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Original Article

Comparison of retroperitoneal laparoscopy with flexible ureteroscopy for treating renal pelvis cysts: superior perioperative outcome with a comparable recurrence rate

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Abstract: Objectives: To assess the efficacy and safety of laparoscopic excision and drainage for treating renal pelvis pericystic cysts. Methods: A total of 100 patients with renal peripelvic cysts were included and divided into two groups according to surgical method: the Open group (receiving ureteroscopic peripelvic cyst excision and internal drainage) and the Observation group (receiving laparoscopic retroperitoneal peripelvic cyst decompression), with 50 cases in each group. The surgical data of the two groups were compared, including surgical time, intraoperative blood loss, first exhaust time, activity time, length of hospital stay, use of analgesics, renal function indicators, pelvic dilation, visual analog scale (VAS) scores for swelling compression related symptoms (lower back pain), postoperative complications, and cyst recurrence rate. Results: Compared to the Open group, the Observation group was superior in operation time, intraoperative blood loss, first exhaust time, time of getting out of bed, hospitalization time, and analgesic demand (all $P < 0.001$). At 6, 12, and 24 months after operation, the improvement rate of renal function and renal pelvis dilatation in the Observation group was higher, the VAS score was lower (all $P < 0.001$), and the overall incidence of complications was lower ($P < 0.05$). During the follow-up period of 6-24 months, there was no significant difference in cyst recurrence rate between the two groups ($P > 0.05$). Conclusion: Retroperitoneal laparoscopic decortication for the treatment of peripelvic cysts significantly improved perioperative outcome and safety, while demonstrating a comparable long-term recurrence rate to flexible ureteroscopic internal drainage.

Keywords: Renal peripelvic cysts, retroperitoneal laparoscopy, parapelvic cyst decortication, curative effect, recurrence

Introduction

Renal cysts are one of the most common renal structural abnormalities in clinical practice, with no obvious clinical symptoms in the early stage. However, with the enlargement of a cyst, blood vessels, urinary tract, or surrounding tissues are compressed, which may cause hematuria, low back pain, infection, and secondary renal function damage [1, 2]. Peripelvic cysts are a special type of renal cyst [3], that mainly results from the development of simple renal cysts. It starts near the renal hilum and eventually extends to the renal sinus [4]. Peripelvic cysts with an early stage or a diameter < 4 cm usually have no specific manifestation [5], but when the cyst is obviously enlarged or lead to compression of the renal pelvis, it may cause hydronephrosis, decreased renal function, and even increase the risk of secondary infection, which has a significant impact on patients' renal health and overall quality of life.

At present, there is no special treatment for general peripelvic cyst in the clinic, which is similar to simple renal cyst. Regular imaging follow-up is sufficient. However, when the cysts cause secondary symptoms or the diameter exceeds 4 cm, surgical intervention is needed. At present, the common surgical methods are ultrasound-guided puncture and aspiration of cystic fluid [6] or cyst decapitation [7]. The main purpose of this is to discharge cystic fluid, reduce the pressure on surrounding tissues, and

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reduce the risk of cyst recurrence [8]. Nevertheless, clinical practice showed thatif the cyst is located around the renal sinus, adjacent to the renal vessels, renal pelvis, and ureter, it is not easily fully exposed and separated during surgery. If the cyst wall is not completely separated and removed, patients treated by cyst puncture and aspiration may experience a higher risk of postoperative recurrence [9, 10]. Cyst decortication involves removing most of the cyst wall and filling the peripelvic space with a pedicled fat flap. The treatment effect of this surgical method is positive and clinically satisfactory, and it is less prone to recurrence [11, 12]. The traditional open surgical approach is mainly used for cyst decortication in renal pelvic cysts, with marked treatment effect and mature technique. Nevertheless, clinical practice has shown that patients are dissatisfied with the long incision, large trauma, marked bleeding, and long recovery time after traditional open cyst decortication [13].

