

Laparoscopic Decortication of Hilar Renal Cysts Using LigaSure

Mehmet Remzi Erdem, MD, Abdulkadir Tepeler, MD, Mustafa Gunes, MD, Mesrur Selcuk Silay, MD, Tolga Akman, MD, Muzaffer Akcay, MD, Abdullah Armagan, MD, Sinasi Yavuz Onol, MD

ABSTRACT

Background and Objectives: In this study, we evaluated the safety and efficacy of using the LigaSure sealing system (Valleylab, Boulder, Colorado) for laparoscopic decortication of symptomatic hilar renal cysts.

Methods: Seventeen patients underwent laparoscopic decortication of hilar renal cysts with the LigaSure system. Our study included only symptomatic, Bosniak type 1, simple and symptomatic renal cysts. The operative route, transperitoneal or retroperitoneal, was planned according to the location confirmed by computed tomography. The patients' symptoms were preoperatively and postoperatively evaluated by the Wong-Baker visual pain scale. Operative measures and radiologic outcomes were prospectively evaluated.

Results: The mean age of the patients was 56.4 years, and the mean follow-up period was 12.5 months. Preoperative computed tomography showed only a single cyst in 15 patients (88.2%) and showed two separate cysts in 2 cases (11.8%). The cysts were located in the perihilar region close to the vascular structure in all patients. A transperitoneal approach was used in 9 patients, and a retroperitoneal approach was used in 8 patients. The mean operative time and hospitalization time were 56.4 minutes and 1.2 days, respectively. Minor complications were observed in 3 patients. Symptomatic and radiologic success rates of 94.2% and 100%, respectively, were achieved.

Conclusion: Laparoscopic decortication of symptomatic hilar renal cysts—first reported in the literature in this study—using the LigaSure sealing system is feasible, ef-

fective, and safe, even if the cyst is located in the perihilar area.

Key Words: Laparoscopy, Hilar renal cyst, Decortication, LigaSure.

INTRODUCTION

Simple renal cysts are found in one-third of the persons aged >50 years and account for 65% to 70% of all renal masses.¹⁻³ Few simple cysts, which are symptomatic, require treatment. The most common symptoms and complications necessitating intervention are dull flank pain, hypertension, infection, upper urinary tract obstruction, hematuria, and renal failure.^{4,5}

The available procedures for the treatment of simple renal cysts are percutaneous aspiration with or without sclerotherapy and laparoscopic or open decortication of the cysts. The complete cure rate with percutaneous procedures has been found to be lower than that with surgical intervention.⁶ Laparoscopic decortication was found to be superior to open surgery regarding cost-effectiveness, operative time, blood loss, and success rate.⁷ Hence the laparoscopic approach has become the standard of care in the treatment of symptomatic simple renal cysts. In addition, it has also been found to be effective in perihilar located cysts and after failed percutaneous drainage of peripheral cysts.⁸

The success of laparoscopic treatment has triggered competition among various laparoscopic energy sources. These sources are monopolar, bipolar, ultrasonic, argon beam, and LigaSure (Valleylab, Boulder, Colorado). There are several studies evaluating the efficacy of the energy sources in the literature. However, there is no study related to the success and efficacy of the LigaSure system for the laparoscopic treatment of renal cysts. In this study we aimed to present the feasibility and safety of the LigaSure system, which has cutting, coagulating, and sealing abilities, for decortication of symptomatic simple renal cysts and to discuss different energy types by reviewing the literature.

Urology Department, Haydarpasa Research and Training Hospital, Istanbul, Turkey (Dr. Remzi Erdem).

Urology Department, Bezmialem Vakif University, Istanbul, Turkey (Drs. Tepeler, Gunes, Silay, Akman, Akcay, Armagan, Onol).

Address correspondence to: Mehmet Remzi Erdem, MD, Urology Department, Haydarpasa Research and Training Hospital, Tibbiye Street, Selimiye, Uskudar, Istanbul, Turkey. Telephone: +90 505 798 1199, Fax: +90 216 336 0565, E-mail: remzierdem@gmail.com

DOI: 10.4293/108680813X13753907291558

© 2014 by JSLS, Journal of the Society of Laparoendoscopic Surgeons. Published by the Society of Laparoendoscopic Surgeons, Inc.

