Evaluation of renal cyst treatment using retroperitoneal laparoscopic decortication

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ABSTRACT
Introduction: Renal cyst is a common disease of the renal parenchyma. The management options include percutaneous aspiration with or without sclerotherapy, open surgery, and laparoscopic decortication of renal cyst. Laparoscopic renal cyst decortication is a safe and effective alternative with a high success rate. This study aimed to evaluate renal cyst treatment by retroperitoneal laparoscopic decortication. Methods: This was a prospective study of patients with asymptomatic renal cyst size greater than 60 mm or symptomatic renal cyst size less than 60 mm in their greatest dimension. These patients underwent retroperitoneal laparoscopic decortication and were admitted to the University Hospital, Can Tho General Hospital (Viet Nam), and Can Tho Central General Hospital (Viet Nam), from September 2018 to May 2020. Renal cysts were localized and characterized by ultrasonography and computed tomography (CT). Symptomatic success rate, radiologic success rate, and complication of procedure were noted. Each patient was reassessed with clinical and ultrasonography examinations at 3 months postoperatively. Results: 33 patients underwent retroperitoneal laparoscopic cyst decortication; this included 11 males (33.3%) and 22 females (66.7%). The mean age of patients was 58.48 ± 9.36 years. Flank pain was a common clinical symptom at presentation in all patients. Most of the cysts were located in the left kidney (39.4%), in the lower pole (54.6%), and in a single cyst (87.9%). The mean cyst diameter was 80.09 ± 27.03 mm. Cysts were classified I with the Bosniak classification. The mean operative time was 69.39 ± 16.94 minutes. Operative time in patients with cyst diameter ≥ 60 mm was statistically significantly longer than in patients with cyst diameter < 60 mm (p = 0.004). The mean hospital stay time was 8.24 ± 2.84 days. Symptomatic success was achieved in 90.1% of patients and radiographic success on ultrasonography was achieved in 84.8%. The operation was successfully completed by laparoscopy in all cases. Conclusion: Retroperitoneal laparoscopic cyst decortication is effective for the treatment of renal cysts. The operation was successfully completed via laparoscopy in all cases.

Key words: renal cyst, retroperitoneal laparoscopic, cyst decortication

INTRODUCTION
Simple renal cyst is a common non-neoplastic disease of the renal parenchyma. It has been estimated that the prevalence of renal cysts increases with age. The management options for renal cyst include percutaneous aspiration with or without sclerotherapy, open surgery, and laparoscopic cyst peeling. Simple aspiration or sclerotherapy is a minimally invasive procedure; however, the recurrence rate is very high. Open surgery offers a high success rate; however, it presents an invasive procedure with the morbidity of flank incision. The laparoscopic technique, however, not only has a high success rate but is also characterized by minimal invasiveness, low morbidity, and early recuperation, making it a preferred treatment. This method has been widely applied in Vietnam, in general, and Can Tho city, in particular. In fact, the Can Tho University of Medicine and Pharmacy Hospital, Can Tho General Hospital, and Can Tho Central General Hospital have performed retroperitoneal laparoscopic decortication for renal cysts for over 9 years. Nevertheless, there have been no reports to evaluate the efficacy of this method in renal cyst treatment. Therefore, the aim of this study was to investigate the efficacy renal cyst treatment by retroperitoneal laparoscopic decortication.

MATERIALS AND METHODS
Patients
This was a prospective study of renal cyst patients who underwent retroperitoneal laparoscopic decortication and were admitted to the University Hospital, Can Tho General Hospital, and Can Tho Central General Hospital, from September 2018 to May 2020. All patients who agreed to participate in the study were confirmed by signing a consent form for the study.
Inclusion criteria: The surgery indicators included patients with asymptomatic renal cyst size greater than 60mm or with symptomatic cyst (such as renal pain, renal lump, hypertension, or hematuria), and renal cyst size less than 60 mm in the greatest dimension with simple cysts (Bosniak I and II classification).

Exclusion criteria: Patients were excluded if they had a history of previous renal surgery or complicated cysts (Bosniak III and IV), or asymptomatic cyst size less than 60 mm in the greatest dimension.

Procedure
Renal cysts were localized and characterized by ultrasonography and computed tomography (CT). Symptomatic success rate, radiologic success rate, and complication of procedure were noted. Each patient was reassessed with clinical and ultrasonography examinations at 3 months postoperatively.

After the induction of general anesthesia, the patient was catheterized and positioned in the standard left/right lateral decubitus position. All the patients were successfully managed by retroperitoneal laparoscopic cyst decortication using a 3-port technique. The first port was inserted 1 cm below and posterior to the tip of the 12th rib. A 2 cm deep stab incision was made down to the thoracolumbar fascia and a homemade balloon was created by tying a fingerstall glove, inflated with 200 to 300 mL air, and kept for about 5 minutes to create adequate working space in the retro-peritoneum. After deflating of the balloon at the retroperitoneal end, it was removed.

