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CASE REPORT

Retroperitoneal laparoscopic-assisted renal autotransplant with bench surgery for renal cell carcinoma in a single kidney: a first for Africa

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We report on a renal autotransplant case with bench surgery from Cape Town, performed for a 4.5 cm hilar renal cell carcinoma in a patient with a single kidney. We describe the procedure and perioperative course and also review the common indications for renal autotransplantation. This is followed by the results from the reported series for renal autotransplantation and bench surgery for neoplastic disease.

Keywords: autotransplant, bench, renal, renal cell carcinoma, RCC, South Africa

Case report

A 64-year-old male, known to have previous high-grade bladder cancer and hypertension, presented with a 4.5 cm renal tumour in the hilum of his functioning single right kidney, with a RENAL nephrometry score of 10 ph. This denotes a high-complexity tumour in the posterior hilar region, with a 21.9% risk of major complications following partial nephrectomy.[1] He was initially diagnosed with superficial high-grade urothelial carcinoma of his bladder following an episode of macroscopic hematuria in September 2021. This required transurethral resection for the bladder tumour (TURBT), followed by intravesical Bacille Calmette-Guerin (BCG). He also had a transurethral resection of the prostate (TURP) for obstructive urinary symptoms. Subsequent contrasted computerised tomography (CT) chest and abdomen scans showed incidental synchronous bilateral renal masses, with no distant metastases present. A robotic-assisted laparoscopic partial nephrectomy of the left kidney was attempted, but a radical nephrectomy was performed due to tumour location and technical difficulties. Histology showed a chromophobe renal cell carcinoma (RCC). The tumour in the remaining right kidney enlarged from 2 cm to 4.5 cm on serial imaging over the following months, with no metastatic disease present. The tumour was central in the right kidney, closely associated with the blood vessels and collecting system in the hilar region. A multidisciplinary team discussed the options of radical nephrectomy and dialysis, tumour ablation or renal autotransplant with bench surgery with the patient.

A renal autotransplant was performed at a private hospital by the first author, assisted by the second author. The procedure consisted of a retroperitoneal laparoscopic nephrectomy with extraction via the superior aspect of the right-sided Gibson incision, which was later enlarged for the autotransplant. The kidney was cooled down using irrigation with cold Custodiol® HTK solution (Essential Pharmaceuticals, USA) in an ice bath. We used bench surgery to dissect the tumour and reconstruct the kidney. Ultrasound was used to guide the dissection. One segmental renal artery was adherent to the tumour surface and was ligated to ensure negative surgical margins. Small vessels and the collecting system were suture-ligated with fine absorbable sutures. We tested for leaks by flushing the vessels and the ureter to test the collecting system. Haemostatic sutures were placed similarly to a robotic-assisted partial nephrectomy, using monofilament sutures and Weck® Hem-o-lok pledgets (Teleflex, USA). We used a haemostatic agent to cover the tumour bed prior to autotransplant to the external iliac vessels in the right iliac fossa, extending the previous Gibson incision. After 3 000 u intravenous heparin was given, the vascular anastomosis was done using a 4.5 mm aortic punch and GORE-TEX® CV-7 sutures (W. L. Gore & Associates Inc., USA). The kidney perfused to pink quickly and haemostasis was adequate on releasing iliac vessel clamps. Ureteric reimplantation was performed over a JJ-stent using a modified Lich-Gregoir technique. The whole procedure was done extraperitoneally. The total surgical time was 7 hours. The first warm ischaemic time was 4 minutes and 2 seconds, the cold ischaemic time was 2 hours and 20 minutes, and the second warm ischaemic time was 35 minutes and 10 seconds. Histology showed a chromophobe RCC of 45 mm × 40 mm with negative surgical margins.

The patient required initial dialysis sessions over the following three days until the kidney function returned. He suffered from a prolonged urine leak from the tumour bed, for which he had a relook procedure on day 5 and no leak was found from the ureter or ureterovesical anastomosis (Clavien–Dindo 3b). The urine leak resolved on day 22 after being managed with low-pressure suction on the transurethral catheter, a JJ-stent and a wound drain. He was discharged the following day, and his catheter and the JJ stent was removed 5 weeks and 7 weeks after the operation, respectively. He remained well until the last follow-up at three months with a creatinine of 131 umol/L independent of dialysis. His preoperative creatinine was 96 umol/L.

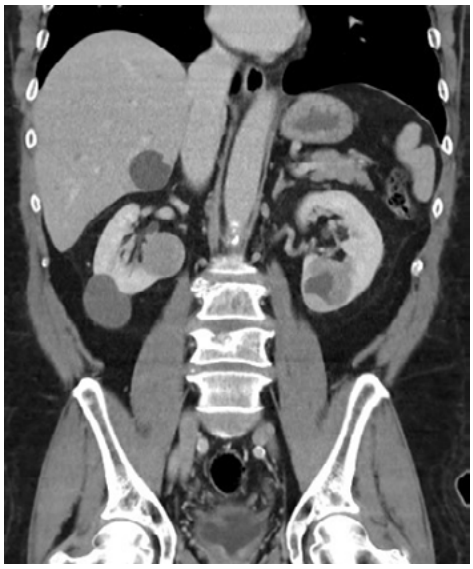

Figure 1: Coronal CT scan prior to the attempted left parital nephrectomy
Note: The heterogenous mass in the left kidney; in the right kidney a simple cyst and the renal mass that was later removed during bench surgery is shown

