SAFETY AND LONG-TERM OUTCOMES OF TRANS-PERITONEAL LAPAROSCOPIC RENAL CYST DECORTICATION FOR THE TREATMENT OF SYMPTOMATIC SIMPLE RENAL CYST

Ismail Hama Amin Agha Wias [a], Sarwar Noori Mahmood [a],
Saman Anwar Wahid [b], and Basheer Anwer Bakr [c]

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ABSTRACT

Background

Laparoscopic decortication of symptomatic simple renal cyst has been shown to be an effective durable treatment with minimal complications.

Objectives

To assess the efficacy, safety, and long-term outcomes of transperitoneal laparoscopic decortication of symptomatic simple renal cysts.

Patients and Methods

Thirty-six consecutive patients (20 men; 16 women) who underwent transperitoneal laparoscopic decortication of simple renal cysts at our department between January 2015 and June 2017 were enrolled in the study. The main indication for surgery was flank pain in 24 (66.5%), urinary tract obstruction in 5 (14%), and cyst enlargement on follow up in 7 (19.5%) patients. Only patients with symptomatic simple cysts more than 5 cm (Bosniak I & II) were included in this study, while patients with complicated cysts (Bosniak III & IV) were excluded. The patients were followed up for symptomatic and radiological success. Symptomatic success was defined as a significant pain improvement (using a visual analog pain scale), and procedure success was defined as no recurrence of the cyst and complete pain relief.

Results

All patients had their cysts completely removed laparoscopically with a mean operative time of 47 minutes without major perioperative complications or conversion to open surgery. The mean blood loss was 65 ml, and the mean patient's hospitalization was 1.3 days. After a mean follow-up of 11.4 months, radiological and symptomatic success was 87.5% and 94%, respectively. Patients having upper pole cyst significantly had longer operative duration and more postoperative pain score compared to the middle and lower pole cysts p-value < 0.05.

Conclusion

Transperitoneal laparoscopic simple cyst decortication is safe and effective with high long-term symptomatic and radiologic success rate.

Keywords: *Transperitoneal laparoscopy, Simple renal cyst, Decortication, Symptomatic renal cyst.*

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[a] Department of Surgery, College of Medicine, University of Sulaimani, Kurdistan Region, Iraq.
Correspondence: sarwar.mahmood@univsul.edu.iq.
[b] Sulaymaniyah General Teaching Hospital, Urology Department, Sulaymaniyah, Iraq.
[c] Kirkuk General Hospital, Urology Department, Iraq.

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INTRODUCTION

The kidney is one of the most common sites of cyst formation in the body [1] It can be diagnosed in approximately one-third of patients older than 50 years [2, 3].

Renal cysts are asymptomatic in 90–95% of the cases [4], however, they can lead to significant morbidity in 2–8% of the cases. They occasionally become large enough to cause pain, pelvicalyceal system and/or ureteral obstruction, hematuria, recurrent urinary tract infection, hypertension, and, less frequently, cyst rupture [1, 3-6].

Open surgery offers the best success rate and the lowest recurrence rate in comparison to other modalities of treatment. However, it is more invasive, costlier, and less cosmetic and has higher morbidities, with longer hospitalization and convalescence periods [7].

With the recent advances in minimally invasive surgical procedures (keyhole surgery), laparoscopic renal cyst decortications have gained a huge reputation and become the standard care modality for treating simple renal cysts [4, 5, 8].

Two laparoscopic approaches, the transperitoneal (TP) and the retroperitoneal (RP) approaches, have been used for renal cyst decortications. The decision of which approach is to be used depends mainly on the preference and experience of the surgical team and the location of the targeted cyst [9–11]. Despite the advances in different laparoscopic techniques, a recurrence rate of up to 19% was reported regardless of the technique used [12-13].

