Preferred management option for small renal masses: laparoscopic partial nephrectomy

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Can Urol Assoc J 2010;4(2):139-41

Small renal masses (SRMs) are usually defined as kidney masses less than 4 cm (stage T1a). With modern imaging capabilities, these SRMs are being found incidentally with more frequency. Of these SRMs, about 70% to 80% are malignant.[1] The smaller the renal mass, the more likely the mass is benign as opposed to malignant. Similarly, the larger the renal mass, the more likely it is to have a higher pathological grade (Fuhrman's Grade I-IV).

Advocates of active surveillance (AS) monitoring of tumour size with serial imaging quote the rationale that if the SRM is slowly growing or stable in size, the more likelihood of it being benign. In fact, the growth rate of malignant SRM has been found to be similar to the growth rate for benign SRM.[2] Up to 8% of patients with SRM between 3 cm to 4 cm present with concurrent metastases at time of diagnosis.

Surveillance protocols usually require percutaneous renal biopsy first to establish tissue diagnosis of malignancy and the minor risk which goes along with a biopsy. These risks include bleeding, infection, possible blood transfusion, arterio-venous fistula and the rare risk of biopsy tract seeding. Following biopsy, most surveillance protocols require imaging with computed tomography (CT) or magnetic resonance imaging (MRI) every 6 to 12 months.[3] The long-term costs associated with serial imaging is significant, as well as the significant long-term radiation exposure associated with serial CT/MRI. Therefore, AS for the SRM is usually reserved for the elderly or infirm patient at high surgical risk.[4]

Probe ablation therapies for the treatment of the SRM include laparoscopic or percutaneous approaches to cryoablation or radiofrequency ablation. These probe ablation technologies, although promising, are currently not the treatment options of choice over laparoscopic partial nephrectomy (LPN) due the lack of long-term oncologic data.

Partial nephrectomy remains the gold standard for the treatment of the SRM.[4,5] A nephron-sparing approach is preferred for the SRM to avoid chronic kidney disease over the long term.[6] Radical nephrectomy should be rarely performed for the SRM and usually only for the centrally located tumour. The long-term oncologic equivalent of partial nephrectomy with radical nephrectomy has been confirmed in multiple studies.[7]

Laparoscopic partial nephrectomy has become the treatment of choice in centres with experienced laparoscopic urologists.[8] Technical difficulty in LPN is encountered when securing renal hypothermia, renal parenchymal hemostasis, pelvicalyceal reconstruction and parenchymal renorraphy by pure laparoscopic techniques. Nevertheless, ongoing advances in laparoscopic techniques and operator skills have allowed the development of a reliable technique of LPN, duplicating the established principles and technical steps underpinning open partial nephrectomy.

A substantive laparoscopic partial nephrectomy entails renal hilar control, transection of major intrarenal vessels, controlled entry into and repair of the collecting system, control of parenchymal blood vessels, and renal parenchymal reconstruction, all usually under the "gun of warm ischemia." As such, significant experience in the minimally invasive environment, including expertise with time-sensitive intracorporeal suturing, is essential. We perform LPN using a transperitoneal approach with Veress needle or directly using the Optiview trocar system (Ethicon Endosurgery, Cincinnati, OH) to attain pneumoperitoneum. Three to four ports (including two 10- to 12-mm ports) are routinely placed in our technique. Exposure of the kidney and the hilar dissection are performed using J-hook electrocautery- suction probe or by using the ultrasound energy-based harmonic shears (Ethicon Endosurgery, Cincinnati, OH). This is done by reflecting the mesocolon along the line of Toldt, leaving Gerota's fascia intact. Mobilizing the kidney within this fascia, the ureter is retracted laterally and cephalad dissection is carried out along the psoas muscle leading to the renal hilum. Once the tumour is localized, we dissect the Gerota's fascia and defat the kidney leaving only the perinephric fat overlying the tumour (Fig. 1). Intraoperative ultrasonography with a Philips Entos LAP 9-5 linear array transducer (Philips Medical Systems Inc., Bothell, WA) can be used to aid in tumour localization if it is not exophytic or if the tumour is deep into the renal parenchyma. A laparoscopic vascular clamp (Karl Storz, Tuttlingen, Germany) is placed around both the renal artery and the renal vein (without separation of the vessels) for