In recent years, the laparoscopic approach has been recognized as the gold standard for the treatment of renal cystic diseases [14]. Laparoscopic-guided fenestration decompression of renal cystic diseases has many advantages, including small incision, less bleeding, less surgical trauma, rapid postoperative recovery, and low risk of infection [15, 16]. This operation has been widely used by urologists and patients because of its good safety and curative effect. Initially, it was mainly used for the treatment of simple renal cysts, and now it is gradually applied for the treatment of perirenal cysts [17, 18]. However, relatively speaking, ureteroscopic peripelvic cysts excision and internal drainage is more widely applied in the treatment of peripelvic cysts compared to laparoscopic-assisted methods. Hence, the efficacy and safety of laparoscopic-assisted cyst fenestration and decompression have become the basis for its adoption in peripelvic cysts.

That is, although laparoscopy has shown many advantages for the treatment of renal cystic diseases, a comparison of the widely used traditional open surgery versus ureteroscopy for the treatment of perirenal cyst has rarely been done. Therefore, the purpose of this study was to compare and analyze the clinical data of retroperitoneal laparoscopic decortication and ureteroscopic drainage in the treatment of peripelvic cysts, and systematically evaluate the performance of the retroperitoneal laparoscopic technique in terms of operation time, intraoperative bleeding, postoperative recovery, complication rate, and renal function protection. This may provide evidence for the rational application of this technique in the treatment of peripelvic cysts.

Materials and methods

Research design

Clinical data from patients admitted to First People's Hospital of Shuangliu District between July 2020 and July 2023 were collected in this retrospective cohort analysis. This study was approved by the Medical Ethics Committee of the First People's Hospital of Shuangliu District, following the principles of the Helsinki Declaration. In view of the retrospective nature of this study, the Ethics Committee waived the requirement of obtaining informed consent from patients.

A total of 100 patients with peripelvic cysts were included. The diagnosis of renal hilum cyst was confirmed through abdominal ultrasound, intravenous pyelography (IVP), and enhanced CT scan. The imaging showed that the cyst was adjacent to the renal pelvis and partially entered the renal sinus. All patients underwent routine preoperative assessment, including renal function (creatinine, eGFR), routine urine, coagulation function, and electrocardiogram.

Inclusion criteria: age between 30 and 70 years old, gender not limited; diagnosed with unilateral parapelvic cyst with cyst diameter ≥ 4 cm; clinical symptoms (such as low back pain or lumbar discomfort) and/or signs of hydronephrosis or renal impairment due to cyst compression; complete clinical data available, with preoperative laboratory tests indicating essentially normal renal function (serum creatinine within the institutional normal range, estimated glomerular filtration rate (eGFR) ≥ 60 mL/min/1.73 m^2); no history of surgical or interventional therapy on the affected kidney; and willingness to comply with postoperative follow-up arrangements.

Exclusion criteria: preoperative identification of ureteral or renal vascular abnormalities; severe cardiovascular disease (*e.g.*, NYHA class III or IV), severe pulmonary disease, or coagulation

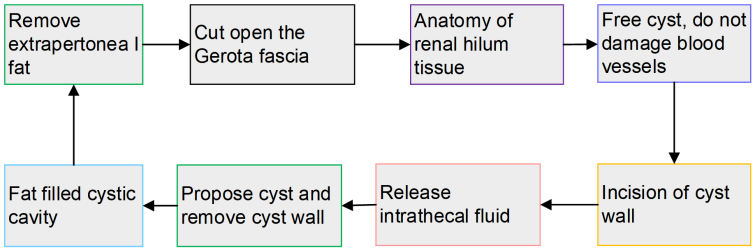

Figure 1. Dissociation and treatment of peripelvic cysts.

disorders, rendering them unsuitable for anesthesia or surgery; suspected or confirmed malignant peripelvic cysts, or complicated by renal parenchymal tumors; active severe renal infection (such as acute pyelonephritis) or severe renal insufficiency (*e.g.*, eGFR < 30 mL/min/1.73 m^2) due to cysts or other causes; a history of major abdominal or retroperitoneal surgery that could lead to severe adhesions or infection and significantly interfere with the planned surgical approach; pregnant or lactating women; and incomplete clinical data or loss to follow-up.