The advantages of transperitoneal (TP) approach are larger working space, detailed anatomic landmarks, and better approachability of large kidney, peripelvic and anteromedially located cysts [10, 11, 14, 15]. The disadvantages of the TP approach are longer operative duration, the need to mobilize the colon, spillage of cyst content to the peritoneal cavity, and post-operative urinoma or hematoma, when developed, being intraperitoneal [10, 11, 14, 15].

We hereby present the outcomes of our initial experience with TP laparoscopic simple renal cyst decortications in patients with symptomatic simple renal cysts.

PATIENTS AND METHODS

Between January 2015 and June 2017, 36 patients (20 males and 16 females) with symptomatic simple renal cysts underwent TP laparoscopic renal cyst decortication at our urology department (Sulaymania General Teaching Hospital).

Only patients having symptomatic renal cysts that are larger than 5 cm and uncomplicated renal cysts with Bosniac I-II, IIF, were enrolled in this study. While patients with asymptomatic renal cysts smaller than 5 cm in their greatest dimensions with Bosniak III and IV (complex renal cysts) and parapelvic cysts were excluded from this study.

Patients who were eligible for our inclusion criteria were assessed by history, physical examination, and laboratory investigations.

All patients were diagnosed by ultrasonography and contrast-enhanced computed tomography to determine the Bosniak classification of the renal cysts pre-operatively.

All the procedures were performed through the TP approach. The procedure started by placing the patient in the supine position until intravenous access and general anesthesia with endotracheal intubation was secured. The patient was placed in a 45-degree flank position for anteriorly and laterally located cysts and in a standard 90-degree flank position for posteriorly located cysts. The table was flexed as needed, and padding was used to support buttocks and flank; the patients were fixed in position with strips.

Access to the peritoneal cavity was first secured using the closed technique of port placement. The first port (a10 mm reusable trocar with a pyramidal tip) was placed four finger breadth lateral and two finger breadth above the level of the umbilicus. This anatomic location (the lateral border of the rectus sheath) was selected because the multiple layers of the rectus sheath can offer a stronger scar than the single layer and provides relatively low blood supply midline linea alba. Additionally, this omits the time needed to put the primary port in supine position and then placing the patient in a lateral position.

The second port (5 mm trocar) was placed under direct vision above the primary port at the mid-clavicular line not less than 8 cm away from the first port to avoid collision of instruments. The third port (5 mm trocar) was placed in the same manner along the anterior axillary line at the level of the umbilicus. These three ports were placed in a baseball diamond concept (Fig.1). An additional fourth port (5mm) was inserted

in the epigastric region when there was a need to reflect the liver or the spleen away from the dissection area. This is done to avoid injury to these viscera using laparoscopic tri-flange liver retractor or fan retractor.

The dissection started along the relatively bloodless white line of toldt to reflect the ascending or the descending colon medially. The Gerota fascia was opened in order to reach the perinephric space. When the blue dome cyst was identified, the cyst was dissected from the surrounding perinephric fat (Fig. 2 A). A puncture was made on the dome of the cyst and aspiration of the content was done carefully to avoid its spillage to the peritoneal cavity using the suction irrigation device. The aspirated fluid was measured and sampled for cytological examination. When there was excess bleeding from the adjacent parenchyma, irrigation was done using normal saline. The amount of blood loss was measured at the end of the procedure by the subtraction of the aspirated cyst fluid volume and the irrigating saline volume from the total volume of fluid in the suction device.

The cyst wall was retracted to dissect the remaining attached perinephric tissue, and then the edges were circumferentially excised and cauterized at the junction with the parenchyma keeping a 5–10 mm distance from the renal parenchyma.

We used either monopolar scissors attached to a conventional monopolar cautery device (Karl Storz-Autocon 200) or ultrasonic harmonic scalpel (Ethicon Endo-Surgery, LCC, Guaynabo, Puerto Rico, USA) for tissue dissection. The interior of the cyst was inspected to exclude any lesion in the base. We hadn't cauterized the base of the cysts (Fig. 2 B).

The cyst wall was retrieved through the 5 mm port and sent for histopathology examination. All port sites were closed in layers. A tube drain of suitable size was placed in the bed of the remnant cyst wall through the lower 5 mm port when indicated.

