

Complications of upper urinary system laparoscopic surgery: a single center experience with 942 cases

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ABSTRACT

Objectives: Since the introduction of laparoscopic nephrectomies, laparoscopic surgeries in the field of urology have become increasingly popular. Laparoscopic surgery has its advantages but carries the risk of complications like all interventions. In our study, we aimed to discuss our complication rates according to difficulty level by presenting our experiences with urological laparoscopic procedures for the upper urinary system.

Methods: This retrospective study includes 942 laparoscopic urological procedures performed by a single surgeon. The procedures divided into three groups according to the European Scoring System (ESS) Classification. The complication rate of each group was calculated separately.

Results: A total of 127 (13.4%) complications were observed. Partial nephrectomy, nephroureterectomy and ureterolithotomy had the highest complication rates. Renal cyst excision, simple nephrectomy and radical nephrectomy had the lowest complication rates. According to the Clavien Complication Classification, the distributions of Grade 1, 2 and 3 complications were 29.1% (n = 37), 57.4% (n = 73) and 13.3% (n = 17); respectively. The open conversion rate was 0.84%. When procedures were classified as “easy”, “difficult” and “very difficult” according to the ESS classification; complication rates were found 7.3% in the easy group, 13.3% in the difficult group and 16.6% in the very difficult group. There was no significant difference between the three groups in terms of complication rates ($p = 0.329$).

Conclusions: Performing easier operations according to ESS in the first years of the learning curve is beneficial in preventing complications. With increasing experience, more complicated procedures can be performed with similar complication rates.

Keywords: Laparoscopy, urology, intraoperative complications, postoperative complications

Since the introduction of laparoscopic nephrectomies, laparoscopic surgeries in the field of urology have become increasingly popular and they are now routine procedures in many clinics [1]. Laparo-

scopic surgery has its advantages, but carries the risk of complications like all interventions. Using common standardized systems for grading and recording surgical complications allows comparing operations per-

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formed in different centers with different techniques to more meaningful criteria [2]. For this purpose, a grading system in 1992 by Clavien that allows classification of complications and this system was updated in 2004 by the same group [3]. The European Scoring System (ESS) is used to assess the degree of difficulty of laparoscopic surgeries [4].

In the literature, the articles reporting complications of laparoscopic urological procedures and investigating the factors associated with complications were published [5-13]. Many parameters have been associated with perioperative complications, such as the surgeon's experience [12-15]. Performing challenging laparoscopic procedures has increased the experience and therefore the subject should be reevaluated. In our study, we aimed to present our experience with consecutive 942 urological laparoscopic procedures for the upper urinary system.

METHODS

After getting the approval of the Local Ethics Committee (2014/225); data from 942 laparoscopic surgical procedures for the upper urinary tract between December 2006 and January 2016 were evaluated. These surgeries were performed by a single surgeon (V.T). Outcomes were prospectively collected and retrospectively evaluated.

All patients received preoperative antibiotics and prophylaxis for deep vein thrombosis (compression stockings, subcutaneous low molecular weight heparin). A nasogastric tube and urethral catheter were placed at the beginning of the operation. A veress needle or Hasson technique was used to achieve pneumoperitoneum for the transperitoneal approach. Open access or balloon dilation was performed for the retroperitoneal approach.

The procedures divided into three groups according to the ESS Classification; renal cyst excision was regarded as "easy"; pyeloplasty, simple and radical nephrectomy, nephroureterectomy, ureterolithotomy and pyelolithotomy operations were regarded as "difficult", partial and donor nephrectomy operations were regarded as "very difficult" [4]. The complication rate of each group was calculated separately. Perioperative bleeding was defined as bleeding requiring blood transfusion. Open conversion was excluded from com-

plications and analyzed separately. Written informed consent was taken from all patients.

Statistical Analysis

Chi Square or Fisher exact test were used for categorical variables. Two-tailed p values < 0.05 was considered as statistically significant. Data are shown as mean \pm SD. Data were analyzed using Statistical Package for Social Sciences (SPSS) 20 software (SPSS Inc., Chicago, IL, United States).

