



ORIGINAL ARTICLE

Nephron-Sparing Laparoscopic versus Open Surgery for T1 Renal Mass: Seven Years' Experience and Outcomes

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Abstract

Background: Nephron-sparing surgery is an accepted treatment modality for renal cell carcinoma (RCC) in certain situations. **Objectives:** The aim of this study was to compare perioperative outcomes after laparoscopic and open partial nephrectomy for patients with a solitary renal tumors of 7cm or less in different institutes in Dhaka. **Methodology:** Between June 2013 and October 2020, 23 patients had undergone LPN and 24 patients had undergone OPN for the treatment of solitary renal tumors of 7cm or less in different institutes in Dhaka. Large renal mass (>7cm), multiple tumor and patients with complex renal anatomy were excluded from this study. Patients having previous abdominal surgery were excluded from LPN and all LPN were performed transperitoneally. **Results:** Although the mean operative time was longer in the LPN than in the OPN group (134.4±35.36 (45-180) minutes versus 110.56±35.36 (60-165) minutes; P<0.001), the blood loss was comparable between the two groups (130 mL versus 180 mL; P value is not statistically significant). No blood transfusions were performed in either group. The hospital stay was significantly reduced after LPN compared with after OPN (2.8 days (2-6) versus 6.7 days (5-8); P <0.0002). 2 patients in LPN and 1 patient in OPN had positive surgical margins. **Conclusion:** This study has revealed that LPN is a feasible and safe alternative to the OPN with better surgical outcomes and similar oncological outcomes. [*Journal of Current and Advance Medical Research, January 2021;8(1):70-74*]

Keywords: Nephron-sparing surgery; renal cell carcinoma; Open partial nephrectomy; laparoscopic partial nephrectomy

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Introduction

Renal cell carcinoma (RCC) seventh most common form of neoplasm in the developed world¹. In the US, about 74,000 new cases of kidney cancer were diagnosed in 2019, accounting for 4.2% of all cancer diagnoses¹. RCC is detected at an early (localized) stage based on the increased incidental diagnosis, and more than 70.0% patients are at stage T1².

Nephron-sparing surgery is an established surgical treatment for patients with renal cell carcinoma (RCC)³. Due to fear of local recurrence with NSS, radical nephrectomy has historically been the treatment of choice for patients with unilateral RCC and normal contralateral kidney⁴. The main concern with Radical Nephrectomy (RN) is that it predisposes to chronic kidney disease (CKD) which is associated with morbid cardiovascular events and increased mortality rates⁵. On the other hand, PN protects kidney function better and reduces the incidence of cardiovascular diseases⁶. Therefore, nephron-sparing surgery (NSS) is now standard of care for the management of clinical T1 (7 cm or less) renal masses even in the presence of a normal contralateral kidney. According to data from Centers of excellence, NSS can result in comparable cancer control outcomes relative to RN⁷.

The goal of nephron-sparing surgery (NSS) is to excise the tumor completely with as minimum as hospital stay, morbidity and loss of renal function¹. NSS became more popular in current era because modern imaging techniques, especially Ultrasound and CT scan of abdomen is more available. So, Small renal tumors are frequently and incidentally diagnosed in clinical practice. For this reason, most of the urologist prefers to go for organ sparing surgery rather than radical surgery⁸⁻⁹.

In early period of time partial nephrectomy was done by open surgery¹⁰. However, over the years urologists has developed skills with the blessings of modern technologies such as Laparoscopy, Robotic surgery.

A pure laparoscopic approach for partial nephrectomy is successfully practiced by only a few experts due to the steep learning curve¹¹⁻¹³. The purpose of the present study was to compare LPN with OPN in terms of perioperative surgical and oncological outcomes.

Methodology

The patients with T1 RCC underwent partial nephrectomy different hospitals of Dhaka, Bangladesh, between June 2013 to October 2020. Among them 23 patients underwent Laparoscopic partial nephrectomy (LPN) and 24 patients underwent Open Partial nephrectomy (OPN). Patients with T1, who were regarded as technically appropriate for LPN by the Tumor Board and consented to undergo this procedure History, Clinical, radiological, laboratory and pathological data collected prospectively. Inclusion criteria was single T1 Renal cell cancer with favorable anatomy and exclusion criteria was more than T1B disease, hereditary RCC syndrome, multiple tumor and complex or unfavorable tumor anatomy. Patients with prior or synchronous bilateral renal cancer, metastatic tumors, and preoperative radiographic evidence suspicious for lymph node were also excluded. Clinical, operative, and follow-up information on these patients were collected prospectively and were maintained in a registry.