MATERIALS AND METHODS

Between November 2010 and January 2013, 17 patients were admitted to our department with symptomatic hilar renal cysts. The patients' symptoms were flank pain (n = 17) and microscopic hematuria (n = 1) due to large renal cysts. Cystoscopy, urinary system imaging, and urine cytology were performed for evaluation of microscopic hematuria to exclude malignancy. Percutaneous cyst aspiration had been previously attempted in 3 patients. All included large renal cysts were Bosniak type 1 and did not communicate with the pelvicalyceal system, as confirmed by contrast-enhanced computed tomography (CT) (**Figure 1**). The operative route (transperitoneal or retroperitoneal) was planned according to the location of the cyst on the axial-plane CT scan.⁹ All patients signed detailed informed consent forms before surgery.

This study of laparoscopic decortications of hilar renal cysts with the LigaSure system was prospectively designed. The patients' symptoms were preoperatively and postoperatively evaluated by the Wong-Baker visual pain scale. Patients were asked to grade their pain status on a numerical chart from 0 to 10, where 0 indicates no pain and 10 indicates incredible pain. Symptomatic improvement was also defined as a considerable decrease in pain, as measured by the visual pain score. Surgical success was defined as no recurrence of the cyst confirmed by postoperative CT at 3 months after the operation.

Surgical Technique

The patient was positioned in the standard flank position, and the table was flexed to open up the space between the 12th rib and the iliac crest during the retroperitoneal approach. An incision was made in the Petit triangle for the insertion of the first optic trocar. The flank muscles were bluntly split up to the anterior thoracolumbar fascia under direct vision with a hemostat to enter the retroperitoneal space. By gentle finger dissection, a retroperitoneal space was created between the psoas muscle posteriorly and Gerota fascia anteriorly. The working space in the retroperitoneum was created by means of a balloon. Expansion of the retroperitoneal space was achieved under direct vision to confirm that the dissection was proceeding through the right plane. Pneumoretroperitoneum was established, and two additional ports were inserted under direct vision. One was a 10-mm port, which was used primarily to minimize the need for a preoperative port change in case intracorporeal suturing became necessary. It was essential to set the ports as far from each other as possible to avoid clashing of the instruments. On initial inspection, the kidney was identified because the overlying Gerota fascia was usually thinned out, and large cysts were easily identifiable. The fascial layer was divided by use of the LigaSure system, the kidney was mobilized on the lateral border, and complete visualization of the cyst surface was obtained.

For the transperitoneal approach, the patient was positioned in a 45° flank position. After abdominal distension

