Retroperitoneoscopic Nephrectomy in Dialysis Dependent Patients and Comparison with Open Surgery

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Objective: *To evaluate the surgical outcomes and morbidity of retroperitoneoscopic nephrectomy compared with open nephrectomy for dialysis dependent patients.*
Material and Method: *Between November 2002 and August 2007, 14 hemo or peritoneal_dialysis patients underwent nephrectomy or nephroureterectomy at Siriraj Hospital. Of the 14 patients, seven were treated with retroperitoneoscopic nephrectomy and seven with open nephrectomy. A retrospective review and data were carried out. The patient factors, type of surgery, perioperative outcomes and complications were analyzed.*
Results: *There was no conversion rate in the retroperitoneoscopic group. The mean estimated blood loss, analgesic requirement and time before starting oral intake were lower in the retroperitoneoscopic group (141.4 $\pm$ 95 versus 292.8 $\pm$ 226 ml, 5.0 $\pm$ 4.5 versus 7.6 $\pm$ 1.9 mg and 14.5 $\pm$ 16.1 versus 23.1 $\pm$ 23.3 hours, respectively). On the other hand, the mean operative time in the retroperitoneoscopic group was longer than the open group but with no significant difference (177.14 $\pm$ 51 versus 160.71 $\pm$ 84min, p = 0.521). Two patients in the open group required intraoperative blood transfusion. There were two complications. One patient developed a large retroperitoneal hematoma after retroperitoneoscopic nephrectomy. Another had a perivesical collection in the open nephrectomy group. No mortality related to the procedures occurred.*
Conclusion: *Retroperitoneoscopic nephrectomy should be considered as the procedure of choice for dialysis dependent patients. This has all the benefits of minimally invasive surgery such as reduced blood loss, minimal post operative pain leading to faster convalescence.*

Keywords: *Retroperitoneoscopy, Nephrectomy, Dialysis, Laparoscopy*

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Laparoscopic nephrectomy was first performed in 1990 by Clayman et al[1]. Since then, this procedure has become routine at many urological centers. This minimally invasive technique is now a well established surgical approach for a variety of renal conditions. It has resulted in better outcomes such as shorter length of stays, reduced postoperative pain and quicker recovery[2]. The laparoscopic nephrectomy has been reported in treating dialysis dependent patients. Generally, these patients are at increased surgical risk because they commonly have a bleeding tendency, metabolic acidosis and increased susceptibility to infection. Almost reports have described transperitoneal laparoscopic nephrectomy, mostly in the treatment of benign conditions such as Autosomal dominant polycystic kidney disease (ADPKD)[3,4]. Nevertheless, the safety of the procedure has not been widely evaluated in patients with end stage renal disease. Only a few reports have documented the outcomes of retroperitoneal approach in laparoscopic nephrectomy in dialysis dependent patients[5,6]. The author reported their experience with retroperitoneoscopic nephrectomy in dialysis patients for a variety of renal conditions including malignancy. The surgical results were compared to the standard open nephrectomy in the same population.

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Material and Method

The authors retrospectively identified all dialysis dependent patients undergoing nephrectomy between November 2002 and August 2007 at Siriraj hospital Mahidol University. A total of 14 patients with renal failure receiving dialysis; both hemodialysis and peritoneal dialysis, were identified and their charts reviewed. In all of 14 patients, 7 retroperitoneoscopic nephrectomies were compared with 7 open nephrectomies. The patients' demographic data and indications for nephrectomy are shown in Table 1.

The patients underwent the routine preparation laboratory investigations. Patients had been instructed to discontinue drugs affecting platelet function a week before the operation. Routine coagulation tests such as partial thromboplastin time, prothrombin time and thrombin time were within the normal range prior to surgery. The patients continued receiving their routine dialysis schedule and were usually admitted to the hospital before the day of surgery. Dialysis was performed on the day before surgery in all patients.

Operative techniques

The retroperitoneoscopic nephrectomy was performed as previously described[7]. In brief, the patient was placed in the lateral position with the table flexed. The initial access was obtained in Petit's triangle through which the retroperitoneal space was developed with finger dissection. Two additional ports were placed at the anterior and posterior axillary line. Dissection was carried out to identify the renal artery and subsequently the renal vein. The artery and vein were controlled using Hem-O-lock clips respectively. The remaining attachments were divided using electrocautery. The ureter was identified just above the level of iliac vessels crossing and ligated using clips. In non-urothelial carcinoma, the ureter was incised and the specimen was removed through an extended skin incision. Morcellation of the kidney was not performed. In the open group the standard nephrectomy was performed using a flank incision retroperitoneally. For upper tract urothelial carcinoma the distal ureterectomy with bladder cuff excision was performed as the same fasion. The patient position was then changed to spine. An approximately 7cm long Gibson incision was made; and the distal ureter with a bladder cuff specimen was removed enbloc without opening the urinary tract.

