

Original Article

Two-port retroperitoneal laparoscopic surgery for the treatment of simple renal cysts by a single person

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Abstract: A new type of laparoscopic surgery for simple renal cysts was explored which is better than methods currently being used. From October 2013 to October 2015, 80 cases were enrolled for further analysis. These patients were divided into two groups randomly. The control group was given traditional three-port retroperitoneal laparoscopic surgery for the treatment of renal cysts. The test group was given a new technique: two-port retroperitoneal laparoscopy for the treatment of renal cysts by a single person. Results were compared and recorded. Some indicators showed no significant differences, including operative time, blood loss, complication rate, success rate, cure rate and length of postoperative hospital stay. However, when compared to traditional three-port retroperitoneal laparoscopy renal cyst decortication, the technique proposed here did have some advantages. These included the simplicity of the operation and the fact that it was minimally invasive. This means that the technique should have some clinical value for patients with simple renal cyst and for understaffed hospitals.

Keywords: Renal cysts, retroperitoneal laparoscopic surgery

Introduction

Simple renal cysts are a common clinical kidney disease. This is a category of diseases where a cystic cavity is filled with fluid and remains unconnected with the outside environment of the kidney. However, the pathogenesis of renal cysts is still not very clear. The disease mostly strikes male, and shows incidence increase gradually with age [1, 2]. Numerous treatments have been reported, but the main harm associated with simple renal cysts kidney is renal function deterioration, with an incidence rate of 20% under 40 years, and 33% under 60 years [3]. Some asymptomatic patients with maximum diameters <4 cm are given conservative treatments, but patients with maximum diameters >4 cm or cysts combined with lumbar swelling, back pain or other symptoms, intervention is required. This may include such things as percutaneous aspiration and cyst fluid injection sclerotherapy. These treatments have the advantage of being simple and minimally invasive. However, disadvantages include high recurrence rates [4]. Today, three-port retroperitoneal laparoscopic surgery is usually performed for the treatment of a renal cyst [5].

As more minimally invasive treatments are becoming increasingly popular in China, the aim of this study was to present our experience where the three-port method was changed to a two-port for operation. This included a 1 cm wound reduction. The objectives here were to make the procedure more minimally invasive and aesthetically pleasing. From October 2013 to October 2015, our department treated 80 patients with simple renal cysts and the details of our study are as follows.

Material and methods

General information

After receiving upper abdomen and enhanced CT scans, 80 patients were confirmed to have single, simple and exogenous renal cysts. All of them were randomly divided into two groups using the random number table method with 40 cases in each group. All experiments were performed by the hospital ethics committee of medical technology. Patients were informed about the purpose of the test. All the patients agreed to and signed an informed consent waiver for the test. General information on the two groups has been shown in (Table 1).

A new type of surgery for simple renal cysts

Table 1. General information on the two comparison groups $\bar{x} \pm s$

	Gender	Age	Affected side	Maximum diameter of cyst	Cysts in the kidney position	Cysts in the kidney position
	Male/female	Year	Left/right	Cm	On/in/under	On/in/under
Test group	15/25*	53.35 \pm 13.92*	25/15*	5.62 \pm 1.14*	16/12/12*	18/22*
Control group	23/17	55.45 \pm 11.86	16/24	5.59 \pm 1.14	19/11/10	10/30

Note: Compared with the control group. * $P > 0.05$.

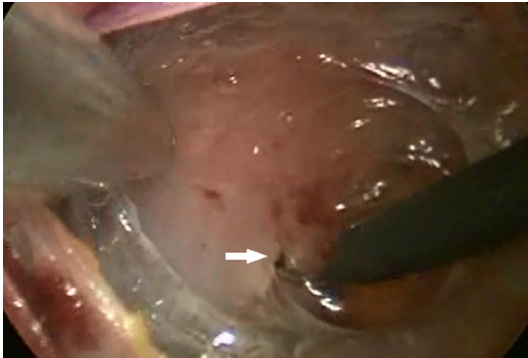


Figure 1. The test group: dissecting the cyst site and stopping free at the cyst's border. The wall was resected with a laparoscopic electrocautery device and the cyst fluid was aspirated. There is no need to free the whole cyst wall.

