

# Case Report

## Conventional Laparoscopic Partial Nephrectomy for A Small Renal Mass

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The authors report the first case series of conventional laparoscopic partial nephrectomy in Thailand. Laparoscopic partial nephrectomy was successfully performed in two patients with small renal tumors. The first patient underwent transperitoneal laparoscopic partial nephrectomy for a 3.8 x 3.3 cm renal mass. Intraoperative blood loss was 100 ml with warm ischemic time of 38 minutes. Pathological report showed renal cell carcinoma. The patient proceeded with laparoscopic radical nephrectomy, as surgical margin was not free. The second patient underwent retroperitoneal laparoscopic partial nephrectomy for a 1.8 x 2.4 cm renal mass. Intra-operative blood loss was 200 ml with clamping time of 45 minutes. Pathological report showed angiomyolipoma. Using two different approaches of laparoscopy, namely, transperitoneal and retroperitoneal approaches, patients gained benefit from small incision and fast recovery.

**Keywords:** Laparoscopy, Partial nephrectomy, Renal mass, Renal cell carcinoma

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Partial nephrectomy has been accepted as an option in treating a patient with a small renal mass<sup>(1)</sup>. The optimal indications for partial nephrectomy are in patients with a relatively small and peripheral renal tumor. However, in the last decade, laparoscopic approaches for renal surgery have replaced many open urological procedures. Laparoscopic partial nephrectomy is proving to be an effective, minimally invasive therapeutic approach with respect to renal functional outcome, with additional advantages of reduced post-operative narcotic use, earlier hospital discharge, and a faster convalescence. Kijvikai *et al* reported the first case of laparoscopic partial nephrectomy in Thailand using hand-assisted technique<sup>(2)</sup>. With hand-assisted technique, a patient requires a longer incision (7 cm) and an expensive hand port device as opposed to those patients who had undergone the operation by standard laparoscopy. In the present report, two cases of standard laparoscopic partial nephrectomy are reviewed.

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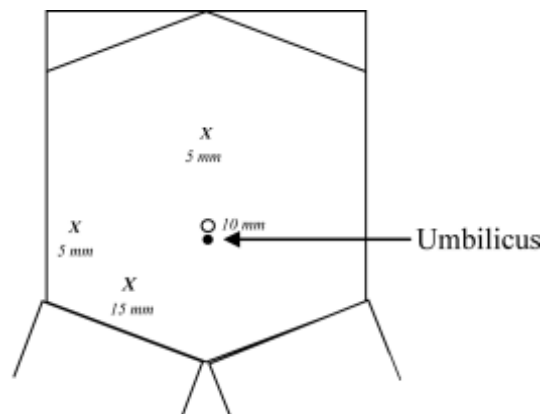
### Case Report

#### Case 1

A 47-year old lady presented with a renal mass found on ultrasonography during her annual physical check up. Subsequent CT scan showed enhancing solid mass size 3.8 x 3.3 cm in size on the upper pole of her right kidney (Fig. 1). She was otherwise fit and well. She underwent laparoscopic partial nephrectomy using the transperitoneal approach. The patient was placed in 45 degrees with the right side up and flexion position. The peritoneal cavity was insufflated via an optical port at umbilicus. Additional ports include two 5 mm port at half way between umbilicus and xiphoid, and at 5 cm from umbilicus on anterior axillary line. Finally, the last 15 mm port was placed at suprapubic area (Fig. 2). Having mobilized the right kidney, a surgeon applied a vascular clamp to control bleeding via the suprapubic 15 mm port. The tumor was excised using laparoscopic scissors and sent for frozen section. Renal parenchyma was closed with vicryl 2-0 interrupted stitches with a Surgicel bolster in between the renal parenchyma. Clamping time was 38 minutes. There was blood loss of 100 ml. Unfortunately, the pathological report for frozen section revealed renal cell



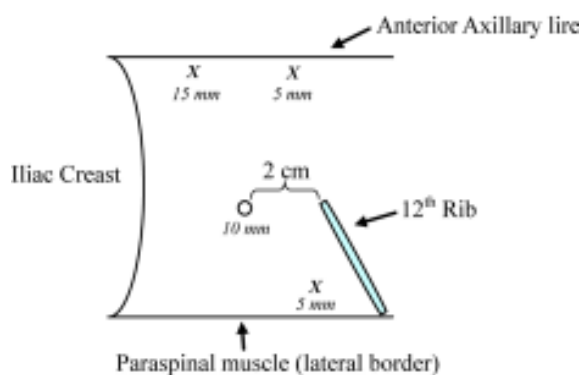
**Fig. 1** CT scan shows an upper pole mass on right kidney