The operative time, conversion rate, estimated blood loss, complications, postoperative course were assessed. The comparison between the retroperitoneoscopic and open groups was carried out. Student's t-test, and Fischer's exact test or the Mann-Whitney test was used for statistical analysis as appropriate. The statistical significance was defined as a p value less than 0.05.

Results

The characteristics of the patients who underwent retroperitoneoscopic nephrectomy and open nephrectomy are shown in Table 1. There was no

Table 1. Demographic data

Characteristic	Retroperitoneoscopic nephrectomy	Standard open nephrectomy	p-value
Number of patients	7	7	
Sex, n			
Male	2	5	
Female	5	2	
Mean age, year (range)	49.57 $\pm$ 7.976 (41-64)	50.86 $\pm$ 8.745 (42-69)	0.748
Indications			
Urothelial cancer	3	2	
Renal mass	-	3	
Hydronephrosis with UTI	2	1	
Complex cyst	1	1	
Stone	1	-	
Previous renal surgery, n	1	-	
Side of the removed kidney			
Right	4	4	
Left	3	3	
Mean duration of dialysis, month (range)	65.71 $\pm$ 50.957 (36-180)	45.57 $\pm$ 38.318 (1-99)	0.651

significant difference in mean age (p = 0.748) and duration of dialysis (p = 0.651). The common indications for nephrectomy were renal malignancy including upper tract urothelial carcinoma (five) and renal mass (three).

A comparison of the perioperative parameters between the two groups is shown in Table 2. No significant differences were found in mean operative time (p = 0.521), and maximal length of specimen (p = 0.499). The mean estimated blood loss, time before starting oral intake and analgesic requirement were all less in the retroperitoneoscopic group than the open group although the difference was not statistically significant. One patient in the retroperitoneoscopic group had a previous renal exploration but no significant difference in the difficulty of renal dissection was noted. There was no conversion rate in the present series. Two patients in the open group required intraoperative blood transfusion but there was no blood transfusion rate in the retroperitoneoscopic group. The overall mean hospital stay of the retroperitoneoscopic group was 11.4 days (range 5-40). One patient developed a large retroperitoneal hematoma after retroperitoneoscopic nephrectomy. This patient required an operative exploration later with the longest hospital stay of 40 days. This result was longer than the mean hospital stay of 8.7 day (range 5-13) in open group. However the mean hospital stay of remaining retroperitoneoscopic patients, when excluding the patient who had an operative exploration later, was 6.6 days (range 5-8). There were two major complications. One patient developed a large retroperitoneal hematoma in the retroperitoneoscopic group. This patient underwent uneventful operative exploration 1 week later. In open group, one patient had an urinoma at perivesical space after bladder cuff excision and required surgical drainage. The mean follow up time in malignancy patients of the retroperitoneoscopic group and the open group was 21.3 months (range 17-24) and 29 months (range 7-63) respectively. No tumor recurrence was observed at the last follow-up time in both groups. No mortality related to the procedures or their complications occurred. In comparison with other retroperitoneoscopic studies and the associated complications are shown in Table 3.

Discussion

Laparoscopic nephrectomy was developed in an effort to reduce the morbidity of the surgical management. Many studies have described the benefits of laparoscopic nephrectomy compared with open nephrectomy, including shorter hospitalization, improved cosmesis and more rapid convalescence[8,9]. The indications and candidates for this procedure have been expanded[10,11]. As there is an increase in the number of long term dialysis patients, the necessity to perform surgery in these patients has also increased. Based on the authors' experience with retroperitoneoscopic nephrectomy in non-dialysis patients, the authors performed this procedure in dialysis patients. The mean estimated blood loss, time before starting oral intake and analgesic requirement were lower after retroperitoneoscopic nephrectomy in the present series. However, the operative time was longer in the retroperitoscopic group but there was no significant difference. Goel et al[6] reported their results comparing between retroperitoneoscopic and open pretransplant nephrectomy in 80 patients. The mean operative time was similar in the two groups; however, the mean

