favorable outcomes can be achieved by using an extraperitoneal approach with the aforementioned adaptations.

References:

1. Marcen R. Immunosuppressive drugs in kidney transplantation: impact on patient survival, and incidence of cardiovascular disease, malignancy and infection. *Drugs.* 2009;69:2227–2243.

2. Vasudev B, Hariharan S. Cancer after renal transplantation. *Curr Opin Nephrol Hypertens.* 2007;16:523–528.

3. US Renal Data System USRDS 2007 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2007.

4. Kasiske BL, Snyder JJ, Gilbertson DT, et al. Cancer after kidney transplantation in the United States. *Am J Transplant.* 2004;4:905–913.

5. Cormier L, Lechevallier E, Barrou B, et al. Diagnosis and treatment of prostate cancers in renal-transplant recipients. *Transplantation.* 2003;75:237–239.

6. Kessler M, Jay N, Molle R, et al. Excess risk of cancer in renal transplant patients. *Transplant Int.* 2006;19:908–914.

7. Konety BR, Tewari A, Howard RJ, et al. for the Urologic Society for Transplantation and Vascular Surgery. Prostate cancer in the post-transplant population. *Urology.* 1998;52: 428–432.

8. Kinahan TJ, McLoughlin MG, Manson AD. Radical prostatectomy for localized prostatic carcinoma in the renal transplant patient. *J Urol.* 1991;146:104–107.

9. Multanen MT, Lindell OI. Radical prostatectomy for localized prostatic carcinoma in a renal transplant patient. *Scand J Urol Nephrol.* 1998;32:221–222.

10. Yiou R, Salomon L, Columbel M, Patard JJ, Chopin D, Abbou CC. Perineal approach to radical prostatectomy in kidney transplant recipients with localized prostate cancer. *Urology.* 1999;53: 822–824.

11. Hafron J, Fogarty JD, Wiesen A, Melman A. Surgery for localized prostate cancer after renal transplantation. *BJU Int.* 2005;95:319–322.

12. Shah KK, Ko DS, Mercer J, Dahl DM. Laparoscopic radical prostatectomy in a renal allograft recipient. *Urology.* 2006;68: 672e5–672e7.

13. Thomas AA, Nguyen MM, Gill IS. Laparoscopic transperitoneal radical prostatectomy in renal transplant recipients: A review of three cases. *Urology.* 2008;71:205–208.

14. Robert G, Elkentaoui H, Pasticier G, et al. Laparoscopic radical prostatectomy in renal transplant recipients. *Urology.* 2009;74:683–687.

15. Jhaveri JK, Tan G, Scher DS, Tewari AK. Robot-assisted laparoscopic radical prostatectomy in the renal allograft transplant recipient. *J Endourol.* 2008;22;2475–2479.

16. Kleinclauss F, Neuzillet Y, Tillou X, et al. Morbidity of retropubic radical prostatectomy for prostate cancer in renal transplant recipients: multicenter study from renal transplantation committee of French urological association. *Urology.* 2008;72: 1366–1370.

17. Doerfler A, Vaessen C, Gosseine PN, Barrou B, Richard F. Laparoscopic radical prostatectomy in kidney transplant patient: our first experience—a case report. *Transplant Proc.* 2009;41: 713–715.

18. Garcia L, Rascon J, Cordero D, et al. Localized prostate cancer treatment in renal transplant patient with high intensity focalized ultrasound (HIFU). *Actas Urol Esp.* 2005;174:70.

19. Whang M, Geffner S, Khachikian Z, et al. Renal transplantation and prostate cancer: guidelines for screening and treatment. *Transplant Proc.* 2002;34:3196.

20. Kleinclauss F, Gigante M, Neuzillet Y, et al. Prostate cancer in renal transplant recipients. *Nephrol Dial Transplant.* 2008;23: 2374–2380.