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T1a/T1b evre renal tümörlerde laparoskopik parsiyel nefrektomi: Biz neredeyiz?

Laparoscopic artial nephrectomy in T1a/T1b stage renal tumors: Where we are?

Mehmet Salih Boğa[1], Murat Savaş[2], Mahmut Ekrem İslamoğlu[1], Mehmet Giray Sönmez[3], Kayhan Yılmaz[1], Mahmut Taha Ölçücü[1], Kaan Karamık[1], Çağatay Özsoy[1], Mutlu Ateş[1]

1 University of Health Sciences, Antalya Training and Research Hospital, Department of Urology, Antalya, Turkey
2 Memorial Hospital, Department of Urology, Antalya, Turkey
3 Necmettin Erbakan University, Meram Medical Faculty, Department of Urology, Konya, Turkey

ÖZET

Amaç: T1a / T1b evre böbrek tümörlerinde laparoskopik parsiyel nefrektomi yapılan hastalara ait (LPN) demografik verileri, perioperatif ve postoperatif sonuçları rapor etmeyi amaçladık.
Gereç ve Yöntemler: Retrospektif olarak Mayıs 2015 - Ekim 2018 arasında normal kontralateral böbreği olan ve LPN yapılan 60 hasta değerlendirildi. Demografik, perioperatif ve postoperatif sonuçlar literatür ile değerlendirildi ve tartışıldı.
Bulgular: Çalışmaya 42 hasta dahil edildi. Ortalama yaş, tümör boyutu ve RENAL skorları sırasıyla 60.52 (± 10.51), 3.58 (± 1.55) cm ve 6.548 (± 1.17) idi. Sıcak iskemi süresi 26,88 (± 6,27) dakika idi. Ortalama ameliyat süresi, tahmini kan kaybı, hastanede kalış süresi, 162.26 (± 38.97) dk, 166.79 (± 98.32) mL ve 3.45 (± 0.89) gündü. Preoperatif ve postoperatif tahmini glomerüler filtrasyon hızı (eGFR) sırasıyla 76.83 (± 18.36) ve 71.93 (± 20,12) mL / dak / 1.73 m2 idi. eGFR azalması ameliyat sonrası 3 ayda 4.9 (% 6.38) mL / dak / 1.73 m2 idi. Postoperatif komplikasyon oranı, cerrahi sınır durumu ve eGFR azalması literatür ile benzer olarak bulundu. Ortalama takip süresi 21.02 (± 13.26) aydı.
Sonuç: Her ne kadar LPN uzun bir öğrenme eğrisine sahip olsa da, seçilmiş renal tümör vakalarında mükemmel onkolojik ve fonksiyonel sonuçlarla kabul edilebilir komplikasyon oranları ile uygulanabilen güvenli bir PN yöntemidir.

Anahtar Kelimeler: *Laparoskopik parsiyel nefrektomi, minimal invaziv cerrahi, renal tümör*

ABSTRACT

Objectives: To report the demografics, operative and postoperative outcomes of laparoscopic partial nephrectomy (LPN) in T1a/T1b stage renal tumors.
Material and Methods: In total of 60 patients were evaluated, retrospectively who underwent LPN with a normal contralateral kidney, between May 2015 and October 2018. Demographics, perioperative and postoperative outcomes were evaluated and discussed with the literature.
Results: 42 patients were included in the study. The mean age, tumor size and RENAL scores were 60.52 (± 10.51) years, 3.58 (± 1.55) cm and 6.548 (± 1.17), respectively. The duration of warm ischemia time was 26,88 (± 6,27) minutes. The mean operative time, estimated blood loss, length of hospital stay time were 162.26 (± 38.97) min, 166.79 (± 98.32) mL and 3.45 (± 0.89) days, respectively. Preoperative and postoperative estimated glomerular filtration rate (eGFR) were 76.83 (± 18.36) and 71.93 (± 20,12) mL/min/1.73 m2, respectively. eGFR decrease was 4.9 (6.38%) mL/min/1.73 m2 at the 3 months postoperative. The rate of postoperative complications, surgical margin status and eGFR decrease were similer to literature. The mean follow-up time was 21.02 (± 13.26) months.
Conclusion: There was no significant difference in both groups in terms of operation time, complication, amount of irrigation fluid used, duration of surgery and length of hospital stay. However, in terms of stone-free rate, digital flexible URS was superior to fiberoptic flexible URS (p <0.05).