Table 2. Operative data and complications

	Retroperitoneoscopic nephrectomy mean ± SD (range)	Standard open nephrectomy mean ± SD (range)	p-value
Operative time, minute	177.14 ± 51.870 (125-270)	160.71 ± 84.923 (80-315)	0.521
Estimated blood loss, ml.	141.43 ± 95.991 (20-300)	292.86 ± 226.253 (50-700)	0.198
Number of patient receiving blood transfusion, n	-	2	0.461
Analgesic requirement, mg of morphine	5.00 ± 4.573 (0-13)	7.64 ± 1.994 (5-10)	0.158
Time before starting oral intake, hours	14.57 ± 16.195 (6-48)	23.14 ± 23.348 (6-72)	0.351
Hospital stay, day	11.43 ± 12.634 (5-40)	8.71 ± 3.147 (5-13)	0.549
Maximal length of the specimen, cm	12.54 ± 6.3 (9-27)	15.21 ± 7.937 (8.0-30)	0.499
Complications, n			
Retroperitoneal hamatoma	1	-	
Urinoma	-	1	

Table 3. Studies of retroperitoneoscopic nephrectomy in dialysis patients

Study	Patients/ nephrectomies (n)	Indication	Approach	Operative time (min)	Blood loss (ml)	Length of stay (days)	Complications (n)
Dunn et al 2000[4]	9/12 Bilateral (2)	ADPKD	Transperitoneal (10)/ Retroperitoneal (1)	378 (204-528)	153 (50-500)	3	Incisional hernia (2) Pulmonary embolism (1) Graft occlusion (1) Brachial plexus (1)
Twamura et al 2001[22]	6	Renal mass	Retroperitoneal	162 (135-210)	58 (15-100)	Not reported	-
Shoma et al 2003[5]	62/64	UTI, stones, HT, proteinuria, renal tumors	Retroperitoneal (48)	99 (45-180)	76 ± 17	3 ± 0.6	Conversion (2) Large hematoma (1) Bleeding (1)
			Transperitoneal (16)	154 (60-240)	81 ± 16	3 ± 1.1	Colonic injury (1) Pneumothorax (1) Conversion (2)
Gulati et al 2003[21]	7	Renal mass	Retroperitoneal (2)/ Transperitoneal (5)	265 (200-383)	149 (50-400)	5	Hypercarbia (1) Conversion (1)
Sanjeevan et al 2004[23]	3/6 Bilateral (3)	Uncontrolled HT	Right Retroperitoneal (2)/ Left Transperitoneal (2)	260, 280	Not reported	3	Conversion (1)
Goel et al 2006[6]	40	UTI, stones, hypertension	Retropetitoneal	72 ± 15 (50-110)	40 ± 20 (40-150)	3 ± 1 (1-7)	Hematoma/open (1) Adrenal vein injury/ open (1) Peritoneal vent (1) Subcutaneous emphycema (2)
Wyler et al 2007[24]	2	ADPKD	Retroperitoneal	120, 190	125	8	Peritoneal tear (1) Retroperitoneal hematoma (1)
Desai et al 2008[25]	13/21 Simultaneous bilateral (1)	ADPKD	Transperitoneal (19)/ Retroperitoneal (2)	189.6 (90-360)	192 (50-500)	4.86	Splenic injury (1) Pleural tear (1) IVC tear/open (1) AVF closure (2) Ileus (2) Conversion (2)
Present study	7	UTI, stones, renal cyst, renal tumors, urothelial cancer	Retroperitoneal	177 (125-270)	141 (20-300)	11.4	Retroperitoneal hematoma (1)

blood loss, postoperative analgesic requirement were significantly less in the retroperitoneoscopic group. These findings correspond to our results and support the effectiveness of retroperitoneoscopic procedure compared with the standard open nephrectomy.