Then, a 1.0 cm blunt-tip trocar was placed and a 30-degree laparoscope was inserted through the sheath. Carbon dioxide was insufflated to 12 mmHg and the initial retroperitoneoscopy was performed for orientation and confirmation of the anatomic landmarks. Typically, 2 working ports (0.5 and 1.0 cm, respectively) were placed under laparoscopic camera. At one lumbar angle, a grasping forceps was inserted, and at another angle more anteriorly (along or more medial to the anterior axillary line, at least 3 cm above the iliac crest to allow maneuverability), a dissecting forceps or clip applier was inserted via this trocar. The direction of dissection depended on the location of the renal cyst (anterior, posterior, or central aspect; upper, middle, or lower pole). Gerota’s fascia was incised over the area corresponding to the position of the cyst. The overlying perinephric fat was dissected from the cyst and the surrounding parenchyma. Then, the cyst was unroofed 1 to 1.5 cm adjacent to the renal parenchyma, leaving behind the floor of the cyst. The cyst fluid was aspirated and the cystic wall was sent for pathologic analysis. Subsequently, the French catheter used for drainage was placed in the retro-peritoneum, and the port sites were cleansed and closed.

Statistical analysis
Statistical analysis was performed with a commercially available statistical program (SPSS 20.0 with the Pearson $\chi^2$ and Student’s t test for independent variables; $p < 0.05$ was considered statistically significant.

Study ethics
The study was reviewed and approved for implementation by Can Tho University of Medicine and Pharmacy under Decision No. 451/Decision-CTUMP (dated 20 March 2018).

RESULTS
33 patients underwent retroperitoneal laparoscopic cyst decortication; this included 11 males (33.3%) and 22 females (66.7%). The mean age of patients was 58.48 ± 9.36 years, as shown in Table 1. Flank pain was a common clinical symptom at presentation in all patients. Most of the cysts were located in the left kidney (39.4%), in the lower pole (54.6%), and in a single cyst (87.9%). The mean cyst diameter was 80.09 ± 27.03 mm with cyst diameter ≥ 60 mm in 87.9%. Cysts were classified as I by the Bosniak classification. Most of the cysts were located in the left kidney (39.4%), followed by right kidney (30.3%) and bilateral kidney (30.3%), with $\chi^2 = 0.545$ and $p = 0.761$, indicating no statistically significant difference. Most of the cysts were located in the lower pole (54.6%), followed by upper pole (42.4%) and peripelvic (3%), with $\chi^2 = 14.364$ and $p = 0.001$, indicating that the differences were statistically significant. Indeed, 87.9% of patients had only 1 cyst and 12.1% had 2 cysts ($\chi^2 = 18.939$, $p < 0.001$); these results were considered as statistically significant differences.

The mean cyst diameter was 80.09 ± 27.03 mm, which included cyst diameter ≥ 60mm in 87.9% of patients and cyst diameter < 60 mm in 12.1% patients (with $\chi^2 = 18.939$, $p < 0.001$; differences were statistically significant). All of the cysts were classified as I with the Bosniak classification. The mean operative time was 69.39 ± 16.94 minutes. Operative time in patients with cyst diameter ≥ 60 mm was longer than that of patients with cyst diameter < 60mm ($p = 0.004$; the difference were statistically significant). The mean hospital stay time was 8.24 ± 2.84 days. Symptomatic success was achieved in 90.1% of patients and radiographic success on ultrasonography was achieved in
Table 1: Patient Characteristics and Preoperative Parameters

| Characteristics                          | N (%)            |
|-----------------------------------------|------------------|
| Gender (n, %)                           |                  |
| Male                                    | 11 (33.3%)       |
| Female                                  | 22 (66.7%)       |
| Mean age (range) (year)                 | 58.48 (39 – 83)  |
| Clinical presentation (n, %)             |                  |
| Flank pain                              | 23 (69.7%)       |
| Flank pain and renal lump               | 2 (6.06%)        |
| Flank pain and dysuria                  | 4 (12.1%)        |
| Flank pain and hematuria                | 2 (6.06%)        |
| Flank pain, renal lump and hematuria    | 2 (6.06%)        |
| Kidney side (n, %)                      |                  |
| Right                                   | 10 (30.3%)       |
| Left                                    | 13 (39.4%)       |
| Bilateral                               | 10 (30.3%)       |
| Cyst location (n, %)                    |                  |
| Upper                                   | 14 (42.4%)       |
| Middle                                  | 0 (0 %)          |
| Lower                                   | 18 (54.6%)       |
| Peripelvic                              | 1 (3.0 %)        |
| Maximum diameter of cyst (mm)           | 80.09 ± 27.03    |
| Diameter of cyst (n, %)                 |                  |
| ≥ 60mm                                  | 29 (87.9%)       |
| < 60mm                                  | 4 (12.1%)        |
| Number of cysts (n, %)                  |                  |
| 1                                       | 29 (87.9%)       |
| 2                                       | 4 (12.1%)        |
| Bosniak classification (n)              |                  |
| I                                       | 33 (100%)        |

84.8%. The operation was successfully completed via laparoscopic in all cases- with no conversion to open surgery, no mortality and no complication occurring in this study (Table 2).