Baseline comparisons between the two groups was shown to be not statistically significant and comparable.

Operation procedure

The test group: the two-port retroperitoneal laparoscopy method for renal cysts is shown below. The operator was located in the left side of the patient regardless of whether patients had renal cysts on the left or right. Then, a 1.0 cm horizontal skin incision was made over the midaxillary line, 1.0 cm above the iliac crest. The musculature was spared straight down using large vessel forceps into the retroperitoneal space. A homemade water balloon was placed inside and 300 ml of saline was injected to expand the retroperitoneum working space. Then, a 10 mm Trocar was inserted. A CO₂ pneumoretroperitoneum of 12-14 mmHg (1 mmHg=0.133 kPa) was obtained. An operative laparoscope (0° Pano-view Richard Wolf, Richard Wolf 8912.402) with a 5-mm working channel was introduced through this trocar. If the renal cyst was on the left, the second puncture channel was on the left posterior axillary line at the intersection of the twelfth rib and

vice versa. When the 0.5 cm skin incision was made, the left hand of the surgeon with the operative laparoscope and the right hand with 5 mm Trocar was used to puncture into the peritoneal and then a suction channel hook cautery was applied. All operations were carried out under observation. According to the cyst site prompted by the preoperative CT, the surgeon would select the appropriate position to cut the Gerota's renal fascia surrounding fat, and the surface of the renal parenchyma was thus exposed. Dissection of the cyst site was accomplished and stopped once the cyst's border was found. The wall was resected with a laparoscopic electrocautery and the cyst fluid was aspirated (**Figure 1**). Then, the cyst and renal parenchyma edges were freed. Cysts revealed after the wall were cut one by one, and the capsule was separated from the entire wall. Finally, the wall was peeled and removed to later be checked by a pathologist.

Because there was a clear operative field with less bleeding, the indwelling drainage tube would not be necessary.

The control group: the three-port retroperitoneal laparoscopy renal cyst decortication method has been shown below. Here, the patient was placed in the lateral decubitus position and the location of the surgeon was ipsilateral. 2 cm above the iliac crest, a 1 cm skin incision was sliced. A homemade water balloon was placed inside and 300 ml of saline was injected to expand the retroperitoneum working space. Then, a 10 mm Trocar and monitor were inserted 0.5 cm and a 1 cm channel was established at the intersection of the anterior axillary line, axillary line and the edge of the twelfth rib, respectively. The left hand of the surgeon held the aspirator and the right hand held the electrical hook or ultrasonic knife. Extraperitoneal fat was freed, opening the renal fascia to expose the renal cyst and free cyst completely. Then, the cyst was exposed and the cyst fluid

Table 2. Surgical parameters between the two groups $\bar{x} \pm s$

	Operative time (min)	Bleeding volum (ml)	Postoperative hospital stay (day)
Test group	40.45±12.06*	7.58±3.65*	4.1±1.14*
Control group	37.85±11.38	8.33±3.07	4.5±1.28

Note: Compared with the control group. * $P > 0.05$.

Table 3. Surgical parameters between the two groups case (%)

	Success rate	Cure rate	Postoperative complications
Test group (n=35)	40 (100)	38 (95.0)*	3 (7.5)*
Control group (n=40)	40 (100)	39 (97.5)	2 (5.0)

Note: Compared with the control group. * $P > 0.05$.

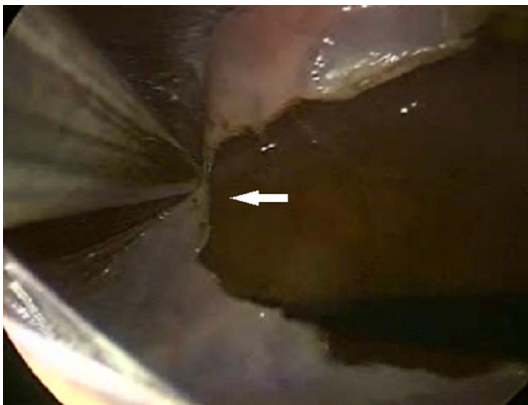


Figure 2. CO₂ gas will be pressed against the cyst wall to the perirenal fat. The collapse of the wall can be prevented. Similarly an “invisible hand” lifts the wall, which effectively plays the role of the left hand of the surgeon.

was aspirated. The wall was removed 0.5 cm along the edge of the renal parenchyma. All the cases did not require the indwelling drainage tube.