All patients were followed up at three and six months after surgery, they were assessed for symptomatic and radiologic success. Pain and cyst recurrence were assessed during the follow-up. Furthermore, the preoperative and postoperative pain was evaluated by a 10-point visual analog scale (VAS).[16] Pain intensity was graded on a scale of 0–3 (mild pain), 4–6 (moderate pain), and 7–10 (severe pain). Patients with a postoperative pain score greater than three (moderate to severe pain) or with no improvement or worsening pain score were regarded as a symptomatic failure. Patients with mild postoperative pain scale were regarded as having symptomatic success.

Patients underwent radiological follow-up with ultrasonography or unenhanced computed tomography. When there was no cyst at the same site and location, we regarded it as a radiologic success. Cyst recurrence at the same anatomic location was regarded as a radiologic failure.

Statistical analysis was performed with a software program (statistical package for the social sciences, IBM, SPSS, version 21; Chicago, Illinois). The data were analyzed using the paired sample t-test and the Pearson chi-square test. *P*< 0.05 was considered statistically significant.

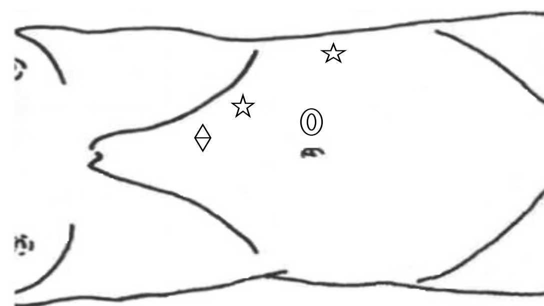
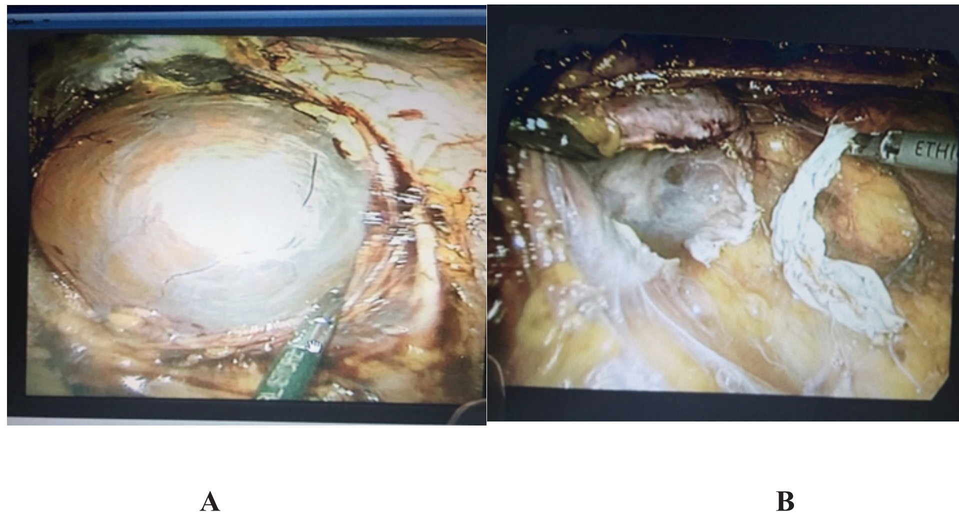


Figure 1. Schematic illustration of port sites. Showing the location of the primary (camera) port (◎), the secondary (working) ports (☆), and the fourth (retraction) port (◊).



A B

Figure 2. Intraoperative view. A, showing tissue dissection to expose the blue dome cyst (left lower pole cyst). B, after complete excision, hemostasis is secured using the harmonic device.

RESULTS

Thirty-six patients, 20 males (56%) and 16 females (44%), were operated for simple renal cysts laparoscopically, and all operations were performed with the TP approach.