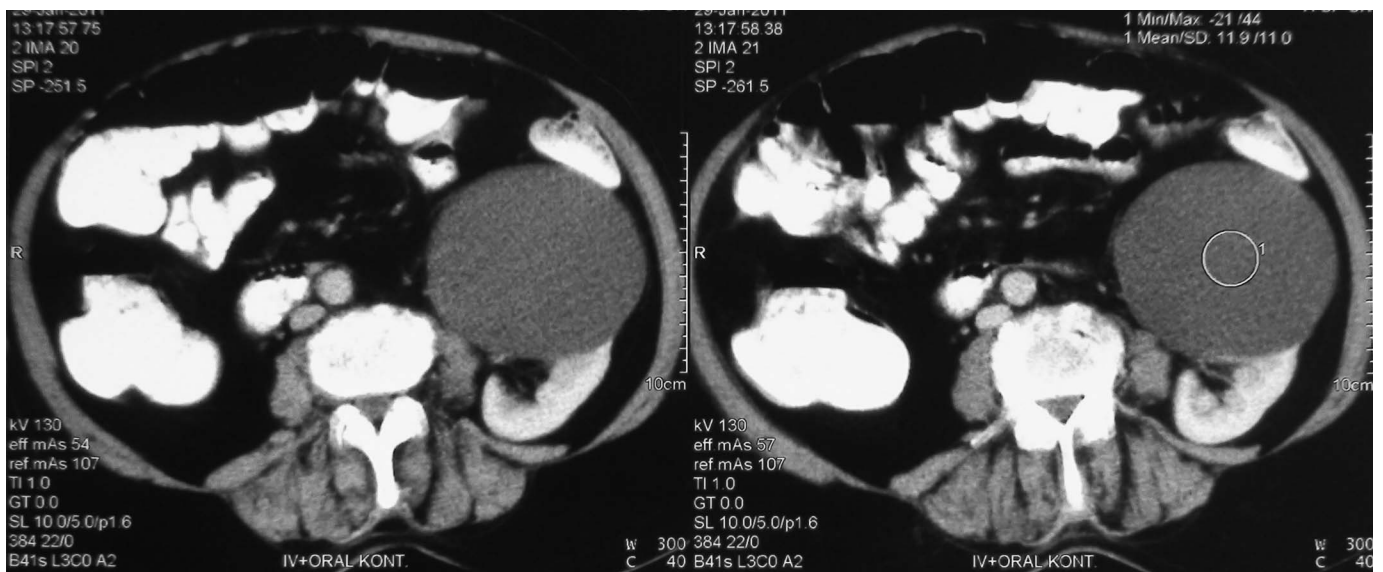


Figure 1. The CT scan shows a perihilar renal cyst.

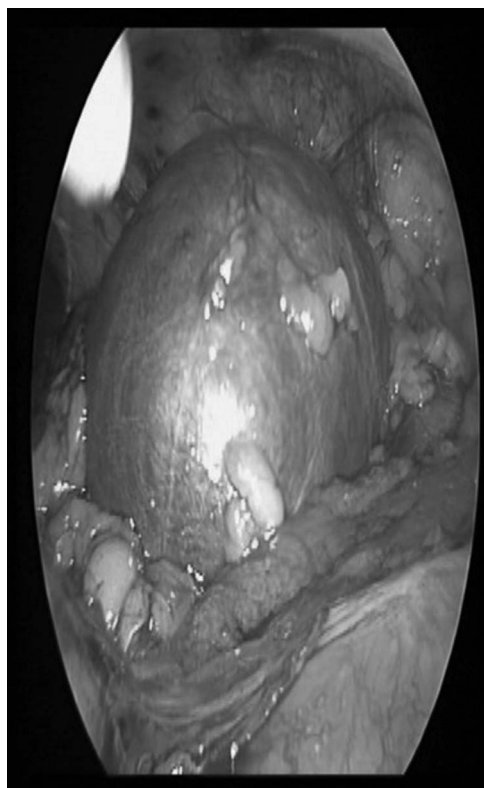


Figure 2. The cyst was exposed through the transperitoneal approach.

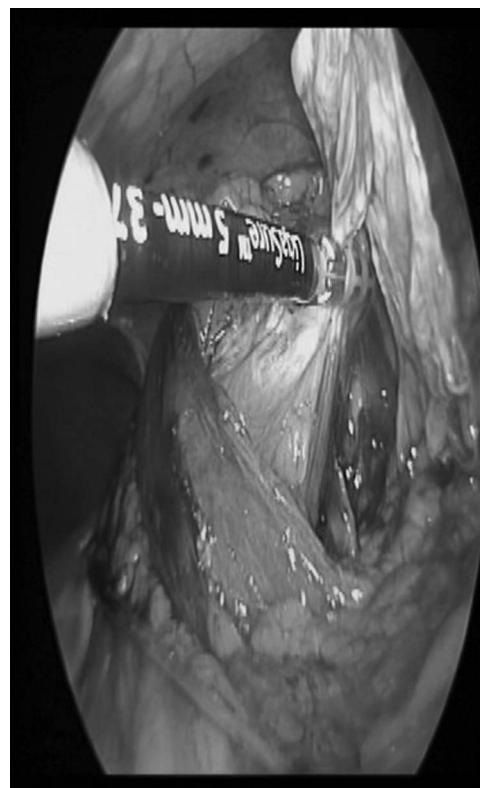


Figure 3. The cyst wall was circumferentially excised with LigaSure dissection within a distance of 5 mm from the renal parenchyma and was assessed for pathology.

