European Review for Medical and Pharmacological Sciences 2015; 19: 4457-4461

Laparoscopic transperitoneal nephrectomy in non-functioning inflammatory kidneys with or without renal stone

M. KABA[1], N. PIRINÇÇI[1], K. TAKEN[1], I. GEÇIT[1], Ö. DEMIRAY[2], H. EREN[1]

[1]Department of Urology, Faculty of Medicine, Yuzuncu Yıl University, Van, Turkey
[2]Clinics of Urology, Hopa State Hospital, Artvin, Turkey

Abstract. – OBJECTIVE: To compare our laparoscopic simple nephrectomy results in non-functioning inflammatory kidneys with or without renal stones.

PATIENTS AND METHODS: Patients, who underwent laparoscopic transperitoneal nephrectomy for non-functioning kidney between June, 2010 and October, 2014 were included to study. Overall, data of 32 patients including 15 patients with renal stone (Group 1) and 17 patients without renal stone (Group 2) were retrospectively reviewed.

RESULTS: Mean age was 44.4 ± 18.5 years (10-71) in group 1 and 35.2 ± 21 years (9-77) in group 2. Mean operation time was 95.0±25.9 minutes (70-175) in group 1 and 86.7 ± 15.1 minutes (70-125) in group 2. Mean estimated blood loss was found to be 64.13 ± 26.67 ml (30-120) in group 1 and 58.94 ± 24.24 ml (30-100) in group 2. Both groups had inflammatory findings in pathological analysis. There was no significant difference between groups regarding estimated blood loss, operation time, pre-operative and post-operative hemoglobin values, percent hemoglobin decrease, complications and hospitalization times ($p > 0.05$).

CONCLUSIONS: Non-functioning kidney with or without renal stone could be operated safely with comparable complication rates and success via laparoscopy in experienced hands.

Key Words:
Laparoscopic nephrectomy, Stone, Non-functioning kidney.

Introduction

Minimal invasive surgery remains to be an actual and important topic in urologic surgery as in all other departments. As a minimal invasive technique, laparoscopic surgery has considerable significance for urologists. Laparoscopic urologic surgery was introduced in 90s in the world, which was subsequently adopted in 2000s in our country.

When compared to open surgery, laparoscopic surgery has several advantages such as less pain and blood loss, shorter hospitalization and minimal incision with better cosmetic results. Laparoscopy is used in urological surgery for pelvic lymphadenectomy for the first time[1]. Claymen et al[2] performed first laparoscopic nephrectomy in 1990. Then, first pediatric laparoscopic nephrectomy was successfully performed in the next year. Currently, laparoscopic nephrectomy is performed as routine procedure for pediatric and geriatric age groups, dialysis patient and in renal transplantation[3-5].

In our study, we aimed to investigate whether there is a difference between patients underwent laparoscopic simple nephrectomy for inflammatory non-functioning kidneys caused by renal stone or other reasons regarding complications and operative findings.

Patients and Methods

Patients, who underwent laparoscopic simple nephrectomy between June, 2010 and October, 2014 and had inflammatory findings in histopathological examination were included to the study. Overall, 32 patients were included. The patients with non-functioning inflammatory kidneys were divided into 2 groups based on etiology as those with (Group 1) or without stone formation (Group 2).

Demographic data, medical history, physical examination findings, operation time, estimated blood loss, blood transfusion history, complications and hospitalization times were extracted from hospital database. In addition, pre-operative and post-operative hemoglobin values were also recorded from hospital database. The percent hemoglobin decrease was calculated by using these data.

Corresponding Author: Mehmet Kaba, MD; e-mail: mehmetkaba@yahoo.com

Operation Technique

Pneumoperitoneum was achieved by using Veress needle and CO_2 at 20 mmHg pressure. When intra-abdominal pressure reached to 20 mmHg, three trocars (10 mm in size) were inserted while an additional trocar (5 mm in size) was used when needed. By insertion of trocars, intra-abdominal pressure decreased to 12 mmHg. Both ultrasonic energy devices (Harmonic Scalper, Ethicon, Somerville, NJ, USA) and thermal energy devices (Ligasure, Covidien, Dublin, Irish) were used for dissection. For vascular closure of hilar vessels laparoscopic stapler was not used. Hem-o-lok clips (Teleflex, Wayne, PA, USA) were used for closure of major vasculature (> 7 mm) while metal clips or ligasure were used for minor vasculature (< 7 mm). Hemostasis was controlled under low pressure (6 mmHg). Excised kidney was removed within endo-bag from abdominal cavity. A 14 Fr drainage catheter was inserted to operation site.

Statistical Analysis

Data were expressed as mean, standard deviation and range. Mann-Whitney-U or chi-square tests were used for correlation analyses when appropriate. $p < 0.05$ was considered as statistically significant. All analyses were performed using SPSS 21.0 for Macintosh (SPSS Inc., Chicago, IL, USA).