The mean age of the patients enrolled in our study was 53.3 years (range: 19–77 years), and the mean body mass index (BMI) was 28.9 (range: 21.7–42.2). Additionally, the patients' demographics and preoperative characteristics were summarized in table 1.

The main indication for surgery were patients presenting with flank pain in 24 (66.5%), followed by urinary tract obstruction in 5 (14%), and cyst enlargement on follow up in 7 (19.5%) cases.

Preoperative CT scan revealed a single cyst in 29 (80%) cases, 2 cysts in 6 (17%) cases, 3 cysts in 1 (3%) case. As much as 23 (64%) patients had left renal cyst, and 13 (36%) had a right renal cyst. The cysts were in the upper pole in 14 (39%) patients, in the mid-pole in 8 (22%) patients, and in the lower pole in 14 (39%) patients. The mean largest cyst dimension measured by CT was 98.7 mm (range: 50–210 mm).

When the patients with operated renal cyst were categorized for Bosniak classification, 28 (78%) patients were Bosniak I, 6 (17%) patients were Bosniak II, and 2 (5%) patients were Bosniac II F.

The estimated mean operative time from skin incision to placement of the last stitch was 47 minutes (range: 20–115 minutes). About 31 (86%) patients needed three ports to accomplish the surgery, while an additional fourth port was needed in 5 (14%) patients. Tube drain was left near the bed of the cyst in only 10 (28%) cases.

The estimated mean blood loss during the surgery was 65 ml. All procedures were successfully completed laparoscopically with no case converted to open surgery. The patients were hospitalized for a mean of 1.3 (range: 1–7) days, and the estimated convalescence period (time to go back to the work) was 7 (range: 3–20) days.

There were no major perioperative complications. One patient bled from the renal parenchyma, which was managed by changing one port size to 10 mm for needle introduction and performing primary intracorporeal suturing of the bleeding vessel.

Another patient had inadvertent 2 cm liver laceration by overshooting of a working Maryland forceps, which was managed by hemostasis via local cauterization, applying hemostatic surgicel, and a tube drain being left near the injury site. The estimated total blood loss was 400 ml, and the patient was discharged from the hospital on the seventh postoperative day when the general condition of the patient stabilized. Another patient developed ileus postoperatively, which was managed conservatively by nil per mouth and a nasogastric tube for 48 hours, and the patient was discharged on the third postoperative

day uneventfully. The overall complication rate was 8.4%, with no serious complication being reported. Table (2) summarizes intraoperative and postoperative parameters and complications.

Symptomatic success was seen in 21/24 (87.5%) patients. The mean pain score was 5.6 (range: 5–8) preoperatively, and it decreases to 2.3 (range: 0–7) postoperatively. Three (12.5%) patients had no improvement in the pain score postoperatively.

All patients operated for upper urinary tract obstruction were followed by the postoperative US and showed complete resolution of the obstruction (100%).

After a mean follow up of 11.4 (range: 8–30) months, the radiologic success rate was 94% with no recurrence of the renal cyst. However, 2 (6%) patients had cyst recurrence at the same anatomic location, which were smaller than 2 cm in maximum diameter. Table 3 summarizes symptomatic and radiological outcomes. Furthermore, aspirated fluid for cytology and excised wall cyst were free of malignancy in all cases.

Patients with upper pole cyst significantly had longer operative duration and more postoperative pain score compared to the middle and lower pole cysts with p-value < 0.05. Cyst laterality and number or dimensions of the cysts, have no significant effect on operation duration, intraoperative and postoperative complications, and symptomatic and radiological outcomes. The P value > 0.05.

Table 4 shows cyst characteristics in relation to intraoperative and postoperative outcomes.

Table 1. Patient demographic and preoperative characteristics.

