Ex-vivo nephron-sparing surgery and autotransplantation for renal tumours: Revisited

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Abstract

Introduction: We studied the feasibility of ex-vivo nephron-sparing surgery and autotransplantation for complex renal tumours. We also studied the role of laparoscopy in these situations.

Methods: All patients who underwent renal autotransplantation for renal tumour at our centre were included in this retrospective study. Patient profiles were recorded in detail. Operative and postoperative details were also recorded.

Results: Our series includes 3 patients. Two patients had complex renal cell carcinoma and 1 patient had bilateral large angiomyolipoma. In first 2 patients, laparoscopic approach was used for nephrectomy. Operative time for case 1, 2 and 3 was 5.5, 4.5, 8 (right side) and 6 (left side) hours, respectively. Cold ischemia time was 110, 90, 150 and 125 minutes, respectively. One patient required temporary postoperative hemodialysis.

Conclusion: Ex-vivo nephron-sparing surgery and autotransplantation still remain a viable option for complex renal tumours. It offers satisfactory renal functional outcome with acceptable morbidity. The laparoscopic approach should be used whenever possible to reduce morbidity.

Introduction

Kidney autotransplantation was first performed by James Hardy in 1963 for the management of a high ureteral injury.1 After this landmark surgery, autotransplantation has been described for renal artery disease, complex urological reconstruction, upper ureteral tumour, extensive renal parenchymal tumour, and complex nephrolithiasis.2-6 Traditionally autotransplantation involves 2 separate incisions with morbidity and vascular complications. With technical advances in endourology and laparoscopy, indications for autotransplantation were reduced as of 1990. However, in the last decade there have been several reports of bench surgery and autotransplantation for complex renal tumours.7-9 Many of these reports have used combined laparoscopic and open approaches to reduce morbidity. In a small proportion of patients with complex renal tumours, this procedure preserved renal function with satisfactory oncological outcome. We present our experience with ex-vivo nephron surgery and autotransplantation for complex renal tumours. We also explore the role of laparoscopy in these complex procedures.

Methods

Case 1

A 64-year-old male presented with left renal cell carcinoma with metastasis in the opposite adrenal gland. In the past, he was treated with open right radical nephrectomy and left adrenalectomy for renal cell carcinoma with adrenal metastasis. His serum creatinine was 1.5 mg/dL during presentation. Computed tomography revealed 2 lesions in the solitary left kidney: one in the upper pole on the medial aspect measuring 4 × 3 cm and the other in the lower pole measuring 2 × 2 cm (Fig. 1a). The right adrenal lesion was removed by the transperitoneal laparoscopic approach. For the left renal tumour, we performed a transperitoneal laparoscopic left radical nephrectomy followed by bench dissection and autotransplantation (Fig. 1b). Both procedures were performed at the same time.

Case 2

A 35-year-old female presented with bilateral renal cell carcinoma (Fig. 2a). For the right side upper polar tumour, transperitoneal laparoscopic nephron-sparing surgery was performed (Fig. 2b). Three weeks later the patient was operated for the left side complex renal tumour. Laparoscopic radical nephrectomy, bench surgery and tumour resection...
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followed by autotransplantation of reconstructed kidney was performed (Fig. 2c).

Case 3

A 28-year-old female presented with giant bilateral angio-myolipoma measuring about 30 × 15 cm on the left side and 26 × 18 cm on the right side (Fig. 3a). Her renal parameters were within normal limits. Detailed evaluation ruled out tuberous sclerosis complex. Different options were discussed with the patient. Angioembolisation was not feasible in view of the large size of the tumour and the difficulty in identifying the feeding vessel. A bilateral open nephrectomy, ex-vivo nephron surgery and auto transplantation was performed in 2 separate sessions (Fig. 2, Fig. 3).

Surgical technique

In the 2 patients with renal cell carcinoma, radical nephrectomy was performed by transperitoneal laparoscopic approach with the standard 4-port technique. The peritoneum was
reflected along the line of Toldt. Dissection was continued outside the Gerota’s fascia. Uretogonadal pedicle was dissected from the iliac vessels to preserve adequate periureteral tissue. Hilar dissection was performed to achieve control over renal vessels. The kidney was freed from posterior and superior attachments to complete the procedure. Papeverine soaked gauze was kept around the renal artery; pneumoperitoneum was removed for 15 minutes to overcome the ischemic effects. The kidney was retrieved through a Pfannenstiel incision after clipping the ureter, artery and vein sequentially. The drain was kept in the renal fossa and port closure was done. The kidney was kept in ice slush and perfused with a cold HTK solution on the back table. Bench surgery was performed to excise the tumour completely followed by callycography and renorrhaphy using 3-0 and 2-0 polyglactin suture, respectively. Renal bed was prepared in the right iliac fossa by extending the Pfannenstiel incision. Reconstructed kidney was autotransplanted by anastomosing the renal vein to the external iliac vein end-to-side and renal artery to the internal iliac artery end-to-end using 6-0 polypropylene suture. In both cases remnant kidney was anastomosed to the right iliac vessels. Ureteric reimplantation was performed by extravesical Lich-Gregoir technique. The drain was placed and the wound closed in layers.