**Fig. 2** A picture shows trocar ports for transperitoneal laparoscopic partial nephrectomy



**Fig. 3** CT scan shows a renal mass on the postero-lateral area of middle pole of left kidney



**Fig. 4** A picture shows trocar ports for extraperitoneal laparoscopic partial nephrectomy

carcinoma with positive surgical margin. Laparoscopic radical nephrectomy was therefore performed. Final pathological reported no malignancy found on the remnant kidney. The patient was uneventful during the post-operative period. She was discharged home on post-operative day 7<sup>th</sup>.

### Case 2

A 64 year old lady presented with a renal mass found on ultrasonography during her investigation for abdominal pain. CT scan showed a 1.8 x 2.4 cm enhancing renal lesion arising from lateral cortex of middle pole of left kidney (Fig. 3). She had no other medical condition. She underwent laparoscopic partial nephrectomy using retro-peritoneal approach. The patient was placed in kidney position with the left side up. Retro-

peritoneal space was created using a finger balloon catheter via an optical port at 2 cm below the tip of 12<sup>th</sup> rib. Two additional 5 mm ports were placed at the anterior axillary line just below costal margin and para-spinal line just below the 12<sup>th</sup> rib. The last 15 mm port was placed at anterior axillary line 2 cm above the iliac crest (Fig. 4). Having mobilized the left kidney, the surgeon applied a bulldog clamp on the renal artery. The tumor was excised using laparoscopic scissors and sent for frozen section. Renal parenchyma was closed with vicryl 2-0 interrupted stitches with a Surgicel bolster in between the renal parenchyma. Clamping time was 45 minutes. There was blood loss of 200 ml. Histological section showed angiomyolipoma. The patient was discharged home on post-operative day 8<sup>th</sup>.

Both patients had good renal function after the operation and there was no complication within three months after the operations.

## Discussion

Laparoscopic partial nephrectomy was firstly reported in 1993 for benign disease<sup>(3)</sup>. In 1998, McDougall et al reported the first series of laparoscopic partial nephrectomy in a patient with renal cell carcinoma<sup>(4)</sup>. Others also reported that laparoscopic partial nephrectomy was associated with longer warm renal ischemia time, more major intra-operative complications, including significant blood loss<sup>(5,6)</sup>. With development of laparoscopic intra-renal suturing while clamping renal hilum blood loss has become less significant<sup>(7)</sup>. The first cohort study comparing laparoscopic partial nephrectomy to open partial nephrectomy in patients with pathological stage T1 renal cell carcinoma suggests that laparoscopic partial nephrectomy emerges as an effective, minimally invasive therapeutic approach with respect to renal functional outcome with the additional advantages of decreased postoperative narcotic use, earlier hospital discharge and a more rapid convalescence. Continued efforts are required to develop laparoscopic renal hypothermia techniques and facilitate intrarenal suturing, while minimizing warm ischemia time<sup>(8)</sup>. Seifman et al had reported that laparoscopic partial nephrectomy could be performed with acceptable complication rates, which would continue to decrease as newer methods of controlling hemostasis were developed. After one-year follow-up, no renal-cell carcinoma recurrences had appeared. The authors suggest that oncological efficacy of a laparoscopic approach appears to mirror that of the open surgical technique<sup>(9)</sup>. Permpongkosol et al retrospectively compared the oncological adequacy of laparoscopic partial nephrectomy to that of open partial nephrectomy in the treatment of patients with pathological stage T1N0M0 renal cell carcinoma. Laparoscopic partial nephrectomy was an alternative technique with mid-range oncological results comparable to open partial nephrectomy in patients with localized pathological stage T1N0M0 renal cell carcinoma. Kaplan-Meier disease-free survival and patient survival analysis revealed no significant differences between the laparoscopic and open partial nephrectomy groups<sup>(10)</sup>.