The patients were divided into two groups based on different surgical methods: the Open group and the Observation group. There were 50 patients in each group.

Surgical methodologies

The Observation group received retroperitoneal laparoscopic peripelvic cyst decompression. General anesthesia was administered. The patient was positioned in the lateral decubitus position. The surgical area was sterilized and draped. A working channel was created in the abdominal cavity *via* three small incisions using laparoscopic insufflation techniques. Retroperitoneal fat was removed, the renal fascia was incised, and the renal cyst was mobilized. The renal cyst was excised with a 0.5 cm margin beyond the renal parenchyma (with careful assessment of the integrity of the renal pelvis and hilum ensured). See **Figure 1**.

The Open group was treated with peripelvic cyst incision and internal drainage under a ureteroscope. Before surgery, the double J tube was routinely indwelled for 2 weeks, and all patients were administered general anesthesia. After successful anesthesia, a hard ureteroscope was used to enter the bladder under direct vision of the urethra. After the walls of the bladder were checked for no abnormalities, a 4F ultra-smooth guide wire was retrofitted through the ureter to the renal pelvis. A 14F flexible ureteroscope sheath (COOK, UK) was inserted into the renal pelvis along the ultra-smooth guide wire, and an Olympus electronic flexible ureteroscope was inserted into the renal pelvis. The anatomic structure of the renal pelvis and calyces was carefully observed, and the location of the cyst was found by the use of imaging data. Under the microscope, the cyst wall was generally pale blue-purple. After locating the cyst, the cyst wall was slowly incised with a holmium laser (Beijing Corrine Medical holmium laser system, 1.0-2.0 J, 15-20 Hz) at the thinnest part of the cyst wall and collecting system. The cyst wall was cut 1.5-2.0 cm away from the vascular texture to fully connect the cyst with the collection system.

Postoperative management: (1) continuous monitoring of vital signs; (2) prophylactic antibiotic administration; (3) fluid, electrolyte, and vitamin supplementation; (4) maintenance of fasting with *nil per os* status; (5) reevaluation of renal function and electrolyte levels; (6) ensuring drainage tube patency; and (7) monitoring cyst changes for 4 days postoperatively.

Postoperative follow-up: all patients were followed up for six months after discharge, including routine blood and urine tests, biochemical tests, physical examination, and imaging examinations (B ultrasound, CT, IVP).

Observation indexes

Primary indicators: 1. Efficacy measures: Technetium-99m diethylenetriaminepentaacetic acid (99mTc-DTPA) renal dynamic imaging was performed preoperatively and at 6, 12, and 24 months postoperatively to determine the percentage of split renal function in the affected kidney and to evaluate whether the surgery effectively preserved and improved renal function on the affected side. CT urography was also conducted to assess the presence of pelvicalyceal dilation and the patency of the collecting system. Significant reduction or resolution of hydronephrosis postoperatively indicated successful relief of cystic compression.

Table 1. Comparison of baseline characteristics

Characteristic	Open group (n = 50)	Observation group (n = 50)	Statistic	*P*
Sex, n (%)			$\chi^2 = 0.162$	0.687
Male	27 (54.0%)	29 (58.0%)		
Female	23 (46.0%)	21 (42.0%)		
Age (years)	54.81 ± 9.22	51.03 ± 9.84	t = 1.978, df = 98	0.051
Cyst diameter (cm)	5.75 ± 1.50	5.89 ± 1.42	t = -0.474, df = 98	0.637
Disease duration (years)	1.68 ± 0.33	1.64 ± 0.25	t = 0.692, df = 98	0.491
Cyst location, n (%)			$\chi^2 = 0.672$	0.413
Left	29 (58.0%)	32 (64.0%)		
Right	21 (42.0%)	18 (36.0%)		
Hypertension, n (%)	8 (16.0%)	9 (18.0%)	FET, P = 1.000	0.792
Urinary tract infection, n (%)	11 (22.0%)	9 (18.0%)	$\chi^2 = 0.256$	0.613
Low back pain/discomfort, n (%)	28 (56.0%)	30 (60.0%)	$\chi^2 = 0.161$	0.688

Note: FET, Fisher's exact test (applied for the comparison of hypertension due to the presence of expected counts < 5); df, degrees of freedom.