**DISCUSSION**

Flank pain was a common clinical symptom at presentation in all patients. This was a major symptom in other reports, such as those reported by Okan (79.9%) and Dinh Le Quy Van (89.5%)⁷. Most of the cysts were located in the left kidney (39.4%), followed by right kidney (30.3%) and bilateral kidney (30.3%), with \(\chi^2 = 0.545, p = 0.761\); thus, the results were not considered statistically significant. These results were similar to other reports, such as those published studies by Nguyen Ngoc Anh (52.78%)⁶, Dinh Le Quy Van (44.7%)⁷, and Shicong Lai (55.1%)⁹. Most of the cysts were located in the lower pole (54.6%), followed by upper pole (42.4%) and peripelvic (3%), with \(\chi^2 = 14.364, p = 0.001\).

Our study was similar to other published reports. In our study, lower pole cyst was also common as those in reports by Nguyen Ngoc Anh (44.4%)⁶, Dinh Le Quy Van (44.7%)⁷, and Okan (32.8%)⁸. Note, 87.9% of patients had only 1 cyst and 12.1% had 2 cysts (\(\chi^2 = 18.939, p < 0.001\)), which indicated that the observed differences were considered statistically significant. Thus, our study had some similar results with other reports.

The mean cyst diameter was 80.09 ± 27.03 mm, and this included cyst diameter ≥ 60 mm in 87.9% and cyst diameter < 60 mm in 12.1%, with \(\chi^2 = 18.939, p < 0.001\) (considered as statistically significant difference). The diameter of the kidney cyst in our study was larger than that of study by Okan Bas (2015) (78.8 ± 17.2 mm⁸), Shicong Lai (2017) (66.9 ± 16.2 mm⁹),
### Table 2: Perioperative results and follow-up

| Perioperative results and follow-up | Data          |
|------------------------------------|---------------|
| Operative time (minute)            | 69.39 ± 16.94 |
| Operative time in patients with cyst diameter ≥ 60 mm (minute) | 71.03 ± 17.39 |
| Operative time in patients with cyst diameter < 60 mm (minute) | 57.5 ± 5.0 |
| Blood loss (range) (ml)             | 5 - 20        |
| Hospitalization time (day)         | 8.24 ± 2.84   |
| Complication                       | 0             |
| Pathologic analysis                |               |
| Benignancy                         | 33            |
| Malignancy                         | 0             |
| Mean length of follow-up (month)   | 3             |
| Mean diameter of cyst after 3 months (range) (mm) | 3.21          |
| Symptomatic success (%)            | 81.9          |
| Radiologic success (%)             | 84.8          |

Nguyen Ngoc Anh (2016) (77.25 ± 16.8 mm) and Dinh Le Quy Van (2018) (69.3 ± 21.3 mm).

The mean operative time was 69.39 ± 16.94 minutes. Operative time in patients with cyst diameter ≥ 60 mm was longer than in patients with cyst diameter < 60 mm with p = 0.004 (p < 0.05 was considered statistically significant difference). Our study was similar to other reports by Shicong Lai (2017) (66.89 ± 22.68 min), Nguyen Ngoc Anh (2016) (57.28 ± 14.1 min), and Dinh Le Quy Van (2018) (79.4 ± 23.3 min).

There was a relationship between operative time and cyst diameter in our study. Operative time of cyst diameter < 60 mm was 57.5 ± 5.0 min and operative time of cyst diameter ≥ 60 mm was 71.03 ± 17.39, with p = 0.004 (considered statistically significant difference). The operation was successfully completed laparoscopically in all cases with no conversion to open surgery, no mortality and no complications observed throughout the study. The mean hospital stay time was 8.24 ± 2.84 days; the hospital stay time in our study was longer than the hospital stay time of Shicong Lai (4.81 ± 1.25 days). The mean follow-up time was 3 months. The mean diameter of cysts was 80.09 ± 27.03 mm before operating and the mean diameter of cysts was 3.21 mm at 3 months operatively with Z = -5.013, n = 33, P < 0.001 (considered statistically significant). Symptomatic success was achieved in 90.1% of patients. This result was lower than other report, such as ones by Okan (96.6%) and Dinh Le Quy Van (96.4%).

**CONCLUSION**

Retroperitoneal laparoscopic cyst decortication is effective for the treatment of renal cyst. The average surgery time was quite reasonable. The operation was successfully completed laparoscopically in all cases with no conversion to open surgery, no mortality and no complications observed in this study. Symptom and ultrasound successes have been achieved at a very high level. However, larger sample size is needed and longer patient follow-up time is required to confirm the effectiveness of this method.

**ABBREVIATIONS**

None

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AUTHOR’S CONTRIBUTIONS
UTH: The main study author designed the study, found references, collected and analyzed data, and wrote and reported the research results. CVD: Co-author and supervisor edited and contributed the research ideas. NKL: Co-author revised the article and supported the data. All authors read and approved the final manuscript.

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AVAILABILITY OF DATA AND MATERIALS
Data and materials used and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE
This study was conducted in accordance with the amended Declaration of Helsinki. The institutional review board approved the study, and all participants provided written informed consent.

CONSENT FOR PUBLICATION
Not applicable.

COMPETING INTERESTS
The authors declare that they have no competing interests.

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