Endovascular control during partial nephrectomy in a renal allograft

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INTRODUCTION

Nephron-sparing surgery is preferred in transplant recipients with tumors to avoid graft removal and return to dialysis. Partial nephrectomy of renal allografts is technically challenging with regard to limiting warm ischemia time and obtaining exposure of renal hilum. We report a case of robotic-assisted laparoscopic partial nephrectomy performed with selective cannulation and endovascular balloon occlusion of vascular inflow to transplanted kidney. The patient experienced a prolonged warm ischemia time of 95 min in the setting of prolonged operative time due to extensive bleeding but ultimately had a full recovery of graft function.

CASE REPORT

A 67-year-old male, underwent deceased donor kidney transplantation into the right iliac fossa in 1991 which was complicated by graft failure after 3 months. He subsequently underwent a second deceased donor renal transplant to the right iliac fossa in 1995 with nephrectomy of previously failed transplant. The patient was diagnosed with an incidental 6.3 cm × 5.4 cm enhancing lower pole renal mass of transplanted kidney in September 2019. The mass was heterogeneous, endophytic, and abutting the renal pelvis [Figure 1a and b]. Imaging did not reveal enlarged lymph nodes or metastases. He had normal baseline renal function with preoperative creatinine of 0.7 (estimated glomerular filtration rate [eGFR] >60).

To preserve as much renal function as possible in light of the challenge of receiving an additional transplant, the patient elected to undergo robot-assisted laparoscopic partial nephrectomy. Difficult renal hilar access was anticipated due to previous surgeries and vascular anastomoses. Vascular surgery team obtained ultrasound-guided access to the right groin and a guide wire was advanced to the transplant renal artery before docking the robot. The camera port was supraumbilical, right working port was to the right 5 cm from the umbilicus, and left working ports were in the left iliac fossa, each 5 cm away and at the level of umbilicus. Subsequent transperitoneal access and robotic dissection were performed utilizing ultrasound for marking borders of the renal mass in the usual fashion. As expected, the hilum was frozen due to extensive scarring around the right common iliac artery. Mobilization of tumor was also extremely difficult; however, we were able to partly mobilize the lower pole of the kidney by identifying and tracing

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the ureter, which was stented before the procedure. The patient was heparinized with 7000 units and endovascular occlusion of the renal artery was then performed using a size 4 over-the-wire Fogarty balloon [Figure 1c and d]. The renal mass was enucleated with grossly negative margins, and the base was cauterized. This was followed by renorrhaphy performed using 3-0 V-Loc sutures that were enforced with Lapra-Tys. Several 2-0 Vicryl sutures were then used in an interrupted fashion to complete the renorrhaphy. Control of extensive bleeding from the endophytic tumor bed increased the warm ischemia time to 95 min. Estimated blood loss was 500 ml. Endovascular occlusion was subsequently released.

The postoperative period was eventful for acute kidney injury with creatinine of 2.3 and eGFR of 28 on the 4th postoperative day, when he was discharged. His creatinine came down to 1.1 with eGFR >60 at follow-up 2 weeks later. Pathology demonstrated clear cell renal cell carcinoma, Grade 3, with posterior superior and inferior margins microscopically involved by carcinoma. He was started on temsirolimus for positive margins. At 1-year follow-up, there was no tumor recurrence on computed tomography urogram [Figure 1e] and renal function continues to be at baseline with creatinine of 0.8 and eGFR >60.

DISCUSSION

Graft nephrectomy was used in the past for transplant kidney tumors due to immunosuppression risk. However, graft nephrectomy can be risky with a mortality of 3% and postoperative complication rates up to 50%. Return to dialysis after graft failure for a transplant recipient portends a higher mortality risk compared to a transplant wait list candidate, who is on chronic dialysis.[2] Furthermore, sensitization with donor-specific antibodies increases the rate of rejection and graft loss of subsequent kidney transplants. The probability of getting a compatible kidney also decreases in sensitized individuals. Hence, it is imperative to save the transplanted kidney using a nephron-sparing approach when feasible. Our patient had two prior transplants, and hence, graft preservation was equally important as cancer control in this case.

Robotic partial nephrectomy (RPN) is an established procedure for small renal mass in patients with chronic kidney disease (CKD). RPN has shown comparable renal functional outcomes compared to open partial nephrectomy, with lower median blood loss and hospital stay in appropriately selected patients.[3] RPN for a renal allograft tumor is complicated by difficulty with securing access of the renal hilum due to perihilar adhesions from previous vascular dissection and anastomosis. Our patient had a two renal transplants performed on the same side, which made the surgery technically challenging. Hence, we decided to obtain vascular control using endovascular route.

Laclergerie et al. first reported the successful performance of RPN for a renal allograft tumor performed with endovascular occlusion.[4] They utilized this technique for a 2-cm Bosniak Type 4 cyst, and the patient had Grade III CKD at baseline. Our patient had a 6.3-cm solid renal mass (T1b) and also normal renal function (eGFR >60) at baseline. We resorted to dissecting the mass with grossly negative margins, as resection of the tumor base was technically challenging due to proximity of the renal hilum and extensive bleeding from the tumor bed.
Our warm ischemia time was significantly prolonged to 95 min due to the abovementioned technical reasons. We did observe acute kidney injury in our patient in the immediate postoperative period, however, this did not translate into renal functional decline during follow-up. Mir et al. report that using dichotomous cutoff values of 25–30 min of ischemia time for predicting renal function outcomes in the setting of partial nephrectomy is flawed, rather the quality and quantity of parenchyma preserved during surgery plays a more important role in determining the ultimate renal function after partial nephrectomy.3) Our patient did have good baseline renal function, which could explain the functional recovery after partial nephrectomy.

In summary, we report a robotic-assisted transperitoneal partial nephrectomy with endovascular vascular occlusion for transplant recipients who develop renal tumors of their allograft. The feasibility and safety of this approach needs to be further evaluated in a series of cases for comparing functional outcomes and complication rates. We believe the endovascular occlusion is a novel technique that can provide relatively easier and quicker control of transplant renal artery in a redo surgical plane. However, this needs to be validated in future studies.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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