Keywords: Digital flexible ureteroscope, fiberoptic flexible ureteroscope, stone free, RIRS

This study was approved by the local ethical committee (Approval number: 2019/24/13). All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

Corresponding Author : Mehmet Giray Sönmez, Yunus Emre Köşesi, Meram Tıp Fakültesi, 42080, Konya, Turkey
Tel: +90 532 604 75 45 ***e-mail:*** drgiraysonmez@gmail.com

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INTRODUCTION

Renal Cell Cancer (RCC) is 2-3% of all cancers and is among the most common cancers in western countries [1]. The number of early stage renal tumors has increased with the widespread use of imaging methods. Partial nephrectomy is recommended for the preservation of renal function since similar oncologic outcomes and complication rates are obtained in Parttial nephrectomy (PN) compare to Radical nephrectomy (RN) in early stage / localized T1 (<4cm) tumors [2]. Recently, the indications for PN were extended to include T2 renal tumors, even if the contralateral kidney was normal [3].

The expectation of an ideal partial nephrectomy is surgical magrin (SM) negativity, minimal deterioration in renal function and no complications, defined as the term of "Trifecta ". [4,5].

However, the ideal warm ischemia time (WIT) safety threshold is a debate, and studies show that WIT should be kept <20–25 minutes as far as possible, and especially the ischemia rate is shown to increase for every minute over 25 minutes causing long-term RF deterioration [6]. The negative effects of warm ischemia on postoperative renal function and the use of new technologies in surgery led to the development of instruments and different operation techniques that aimed at decreasing parenchymal ischemia.

Minimally invasive techniques provide better cosmetic results, less postoperative pain, and shorter hospitalization length compare to open surgery [7]. LPN has been successfully applied in many advanced centers with similar oncological and functional results as open PN.

In this study, we aimed to discuss the demographic, operative and postoperative outcomes of LPN cases performed in our clinic with the actual literature.

MATERIAL AND METHODS

A total of 60 cases who underwent LPN in our department between April 2015 and October 2018 were evaluated. Patients with solitary kidneys, open nephrectomies, zero ischemic and retroperitoneal LPNs, multiple and other than T1a/T1b renal masses and a follow-up of less than 3 months were excluded from the study. As a result, 42 patients were included in the study.

Contrast-enhanced tomography (CT) or magnetic resonance imaging (MRI) was performed to evaluate the renal mass. The demographic data of the patients as age, gender and additional diseases such as diabetes, hypertension and CAD that may affect renal functions were recorded.

RENAL scores were calculated by recording tumor size, pole location (upper-middle-lower), anterior-posterior location, endophytic-exophytic location and nearness to collecting system [8].

WIT, operative time (OT) and estimated blood loss (EBL) were recorded. The duration of the operation was defined as the time (min) between the first incision until suturing. WIT calculated as the time (min) of between insertion and opening of the bulldog clamp in the renal artery.

Complications were classified according to the Clavien-Dindo classification system [9].Histologic subtype, pathological stage, Fuhrman grade and surgical margin status were evaluated in pathology specimens. Pathological staging was performed according to TNM classification. Preoperative and 3 months postoperative eGFR values were calculated using the Modification of Diet in Renal Disease (MDRD) formula using age, gender, and ethnicity [10]. The changes between the two eGFR values were calculated and recorded. Institutional ethics committee approval obtained with number 24/13 for this retrospective study.