Procedure of Open Surgery: All open and laparoscopic surgery was done transperitoneally. Open partial nephrectomy was done in supine position with anterior subcostal incision. Diuretic IV Mannitol was applied for renal protection. Renal arteries were clamped using bulldog clamps, and regional hypothermia was established by crushed ice. In select cases, the intra-operative ultrasound probe was used to define the tumor margins after sharp incision of the renal capsule, an elevator was used to bluntly separate the lesion from surrounding parenchyma. Closure was done with 2-0 Vicryl-sutures on the cut surface. A drain tube was kept in situ.

Procedure of Laparoscopic Surgery: Laparoscopic PN was performed with the patient in full-flank position. A small incision in the lumbar triangle and a Hasson trocar introduced. Two additional ports were placed at the discretion of the surgeon. We clamped the renal arteries with endobulldog clamps. Dissection and excision of the tumor was performed by using a scissor. Hemostasis was achieved by central suturing, application of fibrin glue additional. The tumor specimen was retrieved by the use of an endobag. All specimens were sent for histopathological diagnosis. Per operative important events such as Operation time, ischemia time, blood loss amount, any complications were noted.

Follow up and Outcome Measures: Per operative blood loss amount was measured by drop of hemoglobin and measuring suction bottle. Post-operative renal function was assessed by measurement of serum creatinine. Post-operative hospital stay period and histopathological report including tumor type, stage, grade, margin status, and variant histology were noted. Patients were followed up at the respective urology department, with serum creatinine, urine routine examination, and ultrasound of whole abdomen at 3-month intervals for 2 year and thereafter in yearly intervals. CT scans were performed at baseline after 6 months and thereafter only if ultrasound revealed suspicious findings. Chest x-rays were done at yearly intervals. In cases of positive surgical margins (PSM), additional CT scans were performed at 6 months intervals for 2 years.

Statistical Analysis: Surgical characteristics like total operative time, ischemia time, peroperative complication, pathological characteristics and postsurgical outcomes, difference in hemoglobin level, difference in serum creatinine level, hospital stay, and complications after surgery according to the modified Clavien-Dindo classification were compared for both techniques. Continuous variables are given as the mean \pm SD, categorical variables as relative frequencies. Statistical analysis was performed using Student's t-test for continuous variables, and Pearson chi square test and Fisher's exact test were used to compare the categorical variables, with $p < 0.05$ considered statistically significant.

Results

Among the 47 patients 23 patients underwent Lap partial nephrectomy (LPN) and 24 patient underwent open partial nephrectomy (OPN). LPN and OPN were matched with inclusion and exclusion criteria. Mean age of the patients were 62 ± 8.68 years in laparoscopic Partial nephrectomy (LPN) group and 59 ± 7.68 years in Open partial nephrectomy (OPN) group (p value 0.9). Among the patients 91% were diagnosed incidentally. Male female gender distribution was identical in both group. 24 patient had right sided renal tumor and 23 patient had left sided tumor. Tumor size of LPN group was 3.6 ± 1.08 cm where OPN tumor size was 3.8 ± 1.11 cm (p value=0.2). In LPN group 18 patients tumor were below the polar line, 5 patients crossing the polar line (Table 1).

In OPN group this value was 18 and 09 respectively. In LPN group 15 patients tumors was $>50\%$ exophytic, remaining 8 patients tumor was $<50\%$ exophytic. In OPN this value was 17 and 07 respectively. Mean operative time of LPN group was 134.42 ± 35.36 (45 - 180) minutes where OPN group was 110.56 ± 35.36 (60-165) minute (p value < 0.05). Estimated blood loss in LPN vs OPN was 130 ml and 180 ml (p value < 0.05). Warm ischemia time in LPN group was 25.25 ± 4.3 minute where LPN group was 18.91 ± 3.6 minutes (p value < 0.05). Post-operative hemoglobin drop was more or same in both group.

Table 1: Preoperative Characteristics of Patients and Tumors According to Surgical Procedures

Variables	Partial Nephrectomy	
	Laparoscopic (n=23)	Open (n=24)
Age (Mean \pm SD)	62 \pm 8.68	59 \pm 7.68
Gender		
Male	14	16
Female	9	8
Laterality		
Right	13	11
Left	10	13
Tumor size (cm)	3.6 \pm 1.08	3.8 \pm 1.11
Mean Renal Score	5	5

Mean serum creatinine change was also identical in both group. Only one patient in LPN group needed dialysis in post-operative period. In the post-operative period of OPN group- 2 patient developed prolong ileus, 2 patients respiratory complications. Mean Post-operative hospital stay in LPN group was 2.8 days where OPN group was 6.7 days (p value < 0.05). In histopathological report 43 patients diagnosis was clear cell carcinoma, 3 patients papillary type and 1 patient was diagnosed as Oncocytoma. 2 patients in LPN group found positive surgical margin (PSM) where 1 patient in OPN group found PSM. Mean follow up time in LPN group was 20 months where OPN group was 25 months. None of the patient developed in the period of follow up in both group. Overall survival rate in LPN group was 82% and OPN group was 83% (p value =0.9). Cancer specific survival in both group is 100% in follow up time (Table 2).