Approach to surgery has been an issue of discussion. The present study reports two different approaches including transperitoneal and retroperitoneal approaches. The limited retroperitoneal space makes retroperitoneal laparoscopic partial nephrectomy

technically more challenging but provides superior access to posterior and particularly posteromedial lesions. When feasible, laparoscopic partial nephrectomy by the transperitoneal approach should be performed because of its larger working area and superior instrument angles for intracorporeal renal reconstruction<sup>(11)</sup>. A retrospective review of 51 laparoscopic partial nephrectomies was performed. Patients were analyzed based on the surgical approach, operative parameters, and postoperative recovery. Based on tumor location as the selection criteria the retroperitoneal approach was associated with shorter operative time, less blood loss, more rapid return of bowel function, and shorter hospitalization compared with those in patients selected for the transperitoneal technique. The authors suggest that the decision on the approach should be based on the tumor location on the kidney surface. For polar or posterolateral masses the retroperitoneal approach is preferred. The transperitoneal approach is best suited to anterior and medial lesions<sup>(12)</sup>. Robotic-assisted partial nephrectomy has been reported. Robotic partial nephrectomy can be safely performed using transperitoneal or retroperitoneal approach. However, the robotic approach to laparoscopic partial nephrectomy does not offer any clinical advantage over conventional laparoscopic nephrectomy<sup>(13,14)</sup>.

With experience, laparoscopic partial nephrectomy is a viable alternative to open partial nephrectomy for small renal masses. The overall complication rate was 30.0%, with 13.3% of urologic - related and 16.7% of non-urologic - related complications<sup>(15)</sup>. At present, energy technologies and surgical pharmaceuticals are helpful adjuncts<sup>(16-22)</sup>, but are not reliable for primary hemostasis and collecting system closure. Adaptation of traditional open techniques, including vascular control, excision of the tumor with cold scissors, and suture reconstruction of the collecting system and parenchyma, remain necessary to consistently perform laparoscopic partial nephrectomy successfully.

Link et al reported low perioperative morbidity in 223 cases of laparoscopic partial nephrectomy. The final pathological evaluation revealed renal cell carcinoma in 66.4% and the overall positive margin rate was 3.5%. Only 1.4% of patients had renal cell carcinoma recurrences in the operated kidney<sup>(23)</sup>. In the present report, frozen section, in case number 1, reported that the surgical margin was not free of tumors. The surgeon, therefore, proceeded with laparoscopic radical nephrectomy to make the patient free of tumor. A retrospective study of 511 cases of renal cell carcinoma,

treated by laparoscopic partial nephrectomy with a median follow-up of 32 months, showed that a positive margin, following laparoscopic partial nephrectomy, does not necessarily indicate residual disease. However, vigilant monitoring is mandatory. While mid-term outcomes parallel those of patients with a negative margin, longer follow-up is necessary to determine the ultimate oncological outcomes in this subgroup of patients<sup>(24)</sup>.

Blood loss and renal injuries are significant in partial nephrectomy. To reduce blood loss renal clamping is required. Guillonneau et al performed a non-randomized retrospective comparison of two techniques for laparoscopic partial nephrectomy that is without and with clamping the renal vessels in 28 patients. The authors conclude that laparoscopic partial nephrectomy represents a feasible option for patients with small renal masses. Clamping the renal vessels during tumor resection and suturing the kidney mimics the open technique and seems to be associated with less blood loss and shorter laparoscopic operative time<sup>(25)</sup>. Clamping renal artery for a long time can put the patient at risk of having more renal damage. Risk factors for renal dysfunction in the affected kidney after laparoscopic partial nephrectomy include those over 70 year of age with more than 30 mins warm ischemic time, re-clamping of the renal artery procedure, and a warm ischemic time greater than 60 mins<sup>(26)</sup>. In the present report, arterial clamping time was 38 and 45 minutes, which was in the safety range. To achieve a longer time of renal artery clamping a technique of laparoscopic renal hypothermia with intracorporeal ice slush during partial nephrectomy in 12 patients has been described. Post-operatively renal scan confirmed a functioning ipsilateral kidney in all cases. This technique has the potential to extend the scope of laparoscopic partial nephrectomy to more complicated renal tumors<sup>(27)</sup>. Another technique of cold ischemia was introduced by continuous perfusion of Ringers lactate at 4 °C through the renal artery. Renal reconstruction was performed by suturing over hemostatic bolsters<sup>(28)</sup>. These approaches have the potential to make laparoscopic partial nephrectomy for renal cell carcinoma safe and reliable.

Usage of gelatin matrix thrombin sealant has been shown to enhance parenchymal hemostasis and to decrease hemorrhagic complications to levels comparable with contemporary open partial nephrectomy series. This gelatin matrix-thrombin tissue sealant has been proposed to be used as routine part of laparoscopic partial nephrectomy<sup>(29,30)</sup>. Unfortunately, this substance is not yet been available in Thailand.