Surgical Technique

Transperitoneal approach was applied for all patients. Following general anesthesia, left or right lateral decubitus position was performed acording the side of the tumor. Pneumoperitoneum was created with a intra-abdominal pressure of 12-15 mmHg by inserting a Veress needle 1-2 cm superior to the umbilical level from the lateral of the rectus muscle. The optic port was placed at this point where the pneumoperitoneum was created. A total of 4 ports were placed, 1 for right (12mm) and 1 for left (5mm) due to dissection and one for the retraction (5mm) port. If necessary, one more port (5mm) was placed for retraction or traction.

ENDOÜROLOJİ BÜLTENİ ENDOUROLOGY BULLETIN

The colon was deviated medially from the Toldt line. Hepatorenal or splenorenal ligament was released depend on side of the kidney with tumor. The ureter and gonadal vein were identified on the psoas. These structures were followed by cranial dissection and renal hilum was reached. The arterial and venous structures of the renal hilum were dissected separately.

Perinephric adipose tissue was released from the capsule except the adipose tissue covering the tumor. Aroud the tumor was marked with a monopolar cautery, leaving a safety margin of approximately 5 mm. The renal artery first than renal vein clamped with bulldog clamps. The duration of WIT was recorded. Than the tumor was resected from the marked points with cold scissor and placed into a laparoscopic bag via the working port (12mm).

The collector system and vascular structures in the tumor bed were sutured with 3/0 V-Lock with fixed a Hem-o-Lok clip at the end. Than renorrhaphy was completed using 2/0 Vicryl and 2/0 Monocryl suture material fixed with Hem-o-Lok clip to bring the renal parenchyma closer. The bulldog clamps were opened and warm ischemia was terminated.

The Gerota fascia was closed and the colon was sutured to its original position. A silicon lodge drain was placed and the specimen in the laparoscopic bag was taken out of the body through the camera port which was enlarged by a small incision.

Patients' renal function was evaluated postoperative 1 day, 1 month, 3 months and every 6 months postoperative for 2 years than followed annually. MRI or CT was preferred depend on the oncologic risk factors of the patients.

Statistical Analysis

Statistical analysis was performed with SPSS, v.23.0 statistical software (SPSS, Inc. Chicago, IL, USA). Chi square tests are used to understand distributions of categorical variables. Categorical variables are described by frequencies and percentages. Continuous variables are presented as mean and standard deviations. One samples t-test test are used for the evaluation of continuous variables

RESULTS

Of the 42 patients included in the study, 11 (26.2%) were female and 31 (73.8%) were male. The mean age was 60.52 (± 10.51) years. Eighteen (42.86%) of the patients had additional diseases such as diabetes, hypertension or coronary artery dissease. The mean preoperative tumor diameter, RENAL score and eGFR were 3.58 (± 1.55) cm, 6.548 (± 1.17) and 76.83 (± 18.36) mL/min/1.73 m2, respectively. Twenty-eight (66.7%) of the tumors were in the right and 14 (33.3%) in the left kidney. Patients and preoperative tumor characteristics are shown in Tables 1.

Table 1. **Patient and preoperative tumor characteristics**

Variables	Mean (± SD / %)
Gender	
Female	11 (26.2%)
Male	31 (73.8%)
Age	60.52 (± 10.51)
Follow-up period (month)	21.02 (± 13.26)
Comorbidities (HT, DM, CAD)	18 (42.86%)
Preop. eGFR (mL/min/1.73 m2)	76.83 (± 18.36)
Tumor diameter (cm)	3.58 (± 1.55)
Tumor side	
Left	14 (33.3%)
Right	28 (66.7%)
RENAL score	6.548 (± 1.17)

Abbreviations: eGFR, estimated glomerular filtration rate; HT, hypertension; DM, diabetes; CAD, coronary artery dissease.