Parameter	Value no (%)
No of patients	36
Gender /male: female	20 (56%): 16(44%)
Mean age, range (years)	53.3 (19-77)
Mean BMI, range (kg/m2)	29.9 (21.7-42.2)
Clinical presentation	
Flank pain	24(66.5%)
Urinary tract obstruction	5 (14%)
Cyst enlargement	7 (19.5%)
Cyst characteristics (no.) (%)	
Laterality left/right	23/13 (64%/ 36%)
No. of cysts	
Single cyst	20 (80%)
Two cysts	6 (17%)
Three cysts	1 (3%)
Cyst location	
Upper pole	14 (39%)
Mid pole	8 (22%)
Lower pole	14 (39%)
Maximum diameter, range (mm)	98.7 (50-210)
Bosniak type I/II/IIf	28/6/2

Table 2. Intraoperative and post-operative parameters and complications.

Parameter	Value	
Mean duration of surgery, range minutes	47 (20-115)	
Port no. (%)		
Three ports	31(86%)	
Four ports	5 (14%)	
Mean blood loss (ml), (range)	65 (30-400) *	
Tube drain placement		
Yes	10 (28%)	
No	26 (72%)	
Mean hospital stays, range (days)	1.3(1-7)	
Mean convalescence, range (days)	7 (3-20)	
Intraoperative complications (no) (%)	3 (8.4%)	Clavien-Dindo class
Bleeding	1 (2.8%)	1
Visceral injury	1(2.8%)	2
Ileus	1 (2.8%)	1

***The estimated mean blood loss ranged 30-100 ml, with only one patient with liver injury have loss around 400 ml.**

Table 3. Symptomatic and radiologic outcomes.

Parameter	Value
Mean follow up, range (months)	11.4 (3-30)
Visual analog pain scale	
Before surgery mean score (range)	5.6 (5-8)
After surgery, mean score (range)	2.3 (0-7) *
Symptomatic success (pain)	21 (87.5%)
Symptomatic failure (pain)	3 (12.5%)
Relieve of obstruction	5 (100%)
Radiological success	34 (94%)
Radiological failure (recurrence)	2 (6%)**

***Three patients have post-operative VAS higher than 3, all regards as symptomatic failure.**

**** All radiological recurrence were < 2 cm.**

Table 4. The relation of cyst locations with different variables.

Variable	Upper pole	Mid pole	Lower pole	p.value[a]
Mean age	47	57.5	49.9	>.05
Patients no.	14	8	14	>.05
Mean duration of surgery, minutes	58.4	40	41.2	< 0.5 *
Mean blood loss, ml	72	53	65	>.05
Cyst diameter, cm, mean	9.8	8.5	10.4	>.05
Cyst laterality Lt/Rt	8/6	5/3	7/7	>.05
Post-operative pain				
Mild (0-3)	1	4	5	< 0.5 *
Moderate (4-6)	9	4	8	> 0.5
Sever (7-10)	4	0	1	< 0.5 *
Hospital stay,				
24 hours	10	6	13	>.05
More than 24 ours	4	2	1	>.05
Recurrence	2	1	2	>.05

*** The upper pole location was significantly related to longer duration of surgery and more ` postoperative pain score.**
[a] analyzed by Pearson Chi-square test.

DISCUSSION

Laparoscopic decortication of symptomatic simple renal cyst offers an ideal management and has been shown to be an effective and durable treatment. Additionally, it is associated with minimal complications, reduced operative time, minimal blood loss, reduced hospital stays, and rapid convalescence with low recurrence rate over a long-term follow-up with the advantage of being a minimally invasive approach. It is favored over the other treatments [14].

Laparoscopic procedures can be performed trans- or retroperitoneally. The decision of which approach is to be used depends mainly on the preference and experience of the surgeon and the location of the cysts. [9–11].

Most surgeons prefer the TP approach because it provides a large working space and detailed anatomical landmarks. Furthermore, it is better for approaching large kidney, peri-pelvic, and anteromedially located renal cysts. However, the disadvantages of the TP approach include the necessity to mobilize the colon and, hence, longer operative time and increase in the risk of postoperative ileus. In addition to the possibility of spillage of the cyst contents into the peritoneal cavity, it may lead to peritoneal irritation or peritonitis and post-operative urinoma or hematoma formation within the peritoneal cavity [10, 11, 14, 15].

