Case — Laparoscopic transperitoneal partial nephrectomy of T3a renal cell carcinoma within a horseshoe kidney

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Introduction

Horseshoe kidney (HSK) is a benign malformation characterized by three anatomic abnormalities: ectopia, malrotation, and vascular changes.[1] Renal cell carcinoma (RCC) comprises approximately 53.8% of HSK malignancies. The incidence of RCC within HSK is predicted to equal that within the general population, approximately 5.2/100 000 individuals.[2-4]

Surgical resection of these tumours has been described in the literature. Evidence is mounting that partial nephrectomy, rather than radical nephrectomy, and minimally invasive techniques for T3a RCC is safe and attains equivalent oncological outcomes.[5,6] Review of the literature reveals no case reports of laparoscopic partial nephrectomy for T3a RCC, and therefore, this is the first report of a laparoscopic partial nephrectomy of T3a RCC HSK with renal vein tumour thrombus.

Case report

A 49-year-old male presented for kidney donation. Upon workup with abdominal computed tomography (CT) he was found to have a HSK in addition to a 6.9x5.6x5.9 cm right-sided renal mass suspicious for RCC.

The patient was asymptomatic with neither flank or abdominal pain, nor gross hematuria; however, he did describe weekly night sweats for the preceding six months. His body mass index was 28.9 kg/m² and physical examination of genitalia revealed a right-sided grade 2 varicocele and a left-sided grade 3 varicocele; testes and phallus were otherwise unremarkable.

Review of the imaging led to a clinical staging of cT3aN0M0. A tumour thrombus was present within the most cephalad right renal vein extending to 1.6 cm from the insertion to the inferior vena cava (IVC). There were two codominant right renal veins. The RENAL nephrometry score was 10 xh. Renal function was normal, with serum creatinine of 77 µmol/L for an estimated glomerular filtration rate (eGFR) of 93 ml/min. Several management options were considered, including partial vs. radical nephrectomy and laparoscopic vs. open approaches. It was decided that a laparoscopic partial nephrectomy was feasible and the procedure of choice.

Intraoperatively, the patient was positioned in left lateral decubitus. Five laparoscopic ports were placed on the right side of the abdomen. The colon and duodenum were mobilized. The IVC was identified and dissection of the hilum and upper pole was performed. A concerted effort was made to identify and dissect the segmental branches of the hilar renal arteries and veins. An intraoperative laparoscopic ultrasound probe was used to identify the margins of the tumour and the extent of the renal vein tumour thrombus, which was also visualized grossly and limited to the segmental renal vein. No milking or manipulation of the tumour thrombus was necessary. A 35 mm vascular cutting stapler was used to transect the cephalad renal vein proximal to the tumour thrombus (Fig. 1). Laparoscopic bulldogs were used to selectively clamp the segmental branches of the right renal artery. Absence of Doppler flow to the tumour and mid/upper pole of the right kidney was confirmed with the laparoscopic ultrasound probe (Fig. 2). The lower pole of the right kidney remained perfused throughout the entire resection. Resection with laparoscopic metzenbaum scissors was performed with a thin parenchymal margin surrounding the tumour. The collecting system was then closed with 3-0 Vicryl SH, as were the open-ended vessels, including an arteriotomy of a segmental renal artery in the resection bed (Fig. 3). The bulldog clamps were released after 24 minutes, with excellent hemostasis using the early unclamp/selective clamping technique. Two parenchymal sutures using 0-Vicryl were then secured using LaparaTy. Floseal was applied to the renal resection bed (Fig. 4). The specimen was extracted in a 15 mm Endocatch bag through extension of the right lower quadrant port. Estimated blood loss was 300 mL.
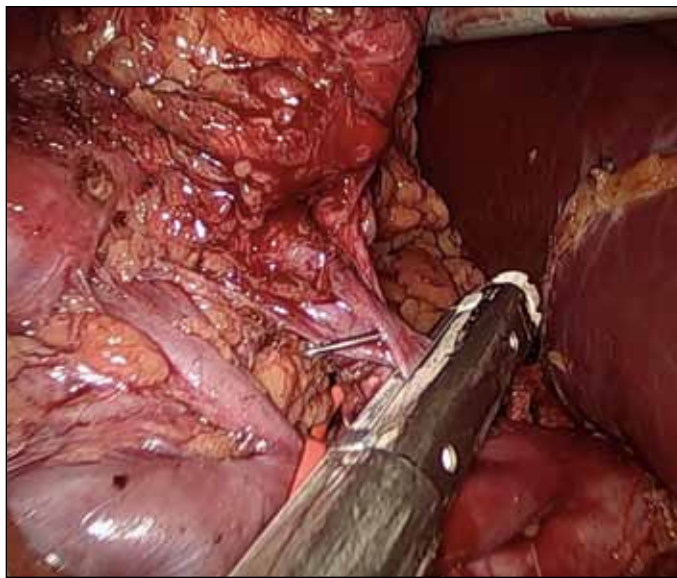
Fig. 1. Most cephalad renal vein with tumour thrombus being transected with laparoscopic stapler.

