LAPAROSCOPY

Original Article

# Comparison of transperitoneal laparoscopic nephrectomy outcomes in atrophic and hydronephrotic kidneys

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## ABSTRACT

**Objective:** To compare the results of transperitoneal laparoscopic nephrectomy in patients with atrophic and hydronephrotic kidneys.

**Material and methods:** Clinical data were collected from 35 patients who had undergone laparoscopic nephrectomies for atrophic or hydronephrotic non-functioning kidneys between January 2010 and March 2014. Comparative analysis was carried out between the two groups examining demographic characteristics, imaging modalities, etiology, operative times, port numbers, conversion to open surgery, complications, pre- and post-operative hemoglobin and creatinine values, transfusion rates and length of hospital stays.

**Results:** Laparoscopic nephrectomy was performed for atrophic kidneys in 20 (57%) patients and for hydronephrotic kidneys in 15 (42%) patients. In the atrophic group, 3 patients (15%) required transfusion because of bleeding but none of the patients required conversion to open surgery. In the hydronephrotic group one patient (6.6%) required transfusion and conversion to open surgery because of bleeding. Both of the groups were similar in terms of postoperative hospital stay but compared to the atrophic kidneys, hydronephrotic ones were associated with a longer total operative times (90.1 min vs. 73.6 min, p=0.03). Any serious complication (except for bleeding) and mortality were not encountered in both groups.

**Conclusion:** Laparoscopic nephrectomy is a safe and effective minimally invasive technique that can be used in atrophic and hydronephrotic non-functioning kidneys.

**Keywords:** Atrophy; hydronephrosis; kidney; laparoscopy; nephrectomy.

## Introduction

Surgical techniques preferred in the treatment of kidney diseases are rapidly evolving with the contribution of technological developments, and tendency to minimally invasive techniques is gaining momentum. Not long ago, almost always only open surgical techniques have been used. Clayman et al.[1] realized the first laparoscopic nephrectomy in 1990s. This operation has demonstrated that a big solid organ can be extracted through a small incision, and opened new horizons for nephrectomy. Meanwhile, this technique has rapidly evolved, and taken various forms. Outcomes reported by many centers have enabled to make comparisons between laparoscopic nephrectomy, and open surgery. Laparoscopic nephrectomy (LN) has been shown to result in lesser postoperative pain, better cosmetic outcomes, and shorter hospital stay, and time to recovery.[2,3]

Nowadays, LN has been used widely in cases where malignant, and benign renal diseases result in permanent loss of renal functions.[4] Although the question of whether or not the outcomes of nephrectomies performed for diverse indications will be the same, has been investigated in various studies, the effect of atrophic or hydronephrotic kidney to be nephrectomized on the treatment outcomes has not been sought before. In this study, we compared the outcomes of LN performed on atrophied kidneys or kidneys which become a pouch following development of hydronephrosis secondary to various etiologies, and

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**Submitted:** 20.02.2015

**Accepted:** 09.07.2015

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Available online at www.turkishjournalofurology.com

Turk J Urol 2015; 41(4): 181-4
DOI:10.5152/tud.2015.97523

investigated whether this factor will be effective on postoperative outcomes.

## Material and methods

Data of 35 patients who had undergone simple LN for atrophic or non-functional hydronephrotic kidneys between January 2010, and March 2014 were retrospectively evaluated. Preoperative images of the patients were evaluated by a radiologist, and it was seen that LN had been performed because of atrophic (n=20; 57%), and hydronephrotic kidney (n=15; 42%). Demographic characteristics of the patients, etiology of the nonfunctional kidney, operative times, number of ports used, the rate of conversion to open surgery, complications, pre-, and post-operative hemoglobin, and creatinine values, need for transfusion, and length of hospital stay were recorded, and compared.

### Surgical technique

Enlightened consent forms were obtained from all patients before the operation. Since it provides an optimal work space, transperitoneal approach was preferred. Besides port entry sites are far away from each other so as to prevent interference of laparoscopic instruments, and anatomical landmarks can be easily identified. The patient was prepared for the operation while the patient was in supine position. After opening an intravenous route, and induction of anesthesia, the patient was intubated. Bladder, and stomach were evacuated using urethral catheters, and nasogastric tubes, respectively. After all these steps, the patient was placed in flank position. Using a Veress needle, pneumoperitoneum was constructed. The first trocar was placed lateral to the *m. rectus. abdominis*, at the level of umbilicus. The other two trocars were inserted under direct vision. In some patients, in cases where forced dissection, and better organ retraction were required a 4$^{th}$ port was placed. For left nephrectomy, Toldt line was incised from iliac vessels up to the spleen also encompassing lienocolic ligament. At the right side, peritoneum was incised including triangular and anterior coronal ligaments up to the hepatic flexura. Colon was deviated to the medial, and psoas muscle was exposed in order to approach gonadal vessels, and ureter. Ureter was followed up proximally up to the renal hilum. Hilar vessels were separately dissected, and clipped. Following dissection of hilar structures, dissection was advanced towards posterior, and superior direction. Kidney was placed in an organ bag, and taken out.