The mean WIT was 26,88 (± 6,27) minutes. Operative time, EBL and transfusion were 162.26 (± 38.97) min., 166.79 (± 98.32) mL and 9.5%, respectively. The length of the lodge drain and hospital stay were 2.52 (± 0. 67) and 3.45 (± 0.89) days.

In the patologic staging of the patients, 28 (66.7%) were T1a and 14 (33.3%) were T1b stage. The pathologic types were clear cell carcinoma (24 cases), chromophobe cell carcinoma (8), papillary cell carcinoma (5), angiomyolipoma (3), cystic cell carcinoma and mixt (CCC+ eosinophilic)(1) type carsinoma. Distrubution of the pathologic grade was 5 (11,9%) cases in Grade 1, 22 (52.4%) in Grade 2, and 15 (35.7%) in Grade 3. Surgical magrin positivity occured in 2 (4.76%) cases.

When the intraoperative complication rates were evaluated, ureter injury (1 case) and renal vein injury (1 case) were observed. In the ureteral injury, 4.8 f DJ stents were placed and primary repair was performed with 4.0 vicryl witout convertion to open. Renal vein injury repaired by convertion to open and partial nephrectomy was completed with primary repair. Convertion to open occured in one case more, because the bleeding could not be controlled following the tumor resection. In this case PN was also successfully completed without any additional complications. Clavien 1-2 complications were observed in 2 postoperative patients, blood transfusion was performed in these two patients due to the decrease in blood values. Clavien 3-5 complications were not observed in our series. The operative and postoperative outcomes are shown in Tables 2.

Table 2. **Perioperative and postoperative outcomes**

Variables	Mean (± SD / %)
Warm ischemia time (minute)	26.88 (± 6,27)
Operative time (minute)	162.26 (± 38.97)
Estimated blood loss (mL)	166.79 (± 98.32)
Lodge drainage time(day)	2.52 (±0.67)
Length of hospital stay (day)	3.45 (± 0.89)
Positive surgical margin	2 (4.76%)
Transfusion rate	4 (9.5%)
Convertion to open	2 (4.76%)
Postoperative eGFR (mL/min/1.73 m2)	71.93 (± 20.12)
Change of eGFR (mL/min/1.73 m2)	4.9 (6.38%)
New onset stage 3 and 4 renal insufficiency	0 (0%)
Patology type	
Clear cell carcinoma	24 (57.1%)
Chromophobe cell carcinoma	8 (19.0%)
Papillary cell carcinoma	5 (11.9%)
Angiomyolipoma	3 (7.1%)
Cystic cell carcinoma	1 (2.4%)
Mixt (CCC+ Eozinofilic)	1(2.4%)
Patologic grade	
Grade 1	5(11.9%)
Grade 2	22(52.4%)
Grade 3	15(35.7%)
Patologic Stage	
T1a	28 (66.7%)
T1b	14 (33.3%)
Complication	
Clavien 1-2	2 (4.76%)
Clavien 3-5	0 (0%)

Abbreviations: eGFR, estimated glomerular filtration rate; CCC, clear cell carcinoma

The mean follow-up period was 21.02 (± 13.26) months. The mean eGFR values of the patients in the 3 months postoperative was 71.93 (± 20.12) mL/min/1.73 m2 and the eGFR change was 4.9 (6.38%) according to the preop eGFR (76,83 (± 18,36) mL/min/1.73 m2).

Disscusion

The importance of nephron-sparing surgery in small tumors has become more prominent by the demonstration of direct correlation between renal function impairment and cardiovascular disease [11].

Although there are methods such as laparoscopic radioablation and robot-assisted partial nephrectomy (RAPN) as an alternative to LPN, studies have shown that LPN is superior to long-term oncologic outcomes to ablative treatments and cost efectivity to RALN [12,13].