Fig. 2. Use of intraoperative ultrasound to confirm regional absence of perfusion with selective renal arterial clamping.

Pathology of the specimen revealed a 5.6x4.8 cm pT3a clear-cell RCC with extension into the renal sinus and renal vein tumour thrombus. Surgical margins were negative. There were no other adverse pathological features. The patient has had routine clinical and radiologic followup with no evidence of recurrence after three years of followup. At three years postoperative, his renal function remains stable, with a creatinine of 89 μmol/L (eGFR 86 ml/min).
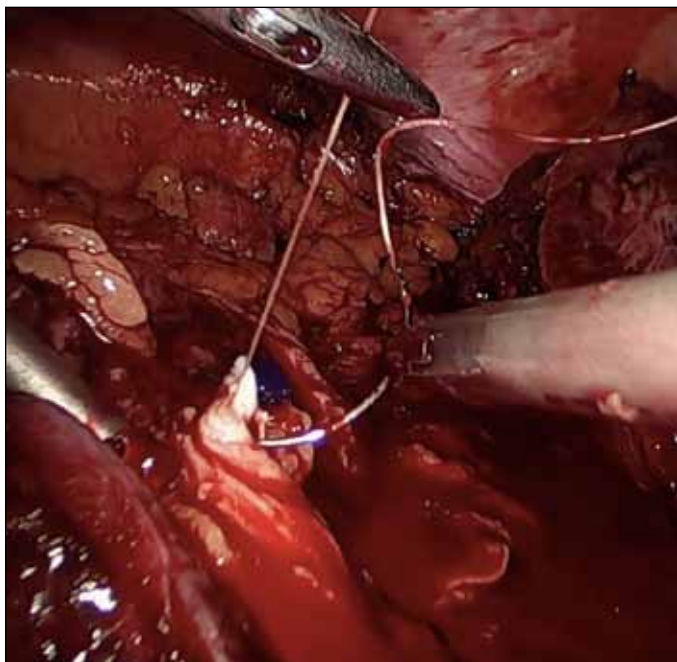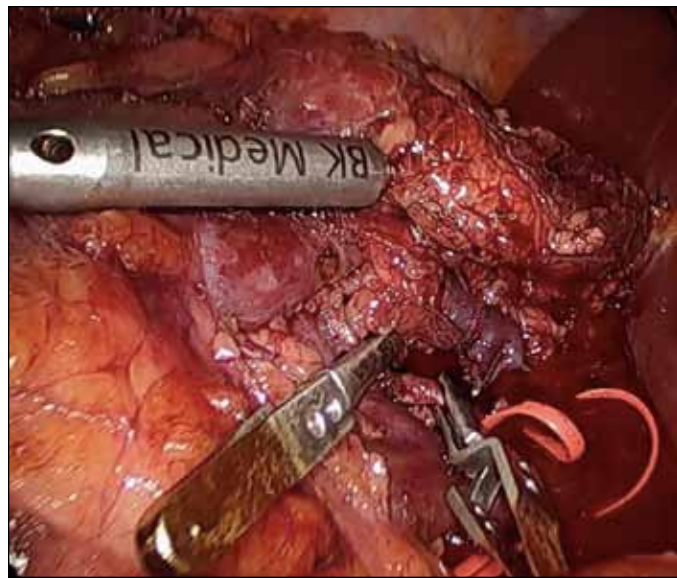
Discussion