In the patient with bilateral giant angiomyolipoma, open nephrectomy was performed with loin incision extending up to iliac fossa to facilitate autotransplant. First, the procedure was performed on the right side, 4 weeks later the procedure was repeated on the left side. After entering the peritoneal cavity, the colon was reflected from lateral attachments to

Fig. 2c. Case 2: Autotransplanted kidney with good perfusion.

Fig. 3a. Case 3: Giant bilateral angiomyolipoma measuring about 30 × 15 cm on the left side and 26 × 18 cm on the right side.

Fig. 3b. Case 3: Bilateral open nephrectomy, ex-vivo nephron surgery and autotransplantation was performed in 2 separate sessions.

Fig. 3c. Case 3: Bilateral open nephrectomy, ex-vivo nephron surgery and autotransplantation was performed in 2 separate sessions.
bare the kidney and ureterogonadal pedicle. The ureterogonadal pocket was dissected up to the iliac vessels without disturbing the vascularity of the ureter. Dissection was continued outside the Gerota’s fascia to mobilize the kidney all around. Hilar dissection was performed to achieve control over renal vessels. Ureter was disconnected at the level of iliac vessels and diuresis was confirmed followed by ligation and disconnection of renal artery and vein sequentially. On the right side, the cuff of the vena cava was included in the renal vein. Each kidney weighed about 2500 g. Bench surgery was performed to excise the tumour completely and to reconstruct the kidney meticulously. Autotransplantation was performed extending the incision to the iliac fossa as described earlier.

Results
The patients’ clinical profiled are listed in Table 1. Operative and postoperative profiles are shown in Table 2. Case 1 required postoperative hemodialysis for 5 days. Renal parameters reached normal levels by postoperative day 12. Another 2 patients did not require hemodialysis during the postoperative period. There were no operative and postoperative complications. Follow-up imaging showed good perfusion of the autotransplanted renal unit. In case 3, the right autotransplanted kidney failed to show good perfusion; however the patient’s renal parameters reached normal limits.

Discussion
Radical nephrectomy for organ-confined renal cell carcinoma is associated with increased risk of chronic kidney disease and cardiovascular events. Nephron-sparing surgery has become the standard for managing small renal tumours. For tumours of the solitary kidney, multiple bilateral tumours and tumours in patients with impaired renal function, it becomes mandatory to preserve as many nephrons as possible. This goal can be achieved either by the laparoscopic or open approach; the latter is preferred for complex tumours. In a small proportion of patients with complex tumour, in situ tumour resection is not feasible. In such situations, ex-vivo tumour resection and autotransplantation are advocated. Previously complex tumours requiring the nephron-sparing approach have been managed by open nephrectomy, bench surgery, and autotransplantation. However, after 1990 this procedure was not common. Although reasons for this are not known, it could be because of the morbidity associated with a large incision and vascular complications associated with autotransplant. As of 2000, there has been a surge of interest in ex-vivo tumour resection and autotransplant for complex renal tumours, as well as for high ureteral injuries and ureteral tumour; this interest has created a need to preserve the kidney. Many of these reports have used the laparoscopic approach to perform nephrectomy thereby reducing the morbidity. This increase in interest could be due to increased experience with laparoscopic approach for radical nephrectomy and donor nephrectomy and increasing expertise in vascular anastomosis. Laparoscopic radical nephrectomy has been demonstrated to be safe, with an oncological outcome similar to the open approach with less morbidity. In 2000 Gill and colleagues reported on retroperitoneoscopic nephrectomy and autotransplantation in 4 patients; one of these patients had a large proximal ureteric stricture. They attributed the feasibility of this procedure to their expertise in laparoscopic donor nephrectomy. At our centre, we have performed more than 800 laparoscopic donor nephrectomies. We also have a lot of experience in renal transplantation which has helped us to embark on laparoscopic nephrec-
Ex-vivo nephron-sparing surgery for renal tumour is a viable option in extreme situations. Laparoscopic approach should be used whenever possible to reduce the morbidity of the procedure. Bench surgery and autotransplant offer several advantages over the anephric condition with renal replacement therapy and it should be considered after discussing the pros and cons with the patient.

Case Summary

In case 1, we performed an ex-vivo nephron-sparing surgery for a large angiomyolipoma in the left kidney. The tumour was resected from the kidney and then transplanted into the left iliac artery. The patient had no complications and was discharged from hospital the following day.

In case 2, we performed a laparoscopic nephrectomy for a large angiomyolipoma in the right kidney. The tumour was resected from the kidney and then transplanted into the right iliac artery. The patient had no complications and was discharged from hospital the following day.

In case 3, we performed a laparoscopic nephrectomy for a large angiomyolipoma in the left kidney. The tumour was resected from the kidney and then transplanted into the left iliac artery. The patient had no complications and was discharged from hospital the following day.

The results of these cases show that ex-vivo nephron-sparing surgery and autotransplantation can be a viable option for the treatment of large angiomyolipomas.

Competing interests: Dr. Abraham, Dr. Siddaiah, Dr. Ramaswami, Dr. George, and Dr. Das all declare no competing financial or personal interests.

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References


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