An ideal partial nephrectomy would be surgical margin negativity, minimal renal impairment and no complications. Surgical margin positivity has been reported between 1-5.5% in the literature [14]. Marszalek et al reported SM positivity as 4% in their LPN series with 100 patients [15]. Also Kızılay et al[16] (71 cases) and Mehra et al[17] (14 cases) reported SM positivity rates as 4.2% and 7.14%, respectively. In the current study, SM positivity was 2 (4.76%), similar to the literature.

Although the learning curve is long in LPN compared to RPN, it is reported that the complication rates are comparable with open and RPN [7, 18]. In our study, complications were observed in 2 cases during the operation. In the postoperative early period (0-90 days), minor complication (clavien 1-2) rate was 4.76% , while major complication (clavien 3-5) was not observed.

In the literature, complication and transfusion rates were reported as 8-24% and 4.5-11.8%, respectively [19]. Gong et al 76 reported the rate of minor and major complications as 2.5% and 8%, respectively [20]. Gill et al reported urological complication rates between 3.8-9.4% acording to their experience eraof LPN series[21]. Wang et al reported urological complications as 6.45% after LPN [22]. The rate of convertion to open was between 1.3-7.9% in the literature, it was 2 (4.76%) in our study.

The most important reason for the increase in the utilization of PN instead of RN in small renal masses is the expectation of better renal function via preserving the renal paranchima. However, prolongation of WIT during resection in PN causes renal ischemia, leading to impaired renal function.

In the current study, the WIT was 26,88 (± 6,27) minutes. Pavan et al reported WIT of the LPN series between 19.7- 35.3 minutes in their review study[23]. Gill et al (771 cases)[21], Marszalek et al (100)[15], Gong et al (76)[20], Benvay et al(118)[24], Kural et al (20)[25] reported WIT as 30.7, 31, 32.8, 28.4 and 35.8 minutes, respectively. Although the WIT was slightly above the recommended value in the current study, it was similar to the developed centers in the literature [23]. We think that the reason of this higher levels can be depend on the presence of surgeons in the learning curve besides the experienced surgeons in our study.

In the current study, the decrease in renal function in the third month was 4.9 (6.38%), which was similar to the literature. Tachibana et al reported a decrease in eGFR of 8.45% (71 ± 14 mL/min/1.73 m2 to 65 ± 14 mL/min/1.73 m2) in the 3 month postoperative [26]. New onset stage 3 and 4 renal insufficiency was not seen in the third month postoperative.

Operative time and peroperative blood loss are factors that may affect renal function. Studies have reported that operative time and WIT are more effective in short-term renal function, whereas peroperative hemorrhage is effective in both short- and long-term renal function [27]. In the literature, operation time was reported as between 115.6-241 minutes and EBL was reported as between 112.5-322 mL [22,23]. In the current study, operative time and EBL were similar to the literature with 162.26 (± 38.97) min and 166.79 (± 98.32) mL, respectively.

Early recovery and short hospitalization are important advantages of minimally invasive surgery. Duration of hospital stay in reported publications is between 2.5-5 days[22]. In our study, the length of drainage and hospital stay were 2.52 (± 0.67) and 3.45 (± 0.89) days, respectively.

We have some limitation factors for this study. The first is that due to the presence of multiple surgeons in the study the results may vary depend on surgeon-related factors. Secondly, the low number of LPNs due to robotic surgery preferred in most cases after the introduction of daVinci Robot system to our department. The third limiting factor was the absence of recurrence, survey and long-term renal function results in the study.

CONCLUSION

The utilization of minimally invasive surgery among the urologists has become widespread due to short hospital stay, beter recovery period and cosmetic advantages. Although learning curve is long in LPN, it can be safely applied in selected cases with excellent oncologic and functional results with acceptable complication rates.

Acknowledgments

Written informed consent of each patient was obtained before the surgery, and our study was conducted according to the principles of Helsinki Declaration. Institutional ethics committee approval obtained with number 2019/24/13 for this retrospective study. All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

Disclosure

The authors report no conflicts of interest in this study.

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