was obtained with a Veress needle, the initial trocar was inserted at the side of the iliac crest or umbilicus, and a 30° camera was introduced. Two other ports were placed, and the colon was mobilized by use of the LigaSure system. After that, the blue dome of the cyst (**Figure 2**) was opened by the tip of the LigaSure, and the fluid was aspirated for cytologic analysis. In some cases in which communication was suspected between the cyst and calyceal system, methylene blue was injected into the renal pelvis by a ureteral catheter, which was previously inserted. Then, the wall was circumferentially excised by LigaSure dissection within a distance of 5 mm from the renal parenchyma and assessed for pathology (**Figure 3**). The inner layer of the cyst was carefully checked for any pathologic condition. The procedure was terminated after appropriate visual control of the operative area was achieved and a drain tube was inserted.

Patients were discharged after the removal of the drain and passing flatus. Routine radiologic evaluation was performed at 3 months postoperatively with CT (**Figure 4**) and at the end of the first year with ultrasonography.

RESULTS

Seventeen patients (10 women and 7 men), with a mean age of 56.4 years (range, 41–72 years), underwent laparoscopic renal cyst decortication. Preoperative CT showed only a single cyst in 15 patients (88.2%) and showed two separate cysts in 2 cases (11.8%). The cyst was located in the perihilar region close to the vascular structure in all patients. A transperitoneal approach was preferred in 9 patients, whereas a retroperitoneoscopic approach was chosen in 8 patients (**Table 1**).

The mean duration of the operation was 56.4 minutes (range, 32–95 minutes). The mean hospital stay was 1.2 days (range, 1–3 days) (**Table 1**).

Three patients (17.6%) had minor complications postoperatively. Subcutaneous CO₂ leakage caused crepitation under the skin of the whole body in one patient. Paralytic ileus was observed in two patients who underwent transperitoneal laparoscopic surgery, and ileus spontaneously regressed after 3 days with conservative follow-up. All



Figure 4. The postoperative CT scan confirms radiologic success.

other operations were completed with no major complications and without conversion to open surgery.

Symptomatic and radiologic success rates of 94.2% (15 of 17 patients) and 100%, respectively, were achieved, with a mean follow-up period of 12.5 months (range, 2–26 months). The symptoms persisted in only two patients after surgery (**Table 1**).

DISCUSSION

The incidence of simple renal cysts increases with age, and most are reported to be asymptomatic benign lesions.¹⁰ However, compression of large renal cysts to the adjacent structures may cause hypertension and urinary tract obstruction only in a few cases. Pain, infection, and obstructive uropathy are the most common symptoms observed resulting from this compressive effect.⁸ Therefore, those large renal cysts that cause the previously mentioned symptoms should be well discriminated from the asymptomatic cysts and should be appropriately treated. Prevention of recurrence is as important as removal of the cysts, and it is an essential goal of treatment.¹¹ Hence, minimally invasive intervention is accepted as the ideal treatment for symptomatic cysts.

Initially, most of the renal cysts were treated earlier by primary aspiration and sclerosing therapy before decortication. However, a high recurrence rate of aspiration and loss of renal function due to the inadvertent leakage of sclerosing material into the pelvicalyceal system are major deleterious effects of this method.¹² On the other side, open surgery of simple renal cysts yields greater success but has a higher morbidity rate in comparison with other

treatment modalities.^{13,14} Hulbert et al¹⁵ published the first report on laparoscopic treatment of renal cysts in 1992; thereafter, laparoscopic decortication of renal cysts has been considered a minimally invasive and successful method with lower recurrence rates.¹² Percutaneous cyst aspiration is also a minimally invasive method, but because of its failure in terms of recurrence,¹⁶ laparoscopic interventions will be increasingly used in the future. Currently, laparoscopic decortication has become the standard of care in symptomatic simple renal cysts because of its high success and low morbidity rates.¹⁷

With technologic advances and the widespread use of laparoscopic surgery, new energy sources have been indispensable instruments for the laparoscopic armamentarium. Initially, a conventional monopolar energy source was used in the treatment of renal cysts during laparoscopic surgery. A monopolar energy source was temporarily used because of its cost-effectiveness and availability, as well as its success.¹⁷ Conversely, the high lateral thermal damage and separate functions of cutting and coagulation stand as limitation factors of monopolar devices.^{18,19} Although monopolar energy devices are the most common and available equipment, there is a lack of knowledge in presenting the results of laparoscopic renal cyst decortication using monopolar energy.