2. Postoperative recurrence rate: during the follow-up period of 6 to 24 months, the recurrence of cysts was monitored and recorded. Cyst recurrence was defined as the appearance of cystic structures with a diameter greater than 3 cm with or without symptoms after surgery [19].

Secondary indicators: 1. Comparison of surgical data: the surgical time, intraoperative blood loss, postoperative time to first flatus, postoperative mobilization time, length of hospital stay, and postoperative analgesic consumption were compared between the two groups. 2. Postoperative renal function changes: serum creatinine (Scr) levels and eGFR were measured and recorded before surgery and on the 3rd and 7th day after surgery to evaluate the effect of both surgical procedures on renal function. 3. Quantitative scoring of symptoms related to cyst compression: three days before surgery, the degree of lower back pain or discomfort were assessed on a 100 mm visual analog scale (VAS), with 0 mm indicating no pain and 100 mm indicating the most severe pain. VAS assessment was repeated before discharge and at 1-, 3-, and 6-month postoperative follow-up. VAS scores were recorded for objective quantification of symptom improvement. 4. Safety assessment: the incidence of postoperative complications, including renal pelvis wall injury, perirenal fluid collection, infection, pressure ulcers, perirenal hematoma, and cardiopulmonary dysfunction, was recorded. All postoperative complications were graded according to the Clavien-Dindo classification: Grade I: complications requiring no specific intervention; Grade II: complications requiring pharmacological treatment (*e.g.*, antibiotics, analgesics) or other non-surgical intervention; Grade III: complications requiring surgical or other specialized interventional treatment; Grade IV: life-threatening complications requiring major therapeutic intervention (*e.g.*, intensive care); Grade V: postoperative mortality. The type and grade of complications for each patient were recorded for detailed analysis of the severity of postoperative complications.

Statistical analysis

Statistical analysis was conducted using *SPSS 22.0*. Normally distributed continuous data were expressed as mean ± standard deviation, and t-test was used for inter-group comparisons. Categorical data were presented as numbers (percentages) [n (%)] and the chi-square test was used for inter-group comparisons. One-way analysis of variance (ANOVA) followed by LSD test was used for the comparison of multiple groups. Differences with $P < 0.05$ were deemed significant.

Results

Comparison of baseline characteristics

No statistically significant differences were found between the two groups in gender, age, cyst diameter, course of disease, cyst location, or the prevalence of complications such as hypertension, urinary tract infection, low back

Table 2. Comparison of operative and postoperative recovery indicators (n = 50)

Indicator	Open group (n = 50)	Observation group (n = 50)	t/χ^2	*P*
Operative time (min)	82.5 ± 9.2	60.1 ± 6.5	8.72	0.000
Intraoperative blood loss (mL)	277.6 ± 45.3	58.4 ± 12.1	15.36	0.000
Time to first flatus (h)	46.1 ± 9.3	21.6 ± 6.2	12.48	0.000
Time to ambulation (h)	78.5 ± 13.3	19.0 ± 3.2	13.29	0.000
Length of hospital stay (d)	12.0 ± 2.1	5.3 ± 1.2	15.01	0.000
Analgesic usage [n (%)]	46 (92)	15 (30)	32.4	0.000
Duration of analgesic use (d)	4.0 ± 1.4	2.3 ± 1.0	6.72	0.000