Results

Overall, there were 32 patients including 15 patients in group 1 and 17 patients in group 2. There were 4 women (26.6%) and 11 men (73.4%) in Group 1 while there were 9 women (52.9%) and 8 men in group 2. Mean age was 44.4 ± 18.5 years (10-71) in group 1 and 35.2 ± 21.0 years (9-77) in group 2. There was no significant difference between groups regarding age ($p = 0.156$). There was one patient with tuberculosis pyelonephritis in each group. Pre-operative and post-operative results of patients are summarized in Table I. Surgical indications for patients without stone disease are listed in Table II. There were no significant differences between groups regarding estimated blood loss, operation time, pre-operative and post-operative hemoglobin values, percent hemoglobin decrease and hospitalization times ($p > 0.05$). Blood transfusion was required in 2 patients from Group 1 (13.3%) and one patient from Group 2 (5.8%). No significant difference was found between groups regarding need for blood transfusion ($p > 0.05$). Only one patient from group 1 (%6.6) had colon perforation, which was repaired with laparoscopic technique. In group 1, operation was converted to open surgery in one patient due to uncontrollable hemorrhage. Reason of uncontrollable hemorrhage was renal venous injury during closure of renal hilum vasculature with hem-o-lok clip. None of the patients had post-operative complications. Post-operative analgesia was provided by diclofenac-sodium. None of the patients needed narcotic analgesia. All patients were invited for control visit at post-operative week 2 and months 1 and 6. Mean follow-up was 16.4 months (1-39) in group 1 and 15.2 months (2-38) in group 2. During follow-up, none of the patients had deterioration in renal functions and urine cultures were sterile. None of the patients had hernia from port sites.

Discussion

In recent years, minimal invasive surgery has replaced open surgery techniques due to advances in technology. Laparoscopic surgery has become choice of surgical technique in oncologic cases and complicated cases in addition to simple procedures after successful results and increasing experience[6,7]. Given the advances in minimal invasive surgery and surgical technique as well as

Table I. Peroperative ve postoperative data.

	Group 1	Group 2	*p* value
Estimated blood loss (mL)	64.13 ± 26.67 (30-120)	58.94 ± 24.24 (30-100)	0.65
Operation time (min)	95.0 ± 25.9 (70-175)	86.7 ± 15.0 (70-125)	0.331
Preoperative hemoglobin (mg/dL)	14.1 ± 2.4 (10.8-18.9)	13.6 ± 1.5 (10.5-16.2)	0.417
Postoperative hemoglobin (mg/dL)	12.5 ± 1.8 (9.7-16.7)	12.6 ± 1.7 (8.6-15.3)	0.533
Hemoglobin change (%)	1.67 ± 1.25	0.95 ± 1.28	0.126
Length of hospital stay (days)	2.93 ± 0.8 (2-5)	2.59 ± 0.62 (2-4)	0.420

Table II. Indications for non-functioning kidneys without renal stone.

Indications	N
Ureteropelvic joint obstruction	8
Tuberculosis	1
Multi-cystic dysplastic kidney	1
Atrophic inflammatory kidney	7

shorter length of stay, lower mortality, lesser analgesic need and better cosmetic results compared to open surgeries, laparoscopic nephrectomy can be considered even for pyelonephritic and hydronephritic kidneys[8,9].

There is a strong correlation between urinary system stones and urinary system infection. This phenomenon could be explained by three underlying mechanisms. (1) Stone formation caused by infection, (2) complications caused by urinary stone disease secondary to urinary infection, (3) urinary system obstruction such as ureteropelvic obstruction or ureteral stricture that can cause urinary system infections and infection stones[10].

Despite advantages such as better lighting and amplification, it is challenging to dissect fibrotic tissue laparoscopically. As anteromedial aspect of kidney tissue may be adherent to the colon, a careful dissection must be performed to avoid colon perforation and vascular injury. Distal pancreas is at risk for pancreatic fistula or injuries of spleen or splanchnic vessel above renal upper pole in left-sided cases. Right-sided cases carry risk for vena cava injury because of shorter renal vein in right side[11]. Given these aspects, adhesions secondary to infected urinary stones, tuberculosis or prolonged infections raise concerns about advantages of laparoscopy[12,13].

In renal surgery, laparoscopy interventions can be performed via intraperitoneal or retroperitoneal approaches. In transperitoneal technique, larger working spaces, presence of anatomic markers such as liver, spleen and colon, longer distance between ports give higher maneuver ability. In retroperitoneal technique, there are shorter operation time and length of hospital stay as well as lower complication rates despite limited working space[14]. In addition, retroperitoneal technique is more readily performed in patients with history of previous abdominal surgery with early control of renal pedicle. However, surgical experience is an important factor in the selection of surgical method. In our clinic, we preferred transperitoneal technique in most cases. In the present study, we reviewed cases underwent surgery via transperitoneal technique.