Rane¹⁷ reported on 11 patients with simple renal cysts who underwent retroperitoneal laparoscopic decortication with conventional monopolar diathermy (**Table 1**). The author confronted only one serious complication, which was ureteral fistula. In addition, no recurrence was detected during follow-up with ultrasonography at the end of 1 year. In another study using a conventional monopolar device, the radiologic success rate was 100%, and a symptomatic success rate of 86.6% was achieved after a mean follow-up period of 12.1 months (**Table 1**).²⁰ Another study was performed in 45 patients using monopolar electrocautery scissors and fulguration of the cyst epithelium with an argon beam coagulator over a 10-year period.¹² The mean operative time was 89 minutes, and the mean hospital stay was 1.1 days. Symptomatic and radiologic success rates of 91.1% and 95.5%, respectively, were reported. One of the important points of this study is the conversion to open surgery in one case because of severe bleeding. Even though the cost-effectiveness and easy availability remain major advantages, the inadequacy of bleeding control and lateral thermal injury are the weak points of monopolar energy sources.

The bipolar PlasmaKinetic system (PK) (Gyrus Medical, Maple Grove, Minnesota) has cutting and coagulation

Table 1. Summary of Studies Presenting Outcomes of Laparoscopic Decortication of Symptomatic Simple Renal Cysts Using Different Energy Sources

	Conventional Monopolar		PlasmaKinetic		Argon Beam Coagulator and Monopolar		Harmonic Scalpel		LigaSure	
Author	Tuncel et al ²⁰	Rane ¹⁷	Tefekli et al ²¹	Abbaszadeh et. al ²²	Atug et al ¹²	McNally et al ²³				Present study
No. of patients	15	11	19	21	45	7 (end-stage renal disease)	17			17
Access route	Transperitoneal	Retroperitoneal	Retroperitoneal	Transperitoneal	Transperitoneal	Transperitoneal	Retroperitoneal (n = 8)	Transperitoneal		Transperitoneal (n = 8)
Mean patient age (y)	49.7 (23-76)	NA*	38.5 ± 11.9 (28-62)	54.7 ± 14.1	53.9 (14-78)	44 (20-55)	56.4 (41-72)			56.4 (41-72)
Mean cyst size (cm)	7.9 (5.2-12)	5-28	8.7 ± 2.0	8.7 ± 2.0	9.7 (6-19)	NA	9.02 (7-14)			9.02 (7-14)
Mean duration of operation (min)	64.6 ± 34.9	90	82.5 ± 16.7	58	89 (48-170)	NA	55.4 (32-95)			55.4 (32-95)
Estimated blood loss (mL)	20	50	50	50	85 (20-400)	<200 (n = 6), other: necessitate transfusion (heparinized patients)	50 (20-100)			50 (20-100)
Success rate (%)	86.6		89.5	95.2	91.1	100 (pain relief)	94.2			94.2
Symptomatic	100	100	88.2	95.2	95.5		100			100
Radiologic										
Mean duration of hospitalization (d)	2.2 ± 1.2 (1-5)	2	2.3 ± 0.9 (1-4)	1.9 ± 1.1	1.1 (1-3)	3.9 (1-10)	1.2 (1-3)			1.2 (1-3)
Mean follow-up (mo)	12.1 ± 6.3 (8-21)	3-12	14.3 ± 5.9	16.6 ± 9.0	58 (3-132)	14 (2-29)	12.5 (2-26)			12.5 (2-26)

*NA = Not available.