RESULTS

The mean age of the 942 patients included in the study was 43.7 ± 14 years. The study included 576 (61.1%) male and 366 (38.8%) female patients. The mean BMI was 25.1 ± 2.3 kg/m², the mean operation time was 125.7 ± 43.6 minutes and the mean blood loss was 85.3 ± 54.9 cc. The duration of hospital stay was 3.5 ± 1.4 days. Data for all patients are given in Table 1. Procedures included pyeloplasty (n = 114, 12.1%), ureterolithotomy (n = 223, 23.6%), pyelolithotomy (n = 55, 5.8%), simple nephrectomy

Table 1. Patients characteristics, peroperative and post operative datas

Parameters	mean \pm SD or n (%)
Age (years)	43.7 \pm 4.7
Male gender	576 (61.1)
BMI (kg/m ²)	25.1 \pm 2.3
Side (right/left)	451 (47.88)/491 (52.12)
Retroperitoneal approach	380 (40.3)
ASA	1.5 \pm 0.5
CCI	0.7 \pm 0.9
Operation time (min)	125.7 \pm 43.6
EBL (cc)	85.3 \pm 54.9
LOS (day)	3.5 \pm 1.4
ESS	
Easy	41 (4.3)
Difficult	787 (83.5)
Very difficult	114 (12.1)

SD = Standart Deviation, BMI = Body Mass Index, ASA = American Society of Anesthesiologists Score, CCI = Charlson Comorbidity Index, EBL = Estimated Blood Loss, LOS = Length of Stay, ESS = European Scoring System

Table 2. Number of procedures and complications.

Procedure	ESS		CDCC			
		n (%)	Grade 1	Grade 2	Grade 3	Total n (%)
Renal Cyst Resection	5	41 (4.3)	0	3	0	3 (7.3)
Ureterolithotomy	7	223 (23.6)	7	16	12	35 (15.6)
Pyelolithotomy	7	55 (5.8)	2	5	2	7 (12.7)
Simple Nephrectomy	10	150 (15.9)	0	13	1	14 (9.3)
Nephroureterectomy	12	25 (2.6)	1	4	0	5 (20)
Pyeloplasty	13	114 (12.1)	8	7	2	17 (14.9)
Radical Nephrectomy	13	220 (23.3)	0	22	5	27 (12.2)
Partial Nephrectomy	15	59 (6.2)	5	5	2	12 (20.3)
Donor Nephrectomy	16	55 (5.8)	0	7	0	7 (12.7)

ESS = European Scoring System, CDCC = Clavien Dindo Complication Classification

(n= 150, 15.9%), radical nephrectomy (n= 220, 23.3%), donor nephrectomy (n= 55, 5.8%), nephroureterectomy (n= 25, 2.6%), partial nephrectomy (n= 59, 6.2%) and renal cyst excision (n= 41, 4.3%). Retroperitoneal approach was applied to 40.3% of the cases.

A total of 127 (13.4%) complications were observed. Partial nephrectomy, nephroureterectomy and ureterolithotomy had the highest complication rates, with rates of 20.3%, 20% and 15.6%, respectively. Renal cyst excision, simple nephrectomy and radical nephrectomy had the lowest complication rates, with rates of 7.3%, 9.3% and 12.2%, respectively. The distributions of the cases and the complication rates are shown in Table 2. According to the Clavien Complication Classification, the distributions of Grade 1, 2 and 3 complications were 29.1% (n = 37), 57.4% (n = 73) and 13.3% (n = 17) respectively. Grade 4 and 5 complications were not observed in any of the cases [3]. Data about complications are listed in Table 3.

The open conversion rate was 0.84% (n = 8); during pyeloplasty (n = 2), partial nephrectomy (n = 2), pyelolithotomy (n = 2), radical nephrectomy (n = 1) and ureterolithotomy (n = 1). There was no significant difference in the open conversion rates between the transperitoneal and retroperitoneal approaches. Open conversion was performed in two cases during partial nephrectomy due to massive bleeding; in five cases in pyeloplasty, pyelolithotomy and ureterolithotomy, due to technical difficulties, and in one case in radical nephrectomy due to massive perirenal adhesions.

Pyelolithotomy and partial nephrectomy had the highest open conversion rates with 3.6% and 3.3%, respectively.

The patients were divided into two groups according to the presence of complications. Operation time, estimated blood loss, open conversion rate and length of hospital stay were significantly higher in patients who had complications. In univariate and multivariate analyzes, none of the parameters could predict the presence of complications.