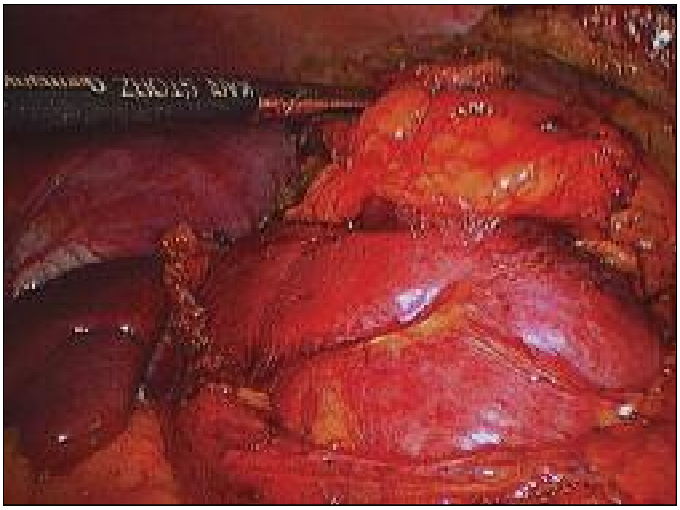

Fig. 1. Defatted kidney except area overlying the tumour.

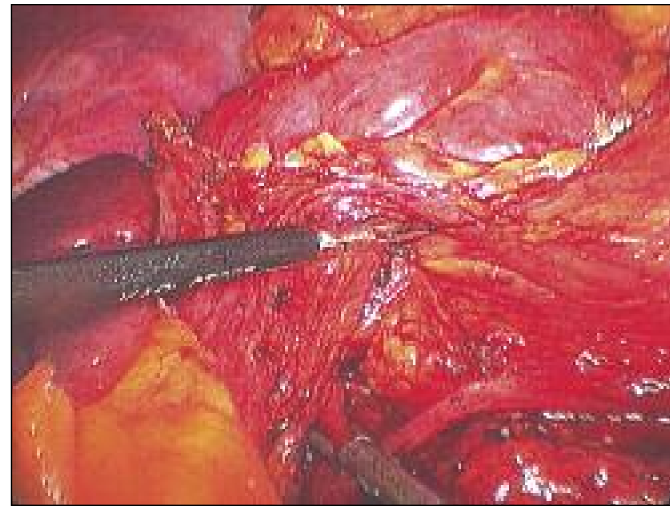

Fig. 2. Clamped renal hilum.

hilar control in cases associated with central masses and heminephrectomy procedures (Fig. 2). Resection of renal parenchyma is performed with cold scissor (Fig. 3), and the specimen is retrieved using a 10-cm laparoscopic EndoCatch bag (US Surgical Corporation, Norwalk, CT), and sent for frozen section analysis (sometimes with an excisional biopsy from the base) to determine the resection margin status. Hemostasis is accomplished using intracorporeal suturing, argon beam coagulator and fibrin sealant (Floseal Tisseel, Baxter, Vienna, Austria) (Fig. 4). Specific figure-of-eight sutures are placed at the site of visible individual transected intrarenal vessels using a CT-1 needle and 2-0 Vicryl suture. Parenchymal closure is achieved by placing prefashioned rolled tubes or packets of oxidized cellulose sheets (Surgicel, Ethicon, Cincinnati, OH) into the parenchymal defect. Braided 2.0 absorbable sutures are used to bolster the sheets into position, and fibrin glue is applied over the operative site using a laparoscopic applicator. We perform parenchymal repair using multiple interrupted 2.0 absorbable sutures and securing them in position using absorbable polydioxanone polymer suture clips, the Lapra-TY (Ethicon, Endosurgery, Cincinnati, OH). Placing one Lapra-TY clip to the end of the suture then another one to the opposite side after compressing the kidney does this (Fig. 4). This modification has resulted in a significant reduction of our warm ischemia time that was consumed primarily by intracorporeal suturing.