functions in a single device that can be safely used in laparoscopic decortications of renal cysts (**Table 1**). Tefekli et al²¹ reported their experience with bipolar PK in 19 patients who laparoscopically underwent retroperitoneal decortication of simple renal cysts. The mean operative time and hospital stay were 82.5 minutes and 2.3 days, respectively. Tefekli et al reported a radiologic success rate of 88.2% and symptomatic success rate of 89.5% at the end of 14.3 months. Six minor complications and two asymptomatic cyst recurrences were reported in their study. In another study using bipolar PK scissors, Abbaszadeh et al²² reported no major complications with a 95.2% symptomatic and radiologic success rate. In addition, given the simultaneous cutting and coagulation action of the bipolar energy source, injuries to the peripheral organs are decreased and the device is especially preferred for peripelvic locations. This feature of the bipolar device provides advantages because the time required for homeostasis is eliminated which decreases the operative time. Moreover, the bipolarity of the device significantly decreases injuries to nontargeted organs.

Another bipolar energy source, the Harmonic Scalpel (Ethicon, Cincinnati, Ohio), was used during laparoscopic management of symptomatic autosomal dominant polycystic kidney disease. McNally et al²³ reported on 7 patients with end-stage renal failure related to autosomal dominant polycystic kidney disease. After decortication of the cyst with the Harmonic Scalpel, a significant reduction was seen in the pain scale scores of all patients. Nevertheless, delayed bleeding necessitating blood transfusion occurred in two patients and laparotomy was required in one patient. Although laparoscopic decortication with the Harmonic Scalpel is a feasible procedure for symptomatic relief, it may not be adequate in the prevention of delayed bleeding. We anticipate that the LigaSure system may be effective at preventing delayed bleeding in heparinized patients by means of its vessel-sealing feature.²⁴

There is no significant difference between the Harmonic and LigaSure devices regarding the lateral thermal damage capability.^{18,25} Several studies in animals and humans have confirmed their effectiveness.^{18,19,24,25} Although the LigaSure vessel-sealing system is widely used in laparoscopic surgery in the endourological era,²⁷ this is the first study evaluating the efficacy of the LigaSure system during laparoscopic decortication of symptomatic hilar renal cysts. Our results show that laparoscopic decortications of simple renal cysts with the LigaSure system decrease complications and operative time but increase the cost. The decreased rate of nontargeted organ injury¹⁹ allows the LigaSure system

to excise cyst walls more adjacent to the renal parenchyma, even when located at the renal hilum. Accordingly, the LigaSure system is safe even for perihilar cysts. Moreover, it may also be safe especially for patients with hemorrhagic diathesis. The inadequate number of patients, the duration of follow-up, and the cost of the LigaSure system are the major limitations of our study.

CONCLUSION

Our results show that the LigaSure system is a safe and effective device in the management of symptomatic renal cysts. It is also safe even when the cyst is adjacent to the perihilar area and in patients with a tendency to bleed. Large randomized controlled trials with long-term follow-up are needed to determine the optimal energy source for the treatment of renal cysts.

References:

1. Tada S, Yamagishi J, Kobayashi H, Hata Y, Kobari T. The incidence of simple renal cysts by computed tomography. *Clin Radiol*. 1983;34:437–441.
2. Wolf JS. Evaluation and management of solid and cystic renal masses. *J Urol*. 1998;159:1120–1133.
3. Terada N, Ichioka K, Matsuda Y, Okubo K, Yoshimuro K, Arai Y. The natural history of simple renal cysts. *J Urol*. 2002;167:21–33.
4. Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA. Laparoscopic surgery of the kidney. In: Kavoussi LR, Schwartz MJ, Gill IS eds. *Campbell-Walsh Urology*. 9th ed. Vol 2. Philadelphia, PA: Saunders; 2007:1759–1818.
5. Dunn MD, Clayman RV. Laparoscopic management of renal cystic disease. *World J Urol*. 2000;18:272–277.
6. Choi YD, Ham WS, Kim WT, et al. Clinical experience of single session percutaneous aspiration and OK-432 sclerotherapy for treatment of simple renal cysts: 1-year follow-up. *J Endourology*. 2009;15:148–152.
7. Hulbert JC. Laparoscopic management of renal cystic disease. *Semin Urol*. 1992;10:239–241.
8. Mingoli A, Brachini G, Binda B, Carocci V, Tiddi C, Modini C. Laparoscopic transperitoneal decortication of a giant peripelvic renal cyst. *J Laparoendosc Adv Surg Tech A*. 2008;18:845–847.
9. Ryu DS, Oh TH. Laparoscopic decortication of large renal cysts: a comparison between the transperitoneal and retroperitoneal approaches. *J Laparoendosc Adv Surg Tech A*. 2009;19(5):629–632.
10. Terada N, Arai Y, Kinukawa N, Terai A. The 10-year natural history of simple renal cysts. *Urology*. 2008;71(1):7–11.

