Laparoscopic nephrectomy: initial experience and 3 years follow-up with 68 cases

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Abstract

Introduction: Partial nephrectomy is considered the gold standard procedure in managing small renal masses less than 4 cm, even less than 7 cm in the last decade. Minimal invasive surgery is a preferred option in those cases. Laparoscopic partial nephrectomy has equivalent oncological results with open partial nephrectomy, offering in the same time all the advantages of minimal invasive surgery. The purpose of our study is to present our initial experience in laparoscopic partial nephrectomy.

Material and Methods: Between May 2015 and December 2017, 68 selected patients with renal masses smaller than 7 cm observed by CT scan, were submitted to laparoscopic partial nephrectomy. Patient demographics, preoperative tumor characteristics and detailed operative, postoperative and pathologic data were collected.

Results: Mean age of patients is 56,1 years (44-71), mean diameter of renal tumor 5, 3 cm (3,3 - 7,4 cm). 36 patients had a right partial nephrectomy and 32 a left one, with no intraoperative complications. In four patients a laparoscopic radical nephrectomy was done, there are no cases of conversion to open surgery. The operation time ranged from 90 to 211 min, estimated blood loss (EBL) ranged from 30 to 300 ml and warm ischemia time (WIT) ranged from 5 to 31 min. Overall, four cases of postoperative complications CDC ≥ 3 were observed. One patient presented with a ureteric stricture and 3 with bleeding which necessitate angiographic intervention. There was one patient with a microscopic positive surgical margin and all patients are disease free during follow up (3-20 months, mean 12,2 months). Mean serum creatinine level has increased 23 mcmol/L (0-114).

Conclusion: Laparoscopic partial nephrectomy is a safe and feasible approach in small renal masses, offering all the advantages of minimal invasive surgery.
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Introduction
The widespread use of abdominal imaging modalities and especially ultrasound has resulted in an increase in the detection of incidental small renal masses [1]. Open partial nephrectomy (OPN) is the gold standard procedure for the treatment of masses less than 4 cm and even in less than 7 cm, if it is technically feasible [2], offering the same oncological results as radical nephrectomy [3]. Additionally, patients who undergo partial nephrectomy have better renal function and are less likely to require renal replacement therapy than patients who undergo radical nephrectomy [4,5].

Laparoscopic partial nephrectomy (LPN) is an alternative option to OPN demonstrating comparable oncological and functional results, adding reduced morbidity and offering all the advantages of minimal invasive surgery (less hospital stay, quicker recovery, less blood loss and need for transfusion, better cosmetic result, less postoperative complications etc.) [6]. Unfortunately, LPN is technically challenging and laparoscopic experience is a prerequisite in order to reproduce the same results as the open procedure [7]. In our study we present our initial experience in laparoscopic partial nephrectomy for small renal masses.

Patients and methods
Between May 2015 and December 2017, 68 consecutive patients (46 males and 22 females) were diagnosed with small renal masses discovered in computed tomography (CT). Laparoscopic partial nephrectomy was performed by a single surgeon with previous laparoscopic experience in upper urinary tract. There were no cases with multiple renal tumors or previous renal surgery. Perioperative data included operative time, estimated blood loss (EBL), warm ischemia time (WIT) and intraoperative complications. Intraoperative complications included significant injury to an adjacent organ, major vessel, ureter or pleura and conversion for visceral injury or hemorrhage. The pathology results and postoperative complications were followed-up. Patients with renal tumors were scheduled to perform a CT scan in a 6 month interval follow-up according to European Urology Guidelines follow up protocol.

Surgical technique
The patients were placed in the flank position with the operative side facing up, and the operating table partially flexed. The abdomen was insufflated with CO2 via transperitoneal optical trocar access to a maximum pressure of 12 mmHg. Five trocars were placed at the end (two 5 mm ports, two 12mm port and the optical trocar for the camera). After insufflation was observed, the colon was reflected medially and the kidney was exposed from the lower pole to the upper pole. The renal pedicle was identified and the Gerota’s fascia was dissected over the kidney. The lesion was identified and the edges of it were marked with electrocautery. A laparoscopic Bulldog clamps were placed and both the renal artery and vein was occluded. Using laparoscopic scissors the lesion was excised. The collecting system was repaired using a 3-0 Vloc suture. For renal reconstruction 1-0 polyglactin suture was placed through the renal capsule in a continuous manner using sliding Hemolok clips at the edges of it. The bulldog clamps were released and the intraabdominal pressure was lowered to 6mmHg. The tumor was placed in a laparoscopic organ bag and a 20F Jackson-Pratt drain was placed around the kidney.

Results
Mean age of patients is 56.1 years (44-71), mean diameter of renal tumor 5.3 cm (3.3 - 7.4 cm). 36 patients had a right partial nephrectomy and 32 a left one, with no intraoperative complications. In two patients a laparoscopic radical nephrectomy was done, there are no cases of conversion to open surgery. The operation time ranged from 90 to 211 min, estimated blood loss (EBL) ranged from 30 to 300 ml and warm ischemia time (WIT) ranged from 5 to 31 min. Overall, four cases of postoperative complications CDC ≥ 3 were observed. One patient presented with a ureteric stricture and 3 with bleeding which necessitated angiographic intervention.