End stage renal disease is commonly associated with bleeding tendency, mainly because of platelet dysfunction. Bleeding diathesis may increase the risk of bleeding with laparoscopy[12]. The presented data showed that one case had bleeding problem in retroperitoneoscopic group. This patient developed a large hematoma that was managed with surgical exploration. This could be attributed to the ineffectiveness in hemostasis. However, because of this complication occurred in the first case in the present series. Thus, the impact of learning curve should be taken into consideration. The incidence of such complication in non-uremic patients is 1.6% to 5.8%[13-15]. Viner et al[16] reviewed 100 dialysis patients undergoing open bilateral nephrectomy before planned renal transplantation. The mean intraoperative blood loss for the flank and midline approaches was 215ml and 358 ml; respectively. Fornara et al[17] noted an increased transfusion rate in 19 dialysis dependent patients undergoing laparoscopic nephrectomy (32%) compared with similar group without renal failure (0%). They attributed this difference; not from increased blood loss or bleeding diathesis, but from a lower initial serum hemoglobulin. Of the 7 patients performing retroperitoneoscopy in our series, the mean estimated intraoperative blood loss was less than 150ml and no patient received blood transfusion. In contrast, the mean blood loss was 292ml and two patients received blood transfusion during open nephrectomy. The authors noted that laparoscopy was not associated with an increasing incidence of bleeding. It is unclear, however, whether perioperative demopressin (?) acetate administration actually reduces bleeding[18]. No patient was given this drug and the authors found no significant bleeding tendency during surgery in the present series.

Laparoscopic nephrectomy can be performed via a transperitoneal or retroperitoneal access. The authors used the retroperitoneal approach. Although the operating space is smaller and a more skilled technique is required when compared with the transperitoneal approach, many advantages of retroperitoneal approach are the authors' considerations. It allows immediate access to the renal artery and precludes the need to enter the intraperitoneal cavity and mobilize the colon, thereby minimizing postoperative ileus and intra-abdominal injury. Furthermore; patients undergoing peritoneal dialysis could re-initiate dialysis shortly after the procedure. Nevertheless, this technique is suitable for removal of small size kidney in dialysis patient. Conversely, it is associated with an increasing rate of conversion compared with the transperitoneal approach for average and large renal unit[19]. Shoma et al[5] reported their results on laparoscopic nephrectomy in patients with end stage renal disease. The conversion rate was 4% (2/48) in retroperitoneal approach compared to 12% (2/16) in transperitoneal approach. Colonic injury was reported in 1 patient after the transperitoneal approach in their study. There was no conversion rate and no intra-abdominal complication in the present series. These findings confirmed the benefit of retroperitoneal approach and a feasible technique for laparoscopic nephrectomy. In fact, the mean maximal length of the specimen was only 12.54 cm (range 9-27) in our series. Thus, the transperitoneal approach should be considered in ADPKD because of the huge renal size, surrounding fibrosis, and proximity to several vital structures.

Many issues associated with end stage renal failure requiring chronic dialysis affect the ability to perform laparoscopic nephrectomy. These patients posses underlying medical conditions and may increase anesthetic complications. Intra-abdominal insufflation with carbon dioxide may affect respiratory capacity, especially if an underlying pathophysiology exists. Optimization of all parameters should be considered. In the presented series, all patients underwent dialysis the day before surgery, as well as, a couple of days post operatively, to maintain their routine dialysis schedule. The author found no problems during laparoscopic surgery in these groups.

It is clear from recent data that cancer outcomes after open and laparoscopic nephrectomy are comparable[7,20]. Little information, however, is available in the subset of patients with end stage renal failure requiring dialysis. It appears that laparoscopic has a lesser impact on surgical stress with more rapid resolution of surgical injury. This effect may be more important in patients with underlying impairments, such as renal failure and uremia. Gulati et al[21] reported no tumor recurrence after laparoscopic nephrectomy for renal cell carcinoma in 5 dialysis patients with median follow up time of 21 months. In the presented series, the retroperitoneoscopic nephrectomy for urothelial carcinoma was performed in 43% (3/7) of cases. At the mean follow-up of 21 months (range 17 to 24), no patient had evidence of tumor recurrence. Longer

follow-up data are needed. However, the authors believe that the indication tends to increase as surgical skill improves in laparoscopic treatment.

Conclusion

The retroperitoneoscopic nephrectomy seems to be safe and technically feasible in comparison to standard open procedure even in dialysis patients. The minimal invasive nature of laparoscopy results in lower blood loss, minimal postoperative pain and a relatively short hospital stay while avoiding the typically large incision associated. The authors' experience and many studies support that despite these advantages of retroperitoneoscopy, perioperative complications should be considered and may decline with increased experience.