We chose the transperitoneal approach in our series because most of our cases had anterolaterally located cysts which were big in size. In addition, our experience in the retroperitoneal approach was limited.

In this study, we have achieved a radiological and symptomatic success rate of 94% and 87.5%, respectively, after a mean follows up of 11.4 months. This is in accordance with the previously published series.

Tuncel *et al.*[4] achieved 100% radiologic success and 86% symptomatic success and the mean follow up was 12.1 months. Altug *et al.*[14] reported the radiological and symptomatic successes in their series of consecutive patients (100% and 86.6%, respectively), after a mean follow up of 12.08 months. Tefekli *et al.*[2] reported a radiological success rate of 88.2% and a symptomatic success rate of 89.5% after a mean follow up period of 14.3 months. Abbaszadeh *et al.*[8] achieved a 95.2% radiologic and symptomatic success rate for a

mean period of 16.6 months. Suhail *et al*.[11] achieved symptomatic and radiologic success rates of 93.7% and 94.7%, respectively, over a mean period of 12 months. Additionally, Okeke *et al*. [17] reported a symptomatic success rate of 100% during 17.7 months of follow up.

In our series, mean operative time, mean blood loss, and mean hospital stays were 47 minutes, 65 ml, and 1.3 day, respectively, which is equivalent to most of the published series reported. Blood loss was more in the first few cases in our series before starting to leave a safety margin away from the parenchyma.

In the study by Suhail *et al*.[11], the mean operative time was 48.8 minutes, with estimated mean blood loss of 119.6 ml, and mean hospital stay of 1.4 days. Tuncel *et al*.[4] also showed a mean operation time of 64.4 minutes with a mean blood loss of 20 ml and a mean hospital stay of 2.2 days. Abbaszadeh *et al*. [8] showed a mean operative time of 58 minutes, with their mean blood loss being 50 ml, and the mean hospital stay being 1.9 days. Moreover, Tefekli *et al*.[2] showed a mean operating time of 83 minutes, a mean blood loss of 50 ml, and a mean hospital stay of 2.3 days. Dong-soo and Taee[18] spent a mean operation time of 100.8 min, with a mean blood loss of 108.4 ml, and a mean hospital stay of 6.4 days. Altug et al.[14] and Okeke et al.[17] also spent a mean of 89 and 106 min on renal cyst decortication and a hospital stay of 1.1 and 3.4 days, respectively.

These results were comparable to our results regarding safety, symptomatic and radiologic success rates with no major complication, reoperation, or conversion to open surgery.

We observed that cysts located in the upper pole seem to be associated with longer duration of surgery and higher postoperative pain score than cysts located in the midpole and the lower pole. This may be due to more tissue dissection and more manipulation of the diaphragm, the pleura, and/or the liver/spleen when mobilizing and dissecting an upper pole renal cyst.

There was no significant correlation of cyst location to the amount of blood loss, hospital stay, or cyst recurrence. Other cyst criteria such as laterality, cyst size, and Bosniak type has not shown any statistical significance in relation to intra-operative or post-operative complication.

There are a few limitations in our study including a relatively small sample size. Furthermore, ultrasonography was used to measure the cyst size in most cases during follow-up because it is less expensive, which sometimes has a drawback, as it is difficult to identify the collapsed unroofed cystic cavity and the caliectasis by ultrasonography imaging.

Our results demonstrate that transperitoneal laparoscopic simple renal cyst decortication is an effective, safe, and durable treatment option in the management of renal cyst with minimal morbidity.

We recommend performing more prospective cohort studies on larger group of patients with simple renal cysts who are candidates for laparoscopic decortication, comparing transperitoneal and retroperitoneal approaches.

In conslusion, transperitoneal laparoscopic simple cyst decortication is safe and effective with high long-term symptomatic and radiologic outcomes.

Conflict of interest

No conflict of interest.

Ethical standard

This study was approved by the local ethical committee of the University of Sulaimani, College of Medicine.

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