In experienced centres, the complication rates of LPN versus open partial nephrectomy (OPN) are similar, as well as similar rates of positive surgical margins.[9] As well, long-term oncologic efficacy is similar for the LPN compared to OPN confirmed in multiple long-term data series. Opponents of LPN quote higher rates of warm ischemia and postoperative bleeding with LPN, but this has been refuted in recent stud-

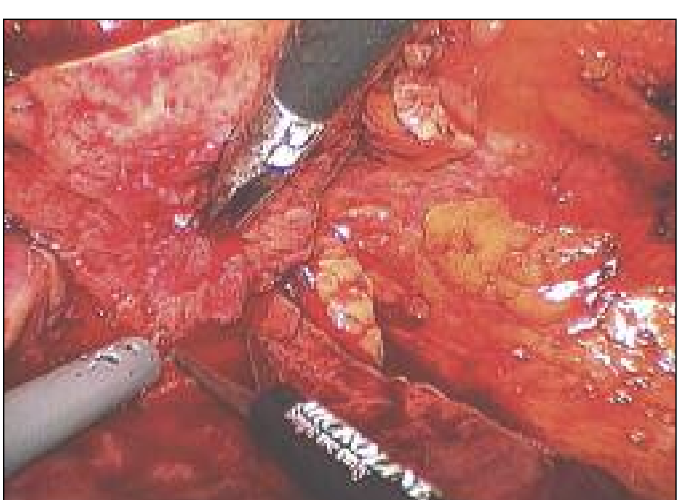

Fig. 3. Tumour resection using the cold scissor.

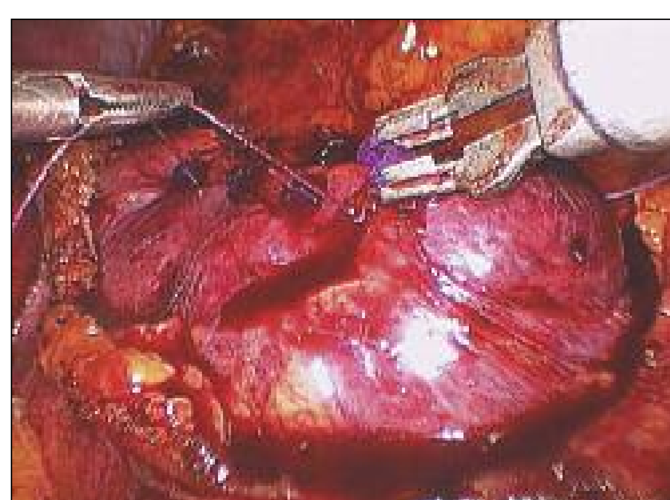

Fig. 4. Parenchymal suturing with Lapra-TY.

ies comparing LPN with OPN in experienced hands.[10] There may be a slightly higher rate of postoperative renal pseudoaneurysms with LPN, but this has not been confirmed in large studies. As expected, patients undergoing LPN have shorter hospital stay, quicker return-to-work time, lower postoperative analgesic requirements, and improved cosmesis.

Laparoscopic partial nephrectomy is a technically challenging operation preferably performed in centres with significant case volumes and with experienced laparoscopists. It is the preferred option over AS because of the small risk of metastatic spread with AS, intensive imaging requirements with its associated costs and radiation exposure with AS, and patient anxiety over the knowledge of persistent renal cancer over the long-term with AS. It is for these reasons that LPN is recommended over AS in those patients able to undergo definitive surgical resection.

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Competing interests: None declared.

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