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การผ่าตัดเอาไตออกโดยการส่องกล้องผ่านช่องด้านหลังเยื่อบุผนังช่องท้อง ในผู้ป่วยไตวายที่ได้รับการล้างไต: เปรียบเทียบกับการผ่าตัดแบบมีแผลเปิด

ธวัชชัย ทวีมั่นคงทรัพย์, ไชยยงค์ นวลยง, ธีระพล อมรเวชสุกิจ, สิทธิพร ศรีนวลนัด, พิชัย ศุจิจันทรรัตน์, สุชาย สุนทราภา

วัตถุประสงค์*: ศึกษาถึงผลการผ่าตัดเพื่อเอาไตออกในผู้ป่วยไตวายที่ได้รับการล้างไตโดยการส่องกล้องผ่านช่องด้านหลังเยื่อบุผนังช่องท้อง เปรียบเทียบกับการผ่าตัดแบบเปิด*

วัสดุและวิธีการ*: ระหว่างเดือนพฤศจิกายน พ.ศ. 2545 ถึงสิงหาคม พ.ศ. 2550 ผู้ป่วยที่ได้รับการล้างไต จำนวน 14 ราย ได้รับการผ่าตัดเพื่อเอาไตออกที่โรงพยาบาลศิริราช ผู้ป่วย 7 รายได้รับการผ่าตัดแบบส่องกล้องผ่านช่องด้านหลังเยื่อบุผนังช่องท้อง และอีก 7 ราย ได้รับการผ่าตัดแบบมีแผลเปิดผ่านช่องด้านหลังเยื่อบุหน้าช่องท้อง เป็นการศึกษาแบบย้อนหลังโดยข้อมูลของผู้ป่วย วิธีการผ่าตัด ผลการผ่าตัดรวมทั้งภาวะ แทรกซ้อนได้รับการรวบรวม และวิเคราะห์ทางสถิติ*

ผลการศึกษา*: ไม่พบอัตราการเปลี่ยนวิธีการผ่าตัดเป็นแบบเปิดในกลุ่มผู้ป่วยที่ได้รับการผ่าตัดโดยการส่องกล้อง ค่าเฉลี่ยของการเสียเลือดระหว่างผ่าตัด, ความต้องการยาแก้ปวดหลังผ่าตัด และระยะเวลาที่เริ่มได้สารอาหารทางปากในกลุ่มที่ทำผ่าตัดแบบส่องกล้องจะสั้นกว่า (141.4 $\pm$ 95 มิลลิลิตร เปรียบเทียบกับ 292.8 $\pm$ 226 มิลลิลิตร, 5.0 $\pm$ 4.5 มิลลิลิตร เปรียบเทียบกับ 7.6 $\pm$ 1.9 มิลลิกรัม และ 14.5 $\pm$ 16.1 ชั่วโมง เปรียบเทียบกับ 23.1 $\pm$ 23.3 ชั่วโมง ตามลำดับ) ในทางตรงข้ามค่าเฉลี่ยของระยะ เวลาการผ่าตัดในกลุ่มที่ทำผ่าตัดแบบส่องกล้องจะยาวกว่ากลุ่มที่ทำการผ่าตัดแบบเปิด แต่ไม่มีนัยสำคัญทางสถิติ (177.14 $\pm$ 51 นาที เปรียบเทียบกับ 160.71 $\pm$ 84 นาที, $p = 0.521$) พบผู้ป่วยสองราย ในกลุ่มผ่าตัดแบบเปิด จำเป็นต้องได้รับการให้เลือดในระหว่างผ่าตัด พบภาวะ แทรกซ้อนทั้งหมด 2 ราย ผู้ป่วย 1 ราย ในการผ่าตัดแบบส่องกล้องโดยมีก้อนเลือดขนาดใหญ่ ในช่องด้านหลังเยื่อบุผนังช่องท้อง และอีก 1 ราย ในผู้ป่วยผ่าตัดแบบเปิดโดยมีสารน้ำตกค้างในอุ้งเชิงกราน ไม่พบอัตราการตายที่เกี่ยวข้อง กับการผ่าตัดในการศึกษานี้*

สรุป*: การผ่าตัดเอาไตออกโดยการส่องกล้องผ่านช่องด้านหลังเยื่อบุผนังช่องท้องควรได้รับการพิจารณาในกลุ่มผู้ป่วยที่มีภาวะไตวายที่ได้รับการล้างไต ผู้ป่วยจะได้ข้อดีจากการผ่าตัดด้วยวิธีนี้คือ เสียเลือดน้อย การเจ็บป่วยหลังการผ่าตัดน้อย และนำไปสู่การฟื้นตัวที่เร็วขึ้น*