When procedures were classified as “easy”, “dif-

Table 3. Complications

Complications	n (%)
Fever	37 (3.9)
Ileus	34 (3.6)
Ureteral stent requirement	12 (1.2)
Port side infection	9 (0.9)
Prolonged drainage	8 (0.8)
Peritoneal tear	7 (0.7)
Secondary UPJ stricture	4 (0.4)
Gonadal vein injury	4 (0.4)
Liver injury	4 (0.4)
Subcutaneous emphysema	3 (0.3)
Colonic injury	3 (0.3)
Vertebral artery injury	1 (0.1)
Renal vein Injury	1 (0.1)

UPJ = Uretero-pelvic junction

difficult” and “very difficult” according to the ESS classification; complication rates were found 7.3% in the easy group, 13.3% in the difficult group and 16.6% in the very difficult group. There was no significant difference between the three groups in terms of complication rates ($p = 0.329$).

DISCUSSION

Many complications have been published in the urology field since the definition of laparoscopic surgery. Complications of laparoscopic urological procedures rates are variable and were given in the literature from 4.4% to 23.1% [6-16]. In their early laparoscopic experience, Parra *et al.* [5] reported their rate of complications 15%. Soulie *et al.* [8] found an overall complication rate of 6.9% in a large study with 1.085 cases. In parallel with the increasing number of performed more complex urological laparoscopic surgery, published complication rates have increased. Vallancien *et al.* [9] reported a complication rate as 22% and an open conversion rate as 1.2%. Sanli *et al.* [10] reported a 23.1% rate of overall complications. In our study, we have found a 13.4% rate of total complications with 10.9% and 2.5% of minor and major complication rates, respectively. Our open conversion rate was 0.84%.

Guillonnet *et al.* [4] have defined a novel scoring system that classifies all laparoscopic procedures according to their difficulty and complexity. The ESS is the most effective scoring system to provide the integrity of a scientific common language and to standardize the results of the studies about laparoscopic urologic procedures. Inoue *et al.* [11] divided each procedure into three groups according to the ESS. For the easy, difficult, and very difficult groups; the complication rates were 0%, 13.2% and 12.8%, respectively. They demonstrated that the complication rate was significantly low in the easy group and that the nephroureterectomy had the highest rate [11]. In our study, the procedures with the highest complication rates were partial nephrectomy, nephroureterectomy and ureterolithotomy. When the groups were separated as “easy”, “difficult” and “very difficult”, no significant difference was observed in complication rates.

It has been found that simpler procedures such as renal cyst excision or simple nephrectomy were gen-

erally performed in the first years of the learning curve, and more complicated operations like donor nephrectomy or partial nephrectomy were performed with the increasing experience over the years. With this result, we thought that, despite more difficult procedures like partial nephrectomy or nephroureterectomy having higher complication rates, the complication rates were similar between three divided groups due to performing more complicated operations with more increased experience over the years. In the light of this analysis; we think that the complication rates can be kept low by preferring easier operations in terms of ESS score in the first year of learning curves.

Studies have shown that the presence of a high American Society of Anesthesiologists (ASA) score is associated with high complication rates [10-13, 17]. There was no relationship between any parameters with complications or open conversions in our study. We have found that the complication and open conversion rates were similar in transperitoneal and retroperitoneal procedures [18].

The main strengths of our study are the presentation of a large series, including all patients treated by a single surgeon from the beginning of the learning curve. The most important limitation is the retrospective nature.

CONCLUSION

Performing easier operations according to ESS in the first years of the learning curve is beneficial in preventing complications. With increasing experience, more complex procedures can be performed with similar complication rates, but complication rates are still high in “very difficult” operations such as partial nephrectomy and nephroureterectomy.

Authors' contribution

Study Conception: ME, VT; Study Design: ME, SŞ, NCŞ; Supervision: KGŞ, VT, SŞ; Funding: İE, SK, VT; Materials: İE, SK, VT; Data Collection and/or Processing: SK, AHY, DNÖ; Statistical Analysis and/or Data Interpretation: ME, SŞ, SK; Literature Review: ME, SŞ, İE, SK, VT; Manuscript Preparation: ME, VT, KGŞ, DNÖ and Critical Review: KGŞ, İE, SK, VT.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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