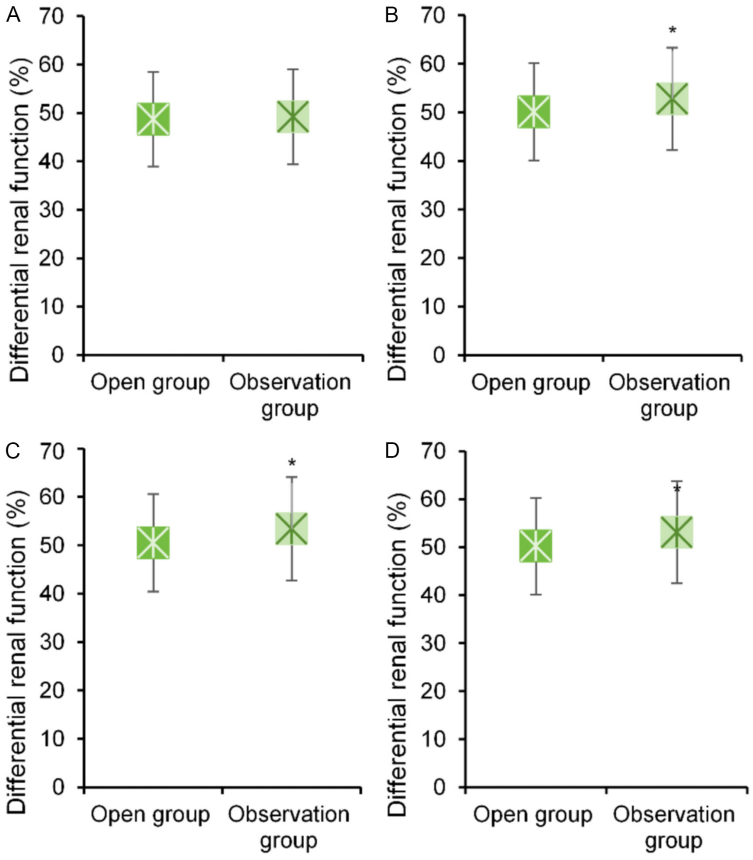

Figure 2. Follow-up of split renal function on the affected side (A: preoperative; B: 6 months postoperative; C: 12 months postoperative; D: 24 months postoperative. *P < 0.05 vs. Open group).

pain, or lumbar distension (all P > 0.05). This shows that the baseline characteristics of the two groups were comparable (**Table 1**).

Comparison of perioperative data

Compared to the Open group, the operation time and blood loss in the Observation group were significantly reduced, and the first postoperative exhaust, getting out of bed activities, and hospitalization time were significantly shortened (all P < 0.001). In addition, the use rate and time of analgesic drugs in the Observation group were significantly lower than those of the Open group (all P < 0.001) (**Table 2**).

Comparison of renal function on different sides

There was no significant difference in renal function between the groups before operation (P = 0.561). Analysis of variance of repeated measurement showed a significant interaction between time factor and grouping factor (P < 0.001). Simple effect analysis showed that the renal function of the affected side in the Observation group was significantly higher than that of the Open group at 6, 12 and 24 months after operation (all P < 0.01) (**Figure 2**).

Comparison of urinary system patency

Varying degrees of hydronephrosis were present in the affected kidneys of both groups preoperatively, with no significant difference observed (t = 0.97, P = 0.342). The improvement of renal pelvis dilatation in the Observation group was significantly higher than that of the Open group at 6, 12, and 24 months (all P < 0.001) (**Figure 3**).

Comparison of renal function before and after surgery

The renal function indexes of patients in the Open group and the Observation group were

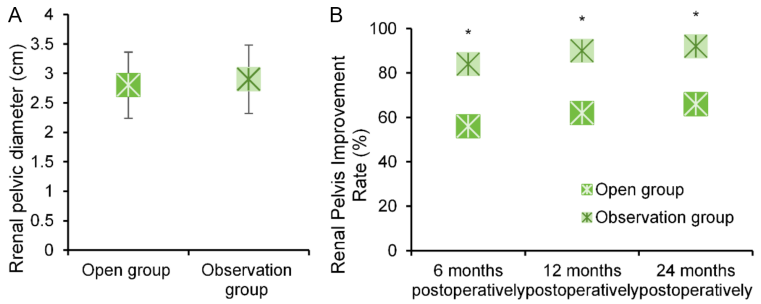

Figure 3. Postoperative pelvic dilation and improvement (A: comparison of pelvic width; B: improvement rate of pelvic dilation at 6, 12, and 24 months postoperatively. *P < 0.05 vs. Open group).