Figure 2: Coronal CT scan prior to the bench surgery showing an enhancing renal mass that has increased in size, now 4.5 cm in maximal diameter, abutting the renal vessels; the simple cyst is unchanged

Figure 3: Bench surgery – dissected tumour and kidney with open tumour bed with vessels ligated and collecting system closed

Figure 4: Kidney prepared for autotransplantation with haemostatic monofilament sutures and pledgets that can be adjusted in the event of bleeding

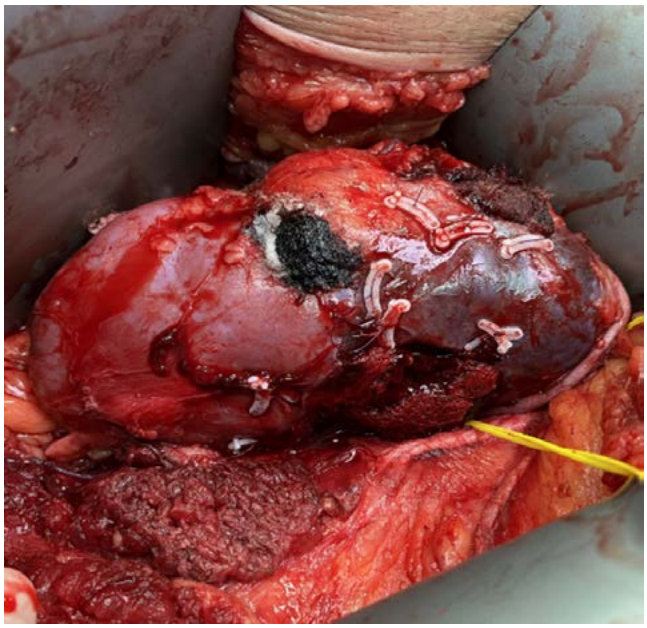

Figure 5: Transplanted kidney after release of clamps
Note the dusky inferior pole where a segmental renal artery was ligated to ensure negative surgical margins

Discussion

Renal autotransplant was first described in 1963 for a case of proximal ureteric injury during aortic surgery.[2] Since then, the indications have expanded and currently, the most common indications for renal autotransplant are renovascular disease, complex ureteric disease, loin pain haematuria syndrome and neoplastic disease.[3] Treatment of bilateral renal tumours or a tumour in a single kidney remains controversial due to risks associated with nephron sparing surgery, radical surgery followed by dialysis and eventual allotransplant, or autotransplant with bench surgery.[3]

In our case, an alternative option to autotransplant would have been an in situ partial nephrectomy with or without intracorporeal renal hypothermia. The potential benefits of this option would be a single incision, shorter operative time and obviating the need for a vascular anastomosis and uteteric reimplantation.[4] However, with an in situ partial nephrectomy there is a time constraint if no

intracorporeal hypothermia is used. The dissection of the tumour and reconstruction would be technically more demanding due to the position of the kidney in the wound, and the position of the tumour behind the kidney. With an autotransplant and bench surgery the warm ischaemic time is limited and controlled, a morbid flank incision is avoided and bench surgery can be done with greater control over kidney temperature. There is also the benefit of freely maneuvering the kidney when dissection and reconstruction is done. We chose this option as we felt this was the patient's best chance of retaining a functional kidney.

Renal autotransplant with bench surgery is not a common procedure, and evidence is limited to a small case series. When bench surgery is considered, the procedure consists of three complex surgeries combined into one, which requires careful planning and patient counselling. Experience from living-donor nephrectomies has enabled the use of laparoscopic or retroperitoneoscopic assistance, as in our case. This advancement has decreased the morbidity associated with autotransplant.[3] Although the procedure is complex, it is a reasonable option to present to patients if they are found suitable after multidisciplinary discussion.

Oncological results for patients with RCC undergoing autotransplant with bench surgery are encouraging. The largest prospective series to date consists of 36 patients with pT1–pT3a disease. The procedure was abandoned in two cases due to N1 disease found at frozen section in one patient and the other having Bellini duct carcinoma. In the remaining 34 patients, one perioperative death was due to myocardial infarction and one kidney was lost due to transplant failure. After a median follow-up of 2.8 years, there was one patient with distant metastatic disease and one with local disease recurrence.[5] An older series by Stormont et al.[6] from 1992 had less encouraging results, with 4 out of 20 surgical failures. Only 6 out of 16 remaining successful autotransplant patients remained free of dialysis or disease recurrence at 35 months.[6]

The functional renal outcomes are acceptable, with 13 out of 15 patients having stable renal function in a series of renal autotransplant and bench surgery by Flatmark et al.[7] Common postoperative complications include bleeding, urinary leak, need for transient dialysis and loss of the kidney.[3] In our case, the patient suffered from a urinary leak, which highlights the potential benefit of performing the procedure extraperitoneally.

To our knowledge, this case is the first African case of laparoscopic-assisted autotransplant and bench surgery for RCC, with one case of bench surgery previously reported for bilateral Wilms tumours in a child.[8] In South Africa, renal transplant and robotic-assisted partial nephrectomy programmes help to build the skill set required to perform this surgery. Renal autotransplant is a last-resort procedure, but we hope that more suitable patients could benefit from this procedure in the future.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Written informed consent was obtained for the publication of the case report.

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