Previous urinary tract infections cause extensive adhesions, particularly in perinephritic area, complicating laparoscopic surgery. Manohar et al[15] compared open (n=94) and laparoscopic (n=84) approaches in patients underwent surgery due to benign disorders such as xanthogranulomatous pyelonephritis, pyonephrosis, tuberculosis pyelonephritis and calculus pyelonephritis. Authors found that operation time was shorter in open procedures when compared to laparoscopic surgery. The only statistical difference was detected in calculus pyelonephritis group. In another study[16], laparoscopic nephrectomy was compared in cases with inflamed and non-inflamed kidneys. Authors found that inflamed kidney group had longer operation times and better healing rates.

Tuberculosis is another reason for severe perirenal adhesions. Kim et al[17] reported laparoscopic nephrectomy experience in 13 tuberculosis cases with non-functioning kidney from Korea. Authors reported conversion to open surgery in only one case. Severe adhesions were seen; however, it didn't cause cessation of operation and no complication was seen at perioperative and postoperative period. There was one patient with tuberculosis pyelonephritis in each group in our study. No complication was seen in these patients at perioperative and postoperative period.

In a study by HatipoğLu et al[18], mean operation time was found to be 95 minutes (70-135) in 32 laparoscopic simple nephrectomy patients. Again, Bayraktar et al[19] found mean operation time as 102 minutes (90-110) in 10 patients. Tepeler et al[10] reported a series of retroperitoneal laparoscopic simple nephrectomy including 27 patients with renal stone and 27 patients without stone. Authors found that operation times were 123.55 ± 38.13 (75-210) minutes and 98.88 ± 40.3 (66-270) minutes with significantly longer mean operation time in patients with renal stone. In larger series[20], mean operation time was reported to be 100 minutes (45-240) in transperitoneal approach. In our study, operation times were 95.0±25.9 minutes (70-175) in group 1 and 86.76 ± 15.1 minutes (70-125) in group 2. We think that relatively shorter operation times without significant difference between groups may be due to transperitoneal approach employed and extra-capsular excision of kidney (with Gerota fascia) in cases with peri-renal adherences.

Kural et al[21] reported mean estimated blood loss of 150 ml (100-300) in 10 patients underwent laparoscopic simple nephrectomy. In another study by HatipoğLu et al[18], it was reported that mean estimated blood loss was 55 ml (30-150). In our study, it was found that estimated blood loss was 64.13 ± 26.67 ml (30-120) and 58.94 ± 24.24 ml (30-100) in group 1 and 2, respectively. Our results are in agreement with to literature.

When compared to open surgery, shorter length of stay is another advantage of laparoscopic surgery over open surgery. Hatipoğlu et al[18] found that mean length of stay was 1.5 days (1-7) while it was reported as 3.5 days (3-5) in another study[19]. Tepeler et al[10] reported that mean length of stay for nephrectomy as 3.14 ± 1.23 (2-6) days in patients with renal stone and 2.55 ± 0.93 (1-5) days in patients without renal stone. In our study, it was found that mean length of stay was 2.9 ± 0.8 days (2-5) in group 1 and 2.59 ± 0.69 (2-4) in group 2. Our results are in agreement with to literature.

Although higher complication rates were reported in preliminary series in the literature, Soulie et al[22] reported rate of major complication as 3.6% and conversion rate as 1.1% in 350 cases underwent renal surgery. In the study by Tepeler et al[12], it was reported that conversion rate was 7.4% (n=2) in patients with renal stone and 3.7% (n = 1) in patients without renal stone. In the same study, authors reported that transfusion was required in 2 cases with renal stone and in one case without renal stone patient group. In a study[23] on 17 cases underwent nephrectomy with inflamed kidneys, blood transfusion was required in 2 cases (11.7%), while the operation was converted to open surgery in 2 cases (11.7%). There was surgical site infection in 2 cases (11.7%). The operation was converted to open surgery in one patient (6.6%) due to uncontrolled bleeding in group 1, while colon perforation occurred in one case (6.6%) which repaired via laparoscopy in group 1. No major complication was observed in group 2. Need for blood transfusion was observed in one case in each group. Our results are in agreement with the literature.