All the operations were performed by the same main surgeon, both the test group and the control group.

Observed index

Operation time, blood loss (as decided by the main operator, success rate, cure rate (the probability that the cyst disappeared following postoperative CT scans), postoperative complications (including bleeding, wound infection

and urine leakage), and postoperative hospital stay were recorded.

Statistical analysis

All the data were analyzed using Spss17.5 software, Measurement data was analyzed with two independent t-test samples, expressed in ($\bar{x} \pm s$). Count data were analyzed using two independent samples, four tables and the χ^2 -test. The significance level was set at $P < 0.05$.

Results

The operation

The operation was successfully accomplished for all 40 patients in the test group. One patient suffered from leakage of urine, which was the result of the fact that the cyst connected with the collecting system. He has since been cured after the application of an indwelling double J tube. Two patients suffered from surrounding hematomas without wound infection after the operation. CT scans indicated that the cysts disappeared in 38 cases, and cysts were reduced on the other 2 cases. Pathological examinations showed that these were in line with the changes in simple renal cysts.

The operation was also successfully accomplished for 40 patients in the control group. One patient suffered from leakage of urine, but this was cured after an indwelling double J tube was inserted. One patient suffered from a wound infection and was cured after treatment. Postoperative bleeding did not occur. Postoperative CT scans indicated that cysts disappeared in 39 cases, and cysts were reduced in 1 case. Pathological examinations showed that results were in line with simple renal cysts.

Observed index comparison

Two groups of statistical indicators are shown in (Tables 2, 3). Each index compares operative time, blood loss, postoperative complications, success rate, cure rate, postoperative hospital stay. These showed no significant statistical difference.

Discussion

Renal cysts are a common benign disease. The main hazard is oppression of the kidneys,



Figure 3. Only one person is needed to complete the operation.

including the renal parenchyma, ureter, renal hilum. When this occurs, the expected result is impaired kidney function [6]. From the 20th century onward, open surgery has become the most effective method for the treatment of renal cysts [7]. With the development of percutaneous puncture for renal cysts, this became the preferred method [8-10]. The effectiveness of percutaneous renal cyst puncture was increased by the injection of a sclerosing agent, such as a cavity, ethanol, tetracycline, glucose phenol, povidone iodine, polidocanol and iodo-benzene ester [11]. According to previous research, the recurrence rate reached 32%~100% [12] regardless of improvement, especially for cyst volumes greater than 200 ml [13]. Some special parts of cysts, such as superior and ventral cysts, showed a greater risk of puncture [14]. At the same time, the use of a hardener potentially increases the risk of collecting system invasion. This can be accompanied by pain, fever, nausea, hematuria, hematoma and other symptoms following a puncture [15].

The laparoscopic technique was eventually developed for the treatment of renal cysts. Clinical studies showed that the success rates from laparoscopic renal cyst surgery reached 95%-100% [16]. This also came with the advantages of smaller wounds, less pain and quicker recovery. This became an efficient, accurate, and minimally invasive treatment method [17]. There are two approaches for laparoscopic renal cysts, they are: retroperitoneal and intra-peritoneal. Many scholars believe that the retroperitoneal route has more advantages [18]. In recent years, single port laparoscopic renal

cyst methods have been reported too. But, because three instruments would need to be put in a single port, a cut diameter 2.5-3 cm is required [19]. Here, the trauma and instrumentation angle is small, and with the increase of operation difficulty, it is not applicable in most cases-especially for beginners.