compared before operation, the third day, and the seventh day after operation (all P > 0.05). There were no significant differences in Scr or eGFR between the two groups before operation (both P > 0.05). The analysis indicated a significant interaction between time factor and grouping factor on Scr and eGFR (both P < 0.05). Back testing analysis showed that on the 3rd day after operation, the Scr in the Open group was significantly higher than that of the Observation group, while the eGFR was significantly lower than that of the Observation group (both P < 0.05). On the 7th day after operation, the differences in Scr and eGFR between the two groups were no longer statistically significant (both P > 0.05) (**Table 3**).

Comparison of VAS score for symptoms related to cyst compression (lower back pain)

All patients were assessed preoperatively (3 days before surgery), before discharge, and at 1-, 3-, and 6-month follow-ups. Preoperative VAS scores were comparable between the two groups (t = 0.698, P = 0.487). The variance analysis of repeated measurement was used to evaluate the changes in postoperative VAS score. The results showed that there was a significant interaction between time factor and grouping factor (P < 0.001). Simple effect analysis demonstrated that the VAS score of the Observation group was significantly lower than that of the Open group at all evaluation time points after the operation (before discharge, at 1-, 3-, and 6-month follow ups) (all P < 0.001) (**Table 4**).

Comparison of surgical complications

The overall incidence of postoperative complications in the Observation group was significantly lower than that of the Open group (8% vs. 18%, P < 0.05). Complications in the Open group included incision infection, high fever, stress ulcer, perirenal hematoma, and cardiopulmonary insufficiency, and there were a high proportion of Grade III and above complications (3/9, 33.33%). In the Observation group, the main complications were renal pelvic wall injury and perirenal effusion (both grade II). Only one case was grade III infection, and there were no serious complications of grade IV or above (**Table 5**; **Figure 4**).

Comparison of postoperative recurrence

The patients in the two groups were followed up for 6 to 24 months after operation, and the time distribution of cyst recurrence is shown in **Table 6**. During the whole follow-up period, 5 cases (10%) recurred in the Open group and 4 cases (8%) recurred in the Observation group. Chi-square test was used to compare the overall recurrence rate between groups. The results showed no significant difference (χ^2 = 0.122, P = 0.727). According to the recurrence situation at different follow-up time points, the generalized estimation equation (GEE) was used to compare the recurrence rates between groups. No significant difference was found at each time point (all P > 0.05).

Discussion

By comparing open surgery with retroperitoneal laparoscopic surgery for the treatment of peripelvic cysts, we found that retroperitoneal laparoscopic surgery was superior to open surgery in terms of surgical trauma, recovery speed, complications, and renal function protection, but there was no significant difference in the recurrence rate of cysts, indicating that its perioperative safety and patient benefit were better.

First, in this study, the operation time, intraoperative blood loss, postoperative recovery speed, pain control, renal function protection, and the incidence of complications in the Observation group were significantly better than those of the Open group. Gao et al. [20] and Ho et al. [21] also pointed out that laparoscopic or

Table 3. Comparison of renal function indicators before and after surgery (mean ± standard)

Time point	Indicator	Open group (n = 50)	Observation group (n = 50)	*t*	*P*
Scr (μmol/L)	Preoperative	83.24 ± 14.65	82.17 ± 13.90	0.484	0.632
	On the 3rd postoperative day	96.71 ± 18.33	88.36 ± 15.47	2.46	0.016*
	On the 7th postoperative day	86.12 ± 12.96	83.53 ± 12.25	1.04	0.301
eGFR (mL/min/1.73 m^2)	Preoperative	87.63 ± 10.12	89.05 ± 9.87	-0.812	0.421
	On the 3rd postoperative day	76.22 ± 11.90	84.31 ± 10.03	-2.68	0.008*
	On the 7th postoperative day	85.09 ± 10.78	88.42 ± 9.74	-1.650	0.104

Note: compared to the Open group, *P < 0.05. Scr, serum creatinine; eGFR, estimated glomerular filtration rate.