Conclusions

Laparoscopic simple nephrectomy is a safe and feasible technique that provides an alternative to open surgery with advances in technology. Technique is applicable in inflammatory kidneys with or without renal stone. It has comparable per-operative and post-operative results with open surgery in experienced hands.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

References

1) Schuessler WW, Vancaillie TG, Reich H, Griffith DP. Transperitoneal endosurgical lymphadenectomy in patients with localized prostate cancer. J Urol 1991: 145: 988-991.
2) Clayman RV1, Kavoussi LR, Soper NJ, Dierks SM, Meretyk S, Darcy MD, Roemer FD, Pingleton ED, Thomson PG, Long SR. Laparoscopic nephrectomy: initial case report. J Urol 1991: 146: 278-282.
3) Ehrlich R, Gershman A, Fuchs G. Laparoscopic renal surgery in children. J Urol 1994: 151: 735-739.
4) McDougall EM, Clayman RV. Laparoscopic nephrectomy and nephroureterectomy in the octogenarian with a renal tumour. J Laparoendosc Surg 1994:4: 233-236.
5) Fornara P, Doehn C, Fricke L, Hoyer J, Jocham D. Laparoscopy in renal transplant patients. Urology 1997: 49: 521- 527.
6) Chung JH, Lee SW, Lee KS, Cho WY, Kim TH. Safety of en bloc ligation of the renal hilum during laparoscopic radical nephrectomy for renal cell carcinoma: a randomized controlled trial. J Laparoendosc Adv Surg Tech A 2013: 23: 489-494.
7) Rassweiler J. Laparoscopic radical prostatectomy is also oncologically safe and effective! BJU Int 2013: 112: 158.
8) Hemal AK, Mishra S. Retroperitoneoscopic nephrectomy for pyonephrotic nonfunctioning kidney. Urology 2010: 75: 585-588
9) Duarte RJ, Mitre AI, Chambô JL, Arap MA, Srougi M. Laparoscopic nephrectomy outside gerota fascia for management of inflammatory kidney. J Endourol 2008: 22: 681-686.
10) Tepeler A, Akman T, Tok A, Kaba M, Binbay M, Müslümano lu AY, Tefekli A. Retroperitoneoscopic nephrectomy for non-functioning kidneys related to renal stone disease. Urol Res 2012: 40: 559-565.
11) Fahlenkamp D, Rassweiler J, Fornara P, Frede T, Loening SA. Complications of laparoscopic procedures in urology. Experience with 2047 procedures at 4 German centers. J Urol 1999: 162: 765-770.
12) Gupta NP, Agrawal AK, Sood S. Tubercular pyelonephritic nonfunctioning kidney--another relative contraindication for laparoscopic nephrectomy: a case report. J Laparoendosc Adv Surg Tech A 1997: 7: 131-134.

13) Bercowsky E, Shalhav AL, Portis A, Elbahnasy AM, McDougall EM, Clayman RV. Is the laparoscopic approach justified in patients with xanthogranulomatous pyelonephritis? Urology 1999: 54: 437-442.

14) McAllister M, Bhayani SB, Ong A, Jaffe W, Malkowicz SB, VanArsdalen K, Chow GK, Jarrett TW. Vena caval transection during retroperitoneoscopic nephrectomy: report of the complication and review of the literature. J Urol 2004: 172: 183-185.

15) Manohar T, Desai M, Desai M. Laparoscopic nephrectomy for benign and inflammatory conditions. J Endourol 2007: 21: 1323-1328.

16) Shekarriz B, Meng MV, Lu HF, Yamada H, Duh QY, Stoller ML. Laparoscopic nephrectomy for inflammatory renal conditions. J Urol 2001: 166: 2091-2094.

17) Kim HH, Lee KS, Park K, Ahn H. Laparoscopic nephrectomy for nonfunctioning tuberculous kidney. J Endourol 2000: 14: 433-437.

18) Hatipo lu NK, Penbegül N, Söylemez H, Atar M, Bozkurt Y, Sancaktutar AA, Bodakçı MN. Urological laparoscopic surgery: our experience of first 100 cases in Dicle University J Clin Exp Invest 2012: 3: 44-48.

19) Bayraktar AM, Ölçücüo lu E, Ta temur S, irin ME, Biçer S, Odaba Ö. Initial results of our laparascopic urological surgery: first 32 cases. Firat Med J 2014: 19: 75-78.

20) Fornara P, Doehn C, Friedrich HJ, Jocham D. Nonrandomized comparison of open flank versus laparoscopic nephrectomy in 249 patients with benign renal disease. Eur Urol 2001: 40: 24-31.

21) Kural AR, Demirkesen O, Akpinar H, Tüfek I, Yalçın V, Özkan B. Laparoskopik nefrektomide başlangıç deneyimlerimiz. Türk Üroloji Derg 2004: 30: 414-421.

22) Soulie M, Seguin P, Richeux L, Mouly P, Vazzoler N, Pontonnier F, Plante P. Urological complications of laparoscopic surgery: experience with 350 procedures at a single center. J Urol 2001: 165: 1960-1963.

23) Tobias-Machado M1, Lasmar MT, Batista LT, Forseto PH Jr, Juliano RV, Wroclawski ER. Laparoscopic nephrectomy in inflammatory renal disease: proposal for a staged approach. Int Braz J Urol 2005: 31: 22-28.