Laparoscopic partial nephrectomy: initial experience

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Summary

Introduction
Partial nephrectomy is considered the gold standard procedure in managing small renal masses less than 4cm. Minimal invasive surgery is an alternative option in those cases. Laparoscopic partial nephrectomy has equivalent oncological results with open partial, 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 October 2012 and March 2014, 9 selected patients with enhancing renal masses 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
6 patients had a right partial nephrectomy and 3 a left one, with no intraoperative complications. In one patient a laparoscopic radical nephrectomy was done because of bleeding. The operation time ranged from 120 to 225 min, estimated blood loss (EBL) ranged from 30 to 300 ml and warm ischemia time (WIT) ranged from 15 to 42 min. One patient didn't require any hilar clamping. Overall, no transfusions were necessary and there were no intraoperative or major postoperative adverse events. One patient occurred with
a small subcutaneous haematoma in a port side and another one with a slight transient haematuria which was resolved spontaneously. There was one patient with a microscopic positive surgical margin and all patients are disease free at the 6 month follow up

Conclusion

Laparoscopic partial nephrectomy is a safe and feasible approach in small renal masses, offering all the advantages of minimal invasive surgery

Keywords:
partial nephrectomy, laparoscopy, initial experience, renal tumor

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 October 2012 and March 2014, 9 consecutive patients (6 males and 3 females) were diagnosed with small enhancing renal masses discovered in computed tomography (CT). For the prediction of potential morbidity of the nephron sparing surgery, the R.E.N.A.L. Nephrometry score was used (8). Laparoscopic partial nephrectomy was performed by one surgeon with previous laparoscopic experience in upper urinary tract. Patient demographics and preoperative tumor characteristics are presented in Table 1. There were no cases with multiple renal tumors or previous renal surgery. Perioperative data included operative time (time from the completion of trocar placement till the
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 are presented in table 3. Patients with renal tumors were scheduled to perform an ultrasound or 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 five mm ports, one 12mm port, one 11mm 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 using the Hook. A laparoscopic Satinski clamp was placed and both the renal artery and vein was occluded. In one case the hole procedure was done without clamping. Using laparoscopic scissors the lesion was excised. The collecting system was repaired using a 3-0 V Loc suture. For renal reconstruction 3-0 polyglactin sutures was placed through the renal capsule in a continuous manner using sliding Hemolok clips at the edges of it. The Satinski clamp was released and the intra abdominal pressure was lowered to 6mmHg. Then an hemostetic agent (Floseal) was placed over the tumor bed. The tumor was placed in a laparoscopic organ bag and a 15F Jackson – Pratt drain was placed around the kidney.

![Image 1: Preoperative CT scan](image1.png) ![Image 2: Specimen](image2.png)

RESULTS

Perioperative data and final pathology reports are presented in table 2 and 3. Six patients had a laparoscopic partial nephrectomy on the right side and three on the left side. One patient had a conversion to laparoscopic radical nephrectomy because of uncontrollable hemorrhage. None of the other patients had an intraoperative complication. Tumor sizes ranged between 1,2 cm and 4,5 cm as it were measured in the final pathology report. For the categorization of the tumors the R.E.N.A.L. nephrometry score was used. Most of the tumors were mainly exophytic and the nephrometry score was from 4a to 8p.
Three patients had a lower pole tumor, two had an upper pole tumor and three had a mid pole tumor. Mean operative time was 174 min (120-225 min), counting from the insertion of the trocars till the extraction of the specimen. Mean estimated blood loss was 187 ml (30 - 300 ml), mean warm ischemia time was 28.8 min (15 - 42 min) and mean hospital stay was three days (2 - 5). No patient needed a transfusion. All patients had a satisfactory renal function after surgery; none suffered from postoperative hemorrhage or developed a clinical significant urine leak. One patient developed a small subcutaneous hematoma in one port side and another one presented with a mild hematuria. All of the complications were considered minor according to the Clavien-Dindo classification (9,10) and were treated by observation or medical measures. No patient required operative reintervention. The pathology report demonstrated the following results; six patients had a clear cell adenocarcinoma, one patient had a chromophobe carcinoma, one had an oncocytoma and one 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.

**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 one surgeon with previous laparoscopic experience in upper urinary tract. All the patients had rather exophytic masses with low nephrometry score. 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 28 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 perioperative complication was occurred and no patient had a blood transfusion. Only in one patient, after an initial trial to control the bleeding with sutures, we performed a
radical nephrectomy laparoscopically. That was happened because the Satinski clamp was malfunctioned in a way that the renal hilum was not clamped at all. Estimated blood loss, peri and post operative complications and mean hospital stay are following the 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 inherent limitations because it is a prospective study with a small cohort of highly selected patients (with no control arms) who were only followed for a short 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 encouraging because the present series reflects our initial experience.

Open partial nephrectomy is still considered to be the gold standard for the treatment of renal tumors less than 7cm according to the EAU Guidelines. However, laparoscopic partial nephrectomy is alternative procedure which in experienced hands has equivalent oncologic and functional outcomes with a slightly bigger proportion of WIT and Clavien III/IV complication rate (19,20). Our future perspectives are to expand our indications in bigger and more endophytic tumors in order to offer to our patients all the advantages of laparoscopic partial nephrectomy, with accepted oncological and functional results.

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). Our future aim is to extent our indications in bigger and more complex masses and at the same time to lower the WIT as much as possible, and even perform clampless laparoscopic partial nephrectomies.

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