Table 4. Comparison of VAS scores before and after operation (mean ± standard)

Time point	Open group (n = 50)	Observation group (n = 50)	*t*	*P*
Preoperative	72.82 ± 11.33	71.52 ± 10.92	0.698	0.487
Before discharge	38.42 ± 9.66	23.73 ± 7.20	5.472	< 0.001
1 month after surgery	25.21 ± 7.41	13.51 ± 5.82	6.213	< 0.001
3 months after surgery	16.32 ± 6.21	8.92 ± 4.60	4.882	< 0.001
6 months after surgery	11.72 ± 4.52	6.52 ± 3.83	5.023	< 0.001

Table 5. Comparison of complications [n (%)]

Complication	Open group (n = 50 cases)	Observation group (n = 50 cases)
Injury of renal pelvis wall	0 (0.00)	2 (4.00)
Incision infection	3 (6.00)	0 (0.00)
High fever	1 (2.00)	0 (0.00)
Stress ulcer	2 (4.00)	0 (0.00)
Perirenal hematoma	4 (8.00)	0 (0.00)
Cardiopulmonary dysfunction	1 (2.00)	0 (0.00)
Perirenal effusion	0 (0.00)	2 (4.00)
Perirenal infection	0 (0.0)	1 (2.00)
Total concurrent number	9 (18.00)	4 (8.00)

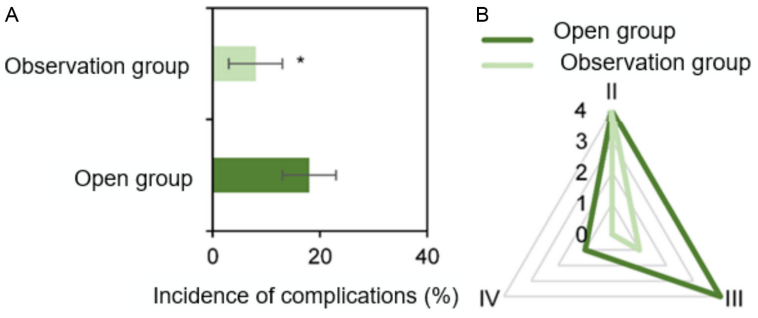

Figure 4. Comparison of the total complication rates between groups. A: incidence of complications; B: grading of complications; *P < 0.05 vs. Open group.

retroperitoneal laparoscopic surgery was superior to traditional methods regarding operation time, blood loss, and postoperative recovery, and that the incidence of complications was low. This is consistent with the results of this study. The retroperitoneal approach is especially suitable for the treatment of complex peripelvic cysts near the renal hilum and collecting system, with the features of accurate anatomical exposure, small manipulation interference, and clear vision [22]. This approach avoids the interference with distal organs in abdominal cavity, reduces traction and inflammatory reaction, reduces intraoperative bleeding, and shortens the operation time. It is conducive to rapid recovery and pain relief after operation, which is in line with the concept of minimally invasive surgery. These characteristics further support the existing research conclusions, that is, the retroperitoneal approach is safer for the treatment of peripelvic cysts and faster in postoperative recovery [23, 24]. In contrast, although the open surgical technique is very mature and the surgical site can be fully exposed, it leaves a large incision and has a relatively long operation

Table 6. Comparison of postoperative recurrence [n (%)]

Group	6 months	6-12 months	12-18 months	18-24 months	Total
Open group (n = 50)	0 (0)	1 (2.0)	2 (4.0)	2 (4.0)	5 (10.0)
Observation group (n = 50)	0 (0)	1 (2.0)	1 (2.0)	2 (4.0)	4 (8.0)
χ^2	-			0.000	0.122
P	-	1.000	1.000	1.000	0.727

time. There are potential risks such as infection, bleeding and delayed wound healing [25, 26]. Thus, retroperitoneal laparoscopy is superior to traditional open surgery in many key perioperative indexes, including being minimally invasive. This establishes its benefitsand its clinical value as a safe and effective alternative.