Table 2: Perioperative and Post-Operative Results According to the Surgical Techniques

Traits	Laparoscopic PN	Open PN
Operating time (Minutes)	134.42±35.36n(45-180)	110.56±35.36 (60-165)
Median estimated blood loss	130 ml	180 ml
Mean warm ischemia time (Min)	25.25±4.3	18.91±3.6
Intraoperative complications	4	1
Renal replacement therapy needed	1	0
Post-operative mean Hb drop	1.6 gm/dl	1.7 gm/dl
Mean rise of serum creatinine	0.2 mg/dl	0.2 mg/dl
Post-operative hospital stay	2.8 days (2-6)	6.7 days (5-8)
Positive surgical margin	2	1
Mean follow up time (Months)	20 (range 6-34)	25 (range 6-34)
Local recurrence	0.0%	0.0%
Port site recurrence	0.0%	0.0%
Overall survival rate	82.0%	83.0%
Cancer specific survival rate	100.0%	100.0%

Discussion

The principal findings of this study were comparable surgical, oncologic, and functional outcomes after laparoscopic and open PN at a mean follow-up about 2 years. To knowledge, there are few reports have been published that compared the surgical, oncological and functional outcomes of LPN and OPN. Although selection bias may have occurred owing to the referral pattern of the open and laparoscopic surgeons, the patients were similarly matched with respect to sex, age, body mass index (BMI), ASA Score. The tumors were also similar with respect to size, location, and depth, and, accordingly, the use of vascular clamping was similar in both groups as well. Therefore, despite the lack of prospective randomization, we believe that these two groups of patients were “well matched”. In this study -mean age of the patients were 62.0±8.68 years in laparoscopic Partial nephrectomy (LPN) group and 59.0±7.68 years. Patient of the RCC patient matched with most of the study^{2,7-8,14-17}.

In this study- no major difference was found between LPN and OPN Group. In the sense of length of hospital stay (LOS) and post-operative complications, LPN far better than OPN. ²The improved recovery time with LPN in T1 tumors and reported that there was no difference between OPN and LPN regarding the perioperative complication rates and long-term quality of life parameters.^{18,19} An obvious decrease in the overall complication rate of LPN has occurred in the past few years. Recent studies also have demonstrated that there is no detectable difference between LPN and OPN regarding the perioperative outcomes^{4,7,20-21}. In

addition, shorter ischemia time and a lower complication rate was reported for LPN¹¹⁻¹³.

In this study LPN group had more operative time than OPN, it may be due to instrument factor or experience factor of surgeons. In this study mean estimated blood loss in LPN was less than OPN group²⁻³. LPN was associated with a significantly shorter duration of operative and ischemia time, as well as hospital stay, and a lower blood loss as determined by fall in hemoglobin level in overall analysis. Furthermore, the rate of peroperative and postoperative complications was significantly lower when compared to the LPN group.

Post-operative hemoglobin drop was about same in both group. Most of the study supports this. Mean serum creatinine change was also identical in both group. This also similar with the other studies⁶⁻⁹. Positive surgical margin is an important drawback of LPN group, because lack tactile feeling of the tumor¹⁰. No patient developed recurrence in the follow up period.

In this study cancer specific survival and overall survival is similar in LPN vs OPN. Interestingly, LPN retained its superiority in this patient group regarding blood loss amount, fall in hemoglobin level, post-operative complications rate and length of hospital stay. These benefits were already postulated beyond established indications for elective NSS^{11,13-15}.

Although this study results suggest a potential perioperative superiority of LPN, especially Short period of follow up, long-term data regarding renal

function and oncological safety are still questionable.

Conclusion

In conclusion, open surgery is still a preferred option in patients with higher tumor complexity, while LPN is promising alternative to OPN in patients with T1 renal cell cancer. Moreover, the overall performance of LPN reflected by operative and postoperative surgical oncological and functional outcomes seems be superior to that of open surgery. Although our study had limitation like limited sample size and short follow up period, hopefully it will strengthen the role of minimally invasive NSS.

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