### Statistical analysis

For statistical analysis IBM Statistical Package for the Social Sciences (SPSS, New York, USA) 20.0 program was used. In the analysis of descriptive characteristics, mean (±SD), minimum, and maximum values were used. Normality of data distribution in groups was controlled. For categorical variables *chi*-square, and for dependent variables Mann-Whitney U test were used.

## Results

Demographic data, and operative findings are presented in Table 1. All patients underwent simple transperitoneal LN. Right (n=18; 51%), and left (n=17, 48%) LNs were performed. The etiologies of these patients were urinary system stone disease (n=16), undefined causes (n=13), ureteropelvic junction stenosis (n=4), renal tuberculosis (n=1), and retroperitoneal fibrosis (n=1). Ten patients had previously undergone urological surgery, while 25 patients had not any history of surgery. LN was performed with the indications of atrophic kidney (n=20; 57%), and hydronephrosis (n=15; 42%).

Mean age of the patients in the atrophic kidney group was 49.2±11.6 years (range 26-72 years). These patients underwent right (n=12; 60%), and left LNs (n=8; 40%). Study population consisted of 11 (55%) male, and 9 (45%) female patients. Renal atrophy developed secondary to stone disease in 10 patients, while in 8 patients any etiology could not be found. In the hydronephrotic kidney group, mean age of the patients was 52.2±19.4 years (range 13-79 years). This group consisted of 5 (33%) male, and 10 (66%) female patients. The patients underwent right (n=6; 40%), and left (n=9; 60%) LNs. Hydronephrosis had developed secondary to stone disease in 6 (40%), ureteropelvic junction stenosis in 4 (26%) patients, while etiologic factor could not be identified in 4 (26%) patients.

In the atrophic kidney group for laparoscopic interventions creation of 3 (n=17; 85%), and 4 (n=3; 15%) ports was required. Pre-, and post-operative hematocrit, and creatinine values were 41.2 g/dL, and 1.01 mg/dL *vs* 1.05 mg/dL, and 37.2 g/dL, respectively. In the hydronephrotic kidney group operations were completed with 3 (n=12; 80%), and 4 (n=3; 20%) ports in respective number of patients. In this group pre-, and post-operative hematocrit, and creatinine values were measured as 38.3 g/dL and 0.87 mg/dL in 3 vs. 35.2 g/dL, and 0.89 mg/dL in 4 patients. In both groups, changes in postoperative hematocrit, and creatinine values relative to preoperative measurements were not statistically significant in both groups ($p>0.05$).

In the atrophic kidney group, bleeding requiring blood transfusions was observed in a total of 3 (15%) patients, who were treated with laparoscopic approach. However in the hydronephrotic group only 1 (6.6%) patient required transfusion because of bleeding which necessitated conversion to open surgery. Mean hospital stay did not differ between both groups (2.8±1.1, and 2.9±1.4 days in the groups with hydronephrotic, and atrophic kidneys, respectively, $p>0.05$). Contrarily, median operative time in the hydronephrotic kidney group was statistically significantly longer when compared with the atrophic kidney group (90.1 min, and 73.6 min, $p=0.03$). Any serious complication, and mortality (excl. bleeding episodes) were not encountered in both groups.

## Discussion

Laparoscopy lithotripsy is an effective minimally invasive technique used in the treatment of renal lesions. As a globally recognized fact, its cosmetic results are better relative to open surgery. With accumulating technical experience, a dramatic drop in operative times, and complications has been achieved. An extremely small incision is required for the removal of the kidney which is a big solid organ.[5] During the postoperative period, the patients experience only a milder degree of pain which decreases requirement for analgesia.[6,7] This condition also effects length of hospital stay favourably. Earlier mobilization of the patients results in discharge of the patients from the hospital within a shorter time. Shorter recovery time also ensues in quicker return to daily life. Thanks to laparoscopy, surgeons can decrease morbidity rates of their patients without making concessions to their therapeutic gains.[8]