Second, in the evaluation of renal function, the changes in eGFR and Scr in the Observation group were insignificant on the third day after operation, but the renal function of the two groups reached a similar level on the seventh day after operation. This shows that this operative method had little interference with renal perfusion and the renal collection system, which is beneficial to the recovery of postoperative renal function. At 6, 12, and 24 months after operation, the split renal function of the affected side was better than that of the Open group. This further proves that retroperitoneal endoscopic surgery had advantages for long-term renal function protection. Do et al. confirmed that retroperitoneal laparoscopic partial nephrectomy combined with selective renal artery branch occlusion could not only completely remove the lesion, but also protect renal function and reduce trauma to a maximum extent [27]. Good safety and postoperative recovery results were obtained during the perioperative period. Lin et al. also confirmed that this surgical method had a favorable effect for protecting long-term renal function [28]. Therefore, our results further showed that retroperitoneal laparoscopic surgery can not only ensure the renal safety during and early after operation, but also has advantages for long-term renal function. Additionally, peripelvic cysts often lead to obstruction due to compression of the collecting system. This study found that improvement in pelvic dilation was significantly greater in the Observation group than in the Open group at all follow-up time points, indicating a clear advantage of retroperitoneal laparoscopic surgery for restoring collecting system patency. Long-term follow-up by Gao et al. also confirmed that minimally invasive surgery can continuously improve renal pelvis dilatation and restore drainage [29]. These findings further confirmed that the posterior peritoneal approach had significant advantages for restoring the patency of the collecting system and improving hydronephrosis.

Chiancone et al. [30] proposed that the postoperative pain of laparoscopic group was significantly reduced, and the recovery was faster, which was consistent with the advantages of this technique for relieving pain and accelerating recovery. This study found that the incidence of complications in the Observation group was lower than that of the Open group (8% vs. 18%), and the main manifestations fpr the Open group were incision infection and perirenal hematoma. A number of studies have confirmed that minimally invasive surgery could effectively reduce the infection rate of surgical incisions. This is due to the small incision size and small exposed area [31, 32]. Therefore, laparoscopic methods demonstrate significantly improved postoperative comfort and better safety.

Nevertheless, findings suggest that if the peripelvic cyst is located deep or the renal hilum structure is complex, inadequate exposure or injury to the renal hilum vessels during surgery can lead to postoperative recurrence [33]. Hence, surgical proficiency is crucial for the success of the operation. This shows that, although the two surgical procedures have shown good effects in preventing recurrence, the technical proficiency of the operator is still an important factor affecting the curative effect, especially when dealing with cases that have complex anatomic structure.

The findings of this study support retroperitoneal laparoscopic surgery as a minimally invasive approach for treating parapelvic renal cysts, particularly in middle-aged and elderly

patients with borderline renal impairment, high postoperative recovery demands, or multiple comorbidities. However, as a single-center retrospective controlled study with a limited sample size, despite statistically significant observations, further validation through multicenter, large-sample randomized controlled trials is required to confirm its efficacy and safety. Additionally, the maximum follow-up period of 24 months in this study precludes a comprehensive assessment of the long-term effects of different surgical approaches on renal function preservation, cyst recurrence risk, and quality-of-life improvement. Future studies may consider incorporating intraoperative cyst fluid analysis and standardized quality-of-life assessment scales to elucidate the biological characteristics of cysts, refine surgical indication criteria, and explore their association with precision treatment strategies.

Conclusion

Retroperitoneoscope peripelvic cyst decompression has more benefits for the treatment of peripelvic cyst than soft ureteroscopic parapelvic cyst incision and drainage. This include faster postoperative recovery, shorter hospitalization time, a lower incidence of postoperative complications, and higher surgical safety. As clinical understanding of peripelvic cysts continues to advance and as laparoscopic techniques, and technical proficiency improve, retroperitoneal laparoscopic decortication for renal cysts will likely gain broader clinical use.

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Disclosure of conflict of interest

None.

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