Urinary leakage is one of the problems after partial nephrectomy. In the present study, a ureteric catheter was placed in each patient prior to laparoscopic partial nephrectomy. During laparoscopic partial nephrectomy, diluted methylene-blue can be injected via the catheter to identify if collecting system has been opened. Intentional caliceal entry in such cases can be effectively repaired in a watertight manner by laparoscopic freehand suturing<sup>(31)</sup>. The ureteric catheter can be left during the post-operative period to alleviate urinary leakage.

Minimally invasive approaches have become the standard treatment in the operative management of renal tumors<sup>(32)</sup>. Nowadays, laparoscopic partial nephrectomy has been accepted as an alternative of care in pathological T1 Renal Cell Carcinoma (tumor size less than 7 cms within the renal capsule). With increasing expertise, a larger tumor can be done. The recent report has demonstrated that adherence to surgical principles allows laparoscopic partial nephrectomy to be performed for occult stage pT2 and pT3 tumors with negative surgical margins and good oncologic outcomes<sup>(33)</sup>.

Cryoablation has also made an impact as a treatment method for small tumors. The prospective study comparing perioperative and short-term outcomes of laparoscopic partial nephrectomy versus laparoscopic cryoablation in patients with peripheral small renal tumors was carried out. Laparoscopic partial nephrectomy was associated with greater blood loss and a higher incidence of delayed complications after hospital discharge compared with cryoablation<sup>(34)</sup>. Hruby et al compared laparoscopic partial nephrectomy and laparoscopic cryoablation for the management of small renal tumors located near the renal hilum. The authors suggest that laparoscopic cryoablation for hilar tumors has a shorter operative time and results in significantly fewer postoperative complications. However, long-term follow-up data for both techniques remain unavailable<sup>(35)</sup>. With experienced surgeon, laparoscopic partial nephrectomy for hilar tumor can be performed. Gill et al reported 25 cases of laparoscopic partial nephrectomy for hilar lesion with good outcomes<sup>(36)</sup>.

## Conclusion

In the present case series, laparoscopic partial nephrectomy is feasible. Patients may gain benefit from minimally invasive surgery. Despite more frequent application of laparoscopy in urology during the last decade, nationwide use of laparoscopic partial nephrec-

tomy remains relatively uncommon, even for the smallest renal masses. Recognizing the favorable outcomes associated with preservation of renal parenchyma, the present findings identify a possible quality of care concern that should be addressed by the urological community.

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## การผ่าตัดผ่านกล้องเพื่อตัดเนื้อไตบางส่วนในผู้ป่วยเนื้องอกก้อนเล็กที่ไต

สิทธิพร ศรีนวลนัด, พิษณุ มหาวงศ์

ได้รายงานการผ่าตัดผ่านกล้องแบบมาตรฐาน เพื่อตัดเนื้อไตบางส่วนในผู้ป่วยเนื้องอกของไต ครั้งแรกในประเทศไทย การผ่าตัดดังกล่าวได้ทำโดยสำเร็จในผู้ป่วย 2 ราย ผู้ป่วยรายแรกได้รับการผ่าตัดเอาเนื้องอกขนาด 3.8 ซม. x 3.3 ซม. ออกจากไตแบบผ่านกล้อง ในระหว่างผ่าตัดมีการเสียเลือด 100 ซีซี โดยที่ใช้เวลาในการปีนเส้นเลือดที่ขั้วไตเป็นเวลา 38 นาที ผลทางพยาธิวิทยาแสดงมะเร็งที่เนื้อไต และผู้ป่วยได้รับการผ่าตัดผ่านกล้องเพื่อเอาไตออก เนื่องจากตรวจพบเซลล์มะเร็งที่ขอบของเนื้องอกที่ตัดออก ผู้ป่วยรายที่สอง ได้รับการผ่าตัดของเนื้องอกออกบางส่วน ขนาด 1.8 ซม. x 2.4 ซม. ระหว่างผ่าตัดมีการเสียเลือด 200 ซีซี และต้องปีนขั้วไตเป็นเวลา 45 นาที ผลทางพยาธิวิทยาแสดงว่าเนื้องอกเป็นแบบ เอ เอ็ม แอล จากการใช้วิธีการผ่าตัดส่องกล้อง 2 แบบ กล่าวคือ แบบผ่านทางช่องท้องและผ่านทางช่องนอกเยื่อช่องท้อง ที่ผู้ป่วยจะได้ประโยชน์ของการที่มีแผลผ่าตัดเล็กและฟื้นตัวได้รวดเร็ว