Partial nephrectomy is the preferred surgical option when technically amenable for renal tumours. Comparative series have demonstrated that partial nephrectomies are non-inferior to radical nephrectomies with respect to oncological results and provide additional benefits to the patient.[7] Evidence continues to accumulate that laparoscopic and robotic approaches for advanced RCC with renal vein tumour thrombus is safe in properly selected patients.[8] In some cases, partial nephrectomies for RCCs with renal vein tumour thrombus involvement have required milking

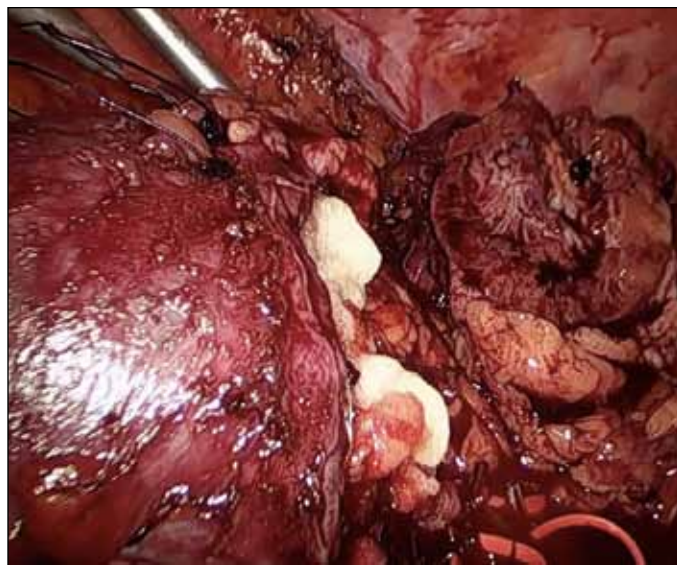Fig. 3. Closure of arteriotomy in segmental artery.

Fig. 4. Renal resection bed with FloSeal; resected mass in background.

of tumour thrombus or vascular control of IVC for adequate resection and repair after tumour thrombus removal from the renal vein; however, this was not necessary in the present case since the renal vein could be stapled proximal to the tumour thrombus.[8]

Surgical resection of RCC in HSK has been described in the literature.[9] HSK vascular anomalies are known to exist and make dissection and effective clamping challenging. However, the presence of multiple renal veins in this case allowed us to ligate one of the codominant renal veins without compromising venous outflow of the remaining right renal parenchyma. In other words, if this patient had a single right renal vein, then a partial nephrectomy would not have been technically feasible. Careful preoperative planning and intraoperative correlation with preoperative imaging was essential to the success of this unique and complex case. A concerted effort to identify and dissect segmental hilar right renal arteries was crucial for control and resection. Intraoperative ultrasound also aided in the safe and effective resection of tumour within renal parenchyma, and identification of the tumour thrombus to facilitate subsequent resection with clear margins. Finally, early unclamp/selective clamping technique allowed for complex resection and reconstruction while minimizing warm ischemia.

To our knowledge, the present study describes the first laparoscopic transperitoneal partial nephrectomy of 6.9 cm T3a RCC with renal vein tumour thrombus. Three year followup has shown excellent oncological control with no evidence of recurrent disease and stable renal function.

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