One can say that LN is superior to open nephrectomy in many aspects, and it can be recommended as a standard approach to elective nephrectomy. Nowadays, simple LN used for benign renal lesions is preferred as a standard procedure in many centers with its applicability, successful surgical outcomes, and enhanced patient's comfort.[9] LN can be safely applied both in adults, and pediatric patients as well.[10] Even though some publications have reported shorter operative, and hospitalization times, and lower conversion rates for retroperitoneal approach, choice of the laparoscopic technique is related basically to training, experience, and preference of the surgeon.[11]

In simple LNs performed for benign conditions ensuing complications, and outcomes have been effected by various factors. Learning-curve is one of these factors. In a multicentered analysis of 153 patients who had undergone LNs for benign etiologies, Gill et al.[12] reported a higher complication rate as 12% for the first 20 LNs. In the same series, 5 patients who belonged to the first 20 cases were switched to open surgery. Other authors have documented that learning curve effect rates of both complications of nephrectomies performed for benign etiologies and also of conversion to open surgery [13]. Previously experienced abdominal surgery can increase the incidence of complications related to laparoscopic procedures. They can induce formation of intraabdominal adhesions which can complicate insufflation, placement of trocars, and dissections. In our study, only one patient out of 4 patients with complications had a history of surgical intervention. This patient had previously undergone open pyelolithotomy because of a renal stone, and transfusion requiring bleeding was observed during the operation. It has been reported that constructing the first entry site away from the previous incision line, and placement of a trocar under direct vision can decrease the potential risks of previous surgeries.[14]

**Table 1. Demographic data, and operative findings of the patients**

| | Atrophic kidney group | Hidronephrotic kidney group | Total number of cases |
|---|---|---|---|
| Patients, n | 20 | 15 | 35 |
| Operative time. min median (range) | 73.6 (45-105) | 90.1 (55-130) | 80 (45-130) |
| Preoperative hematocrit value (g/dL) | 41.2 | 38.3 | 39.9 |
| Postoperative hematocrit value (g/dL) | 37.2 | 35.2 | 36.4 |
| Preoperafive creatinine (mg/dL) | 1.01 | 0.87 | 0.94 |
| Postoperative creatinine (mg/dL) | 1.05 | 0.89 | 0.98 |
| Length of hospital stay (day) | 2.9±1.4 | 2.8±1.1 | 2.8±1.3 |
| Requirement for transfusion | 8.5% | 2.8% | 11.4% |
| Conversion to open surgery | 0 | 1 | 1 |
| Use of 4 trocars | 15% | 20% | 17% |

Complication rates can change according to the pathologic conditions of the kidneys to be nephrectomized. For instance, these influential factors include postinflammatory processes as xanthogranulomatous pyelonephritis, and renal tuberculosis, increased complication risk secondary to perinephric adhesions, and risk of conversion to open surgery.[12,15] In their series of simple LNs, Toktaş et al.[16] reported higher complication rates in renal dysfunctions caused by stone disease, and in nephrectomies performed to treat inflammatory conditions. Study of Soulie et al.[17] also supports the outcomes of Toktaş et al.[16]

In our study we examined the effect of atrophic or hydronephrotic kidneys developed independent of the etiology of nonfunctional kidney on the outcomes of laparoscopy. We observed that operative time was the only statistically significant difference between nephrectomies performed for atrophic or hydronephrotic kidneys. Rates of conversion to open surgery, bleeding, need for transfusion, complications, length of hospital stay, and alterations in hematocrit, and creatinine values did not differ between groups. We think that prolonged operative times in cases with hydronephrotic kidneys might be related to perirenal adhesions due to urinary infections with obstructive etiologies. However prospective studies with larger series, and experimental studies are needed to clarify the issue. Even though our study is a prospectively designed small–scale clinical investigation on this subject, it merits due importance as it is the firstly conducted study on this issue, in addition to its remarkable outcomes.

Turk J Urol 2015; 41(4): 181-4
DOI:10.5152/tud.2015.97523

In conclusion, we have observed that the presence of atrophic or hydronephrotic kidney in patients who will undergo simple LNs has no effect on surgical outcomes except operative times, and this minimally invasive technique can be safely performed on patients with either renal pathologies with lower morbidity.

**Ethics Committee Approval:** Due to the retrospective nature of this study, ethics committee approval was waived.

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept - M.T.G., B.R., A.A.; Design - AL.A., B.R.; Supervision - B.R., E.B.S., M.A.; Funding - A.A., A.T.; Data Collection and/or Processing - A.T., M.A.; Analysis and/or Interpretation - AL.A., B.R.; Literature Review - B.R., M.T.G.; Writer - M.T.G.; Critical Review - E.B.S., A.T., A.A.

**Conflict of Interest:** The authors declared no conflict of interest.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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