Currently, the three-port retroperitoneal laparoscopy renal cyst decortication is the most preferred choice for the treatment of simple renal cysts [20]. It usually requires sur-

geons to cut open the cyst wall after it has been completely dissociated, and cyst fluid is then released with the removal of the wall. With the collapse of the wall in surgery, the wall was difficult to remove and sometimes left inside [21]. For this surgery, we have found an interesting phenomenon: at the beginning of the process of dissociating the cyst (most of the cyst has not been separated), and cysts rupture prematurely. After the cyst fluid was aspirated, sometimes the cyst fills up with CO₂ gas and is restored to its original spherical shape. At this time, the cyst is filling up with gas rather than liquid, which leads to tension decreases. In this case, dissociating the wall will become very easy. The wall does not collapse when choosing dissociating the renal parenchyma and edge of cystic rather than dissociating the top of the wall. Based on the above, a new renal cyst excision method has been proposed here, along with the renal parenchyma edges to look for cysts. The wall was resected with a laparoscopic electrocautery and the cyst fluid was aspirated. After the cavity was filled up with gas, the wall was cut one by one. It is noteworthy that the wall was attached to perirenal fat because it is not free. The wall does not collapse under the pressure of CO₂ gas. As the cyst's horizons gradually expanded, a clear surgical field appeared and the wound became smooth. The entire operation can be performed inside the cavity. The wall does not appear to shrink because it maintains a certain tension. Moreover, the problem with leaving too many walls can be also avoided due to the fact that the resection margin of the wall is clear.

Compared with conventional removal methods, the above method has some great advantages. The surgeon needs to be right-handed to complete the surgery. That is, the left hand is not necessary. The reason for this is that the wall of the cyst is not free, and CO₂ gas will press against the cyst wall the to perirenal fat. Accordingly, the collapse of the wall can be prevented. Similarly an “invisible hand” lifts the wall, which plays the role of the left hand for the surgeon (**Figure 2**). Thus, we effectively designed two channels. Only one person can complete the entire operation: the left hand of the surgeon holds the operative laparoscope and right hand holds an instrument. There are two different instruments: 1, operative laparoscope (0° Pano-view Richard Wolf, Richard Wolf 8912.402) with a 5 mm operating channel, which can assist separation and exposure and; 2, an electrocautery with an aspirator. This is utilized to attract liquid and smoke to ensure the operative field remains clear. Our experience is that the surgeon should choose a good path to the cyst according the cyst site. This means that an effective reading of CT scans during the preoperative stage becomes necessary, otherwise more trauma will occur. The surface of the renal parenchyma is exposed after cutting the perirenal fat. We found the cysts with the “tunneling” approach. It should be noted that simple auxiliary separating and exposure by attracting were used during operation.

According to the research, and compared with traditional three-port retroperitoneal laparoscopic surgery for the treatment of renal cysts, the proposed method has the following advantages:

1. Surgery becomes easier by changing the traditional laparoscopic cyst.
2. Without assistance, the surgeon himself holds an operative laparoscope to reveal vision conveniently.
3. The operation can be performed inside the cavity with clearer vision.
4. Cysts open directly after being found by “tunneling”, the free range is smaller and less invasive because freeing the entire cyst is not necessary.
5. Unlike the device interference common to three- or single-port multi-channel instruments in surgery, single instrumentation does not create interference.
6. One person is able to complete the operation, which can reduce overall medical costs (**Figure 3**).
7. The results are more aes-

thetic due to the reduction of a 1 cm laparoscopic wound.

However, this surgical procedure also has some limitations. These include the fact that the exposure range cannot be too large. Otherwise, it will increase difficulties associated with left-handed operation and lead to an inability to expose the operation site clearly. When patients have too much extraperitoneal or perirenal fat, or when the cyst is located in the deep ventral, the surgical procedure becomes difficult. If the left-handed is exposed to a wide range along with visual field changes, this makes exposure difficult. Therefore, for overweight patients whose kidney cysts are located deep in the surface, this surgery doesn't have as many advantages.

In conclusion, our two-port retroperitoneal laparoscopic surgery for the treatment of simple renal cysts by a single person showed a high level of clinical operation, and it seems to be worth clinical promotion. With that said, a more complete evaluation of the operation for difficulty and proper case selection is still needed. It requires the operator to have skilled laparoscopic abilities and to consider patient safety. It is not advisable to pursue minimally invasive techniques excessively if it results in a neglect of surgical safety.

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Disclosure of conflict of interest

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A new type of surgery for simple renal cysts

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