Four patients (5.8%) had a conversion to laparoscopic radical nephrectomy because of intraoperative reassessment of feasibility and safety of partial nephrectomy because of tumor characteristics. None of the other patients had an intraoperative complication or conversion to open surgery. Tumor sizes ranged between 5.3 cm (3.3 - 7.4 cm) as it were measured in the final pathology report. 31 patients (45.58%) had a lower pole tumor, 17 (25%) had an upper pole tumor and 20 (29.41%) had a mid pole tumor. Mean operative time was 115 min (90 to 211 min), estimated blood loss (EBL)
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ranged from 30 to 300 ml, warm ischemia time (WIT) ranged from 5 to 31 min (mean 14.7 min) and mean hospital stay was four days (3-6). Three patients needed a transfusion (4.4 %). All patients had a satisfactory renal function after surgery; none suffered from transient or permanent kidney failure or developed a clinical significant urine leak. Mean serum creatinine level has increased 23 mcmol/L (0-114). Three patients developed a small subcutaneous hematoma in port side (4.4 %) and one presented with a mild hematuria (1.4 %). Overall, four cases of postoperative complications CDC ≥ 3 were observed [9,10] One patient presented with a ureteric stricture and 3 with bleeding which necessitated angiographic intervention. The patient with ureteric stricture was been subjected to percutaneous nephrostomy postoperatively and to combined antegrade/retrograde ureteroscopy at a later time which restore ureteral patency. All three patients with post-opp bleeding were treated successfully with angiographic procedure.

No patient required operative reintervention. The pathology report demonstrated the following results; sixty-two patients had a renal-cell carcinoma, one patient had a chromophobe carcinoma and three had an angiomyolipoma. One patient had a microscopic positive surgical margin. Patients with low risk tumors defined as stage pT1a-b Fuhrman grade 1 or 2 had an ultrasound and a chest radiograph in 6 month period and a CT scan in one year . Patients with intermediate risk tumors defined as high grade (Fuhrman 3-4) had a 6 month CT scan and a chest X-ray. All patients are disease free during follow up (3-20 months, mean 12,2 months).

Discussion

Over the past two decades the role of partial nephrectomy has been expanding. By providing oncologic outcomes equivalent to radical nephrectomy, along with improved preservation of renal function, partial nephrectomy has become established as a standard of care for renal masses, even in patients with a normal kidney [5,7].

Laparoscopic partial nephrectomy has become the less invasive alternative approach, offering equivalent oncological results to open partial, while offering patients a shorter hospital stay and recovery time [6,11-13].

In our study we present our initial experience in laparoscopic partial nephrectomy, performed by single surgeon with previous laparoscopic experience in upper urinary tract. Upper pole tumors were more difficult because a greater mobilization of the kidney was needed in order to have a better exposure of the tumor. Unfortunately no intraoperative ultrasound was used and the excision of the masses was based on meticulous study of the preoperative CT scan. Both renal artery and vein was occluded and that was necessary in order to have a bloodless field and clear visibility, which lowers the positive surgical margin. The important of hilar control prior to mass excision, in order to obtain adequate hemostasis, has been suggested by other authors [14-16]. The median ischemia time was 14,7 minutes which is lower than the 30 minutes limit which is set as safety for renal preservation. In one case we avoided hilar clamping because the tumor was small and mostly exophytic. No major intraoperative complication occurred in our series. Estimated blood loss, peri and post operative complications and mean hospital stay are comparable with those in published literature for laparoscopic partial nephrectomy series [14-16].

Laparoscopic partial nephrectomy may be the most challenging and complex laparoscopic technique performed by any surgeon, given the requirement for perfect extirpation and satisfactory reconstruction within a limited time [17]. In experienced hands laparoscopic procedure can duplicate both functional and oncological results of open partial nephrectomy. Warm ischemia time is the most important factor that has to be lowered as much as possible. Clampless partial nephrectomy is an option but it is quite difficult in big, central located tumors, needs great experience and it raises the percentage of positive surgical margins [18].

The present study has several limitations because it is a retrospective study with a relatively limited cohort of patients (with no control arms) who were followed for a medium-term period of time. Nevertheless, the present study was able to show that laparoscopic partial nephrectomy is a safe and feasible option for the management of selected small renal tumors. Furthermore, our operative time, estimated blood loss and WIT results were comparable to those of previous LPN studies, which is rather en-
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Conclusions

Laparoscopic partial nephrectomy is a feasible and safe approach to remove small renal masses amenable to partial nephrectomy, offering all the advantages of laparoscopic surgery (less blood loss, less pain, shorter hospital stay, quicker recovery time, etc).

Conflicts of interest

The author declared no conflict of interest.
References