11. Kattan SA. Immediate recurrence of simple renal cyst after laparoscopic unroofing. *Scand J Urol Nephrol*. 1996;30(5):415–418.
12. Atug F, Burgess SV, Ruiz-Deya G, Mendes-Torres F, Castle EP, Thomas R. Long-term durability of laparoscopic decortication of symptomatic renal cysts. *Urology*. 2006;68:272–275.
13. Amar AD, Das S. Surgical management of benign renal cyst causing obstruction of the renal pelvis. *Urology*. 1984;24:429–433.
14. Chung BH, Kim JH, Hong CH, Yang SC, Lee MS. Comparison of single and multiple sessions of percutaneous sclerotherapy for simple renal cyst. *BJU Int*. 2000;85:626–627.
15. Hulbert JC. Laparoscopic management of renal cystic disease. *Semin Urol*. 1992;10:239–241.
16. Fontana D, Porpiglia F, Morra I, Destefanis P. Treatment of simple renal cysts by percutaneous drainage with three repeated alcohol injection. *Urology*. 1999;53:904–907.
17. Rane A. Laparoscopic management of symptomatic simple renal cysts. *Int Urol Nephrol*. 2004;36:5–9.
18. Sutton PA, Awad S, Perkins AC, Lobo DN. Comparison of lateral thermal spread using monopolar and bipolar diathermy, the Harmonic Scalpel and the Ligasure. *Br J Surg*. 2010;97:428–433.
19. Diamantis T, Kontos M, Arvelakis A, et al. Comparison of monopolar electrocoagulation, bipolar electrocoagulation, Ultracision, and Ligasure. *Surg Today*. 2006;36:908–913.
20. Tuncel A, Aydin O, Balci M, Aslan Y, Atan A. Laparoscopic decortication of symptomatic simple renal cyst using conventional monopolar device. *Kaohsiung J Med Sci*. 2011;27:64–67.
21. Tefekli A, Altunrende F, Baykal M, Sarilar O, Kabay S, Muslumanoglu AY. Retroperitoneal laparoscopic decortication of simple renal cysts using the bipolar PlasmaKinetic scissors. *Int J Urol*. 2006;13:331–336.
22. Abbaszadeh S, Taheri S, Nourbala MH. Laparoscopic decortication of symptomatic renal cysts: experience from a referral center in Iran. *Int J Urol*. 2008;15:486–489.
23. McNally ML, Erturk E, Oleyourryk G, Schoeniger L. Laparoscopic cyst decortication using the harmonic scalpel for symptomatic autosomal dominant polycystic kidney disease. *J Endourol*. 2001;15:597–579.
24. Carbonell AM, Joels CS, Kercher KW, Matthews BD, Sing RF, Heniford BT. A comparison of laparoscopic bipolar vessel sealing devices in the hemostasis of small-, medium-, and large-sized arteries. *J Laparoendosc Adv Surg Tech A*. 2003;13:377–380.
25. Phillips CK, Hruby GW, Durak E, et al. Tissue response to surgical energy devices. *Urology*. 2008;71:744–748.
26. Metzelder ML, Kübler JF, Nustede R, Ure BM. LigaSure in laparoscopic transperitoneal heminephroureterectomy in children: a comparative study. *J Laparoendosc Adv Surg Tech A*. 2006;16:522–525.