Running Head: **Retroperitoneal partial nephrectomy**

Retroperitoneal Nephrometry Scoring System (RETRO) for Minimal-Invasive Partial Nephrectomy

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Authors contribution statement

SYY, LXZ and SW had full aaccess to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: SYY, LXZ, PW, SW.

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Analysis and interpretation of data: SYY, PW, QH, YD, DX.

Drafting of the manuscript: SYY, LXZ, DX.

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Conflict of Interest

The authors declared that there is no conflict of interest.

Ethics statement

The study was obtained local ethic committee approval.

Data sharing statement

We can share our data with the journal for representing analysis and interpretation of the data. However, we do not want the readers to view or download our data.

Abstract

Purpose: To propose a standardized scoring system of renal tumors suitable for partial nephrectomy based on mini-invasiveness and retroperitoneal approach.

Materials and Methods: One-hundred and five patients in retroperitoneal group were prospectively enrolled from January 2017 to December 2018. Perioperative characteristics of all patients were collected: age, gender, BMI, preoperative blood test and imaging results, operation time (the time period starts from the skin incision to the final skin closure), estimated blood lost, clamping time, complications within 30 days, American Society of Anesthesiologists (ASA) score, pathology. An algorithm was extracted, and it was used to predict the risk of complications.

Results: Symptoms, ASA score and RETRO score were significantly correlated to postoperative complications, excluding tumor size, ischemia time and operation time. Adjusted RETRO points were an independent factor to predict complication rate (p=0.006). Limitation was that it did not analyze the relationship between the RETRO score and the long-term outcomes.

Conclusions: The RETRO score simplifies the risk evaluation of partial nephrectomy for patients with renal tumor, especially benefits those surgeries performed under robot-assisted laparoscope via retroperitoneal approach. The new RETRO score system that we developed is a selection criterion to perform surgery via different approach, and an accurate system to evaluate the complexity during partial nephrectomy.

Key Words: Partial nephrectomy; Retroperitoneal nephrometry; surgical approach; score system; mini-invasive

Background

Partial nephrectomy (PN) is becoming the standard treatment for patients with low-stage renal tumor [(1)]. The 2019 updated Guidelines on renal cell carcinoma illustrated that localized T1 tumors are best managed by partial nephrectomy rather than radical nephrectomy, irrespective of the surgical approach (LE: 1b). Tan et al. analyzed more than 3000 patients with low-stage renal cell carcinoma under radical nephrectomy or partial nephrectomy, they found that the long-term overall survival was similar between radical and partial nephrectomy [(2)]. While the risk of development of metabolic or cardiovascular disorders is increased after radical nephrectomy [(3)]. Patients with T2a also received PN, estimated blood lost and perioperative complications were higher, the all-cause mortality and oncologic outcomes were similar compared to radical nephrectomy (RN)[(4,5)].

With the development of robot-assisted surgical technique, more and more patients received robot-assisted laparoscopic partial nephrectomy. Off-clamp technique was used in totally endophytic renal tumors under robotic platform[(6)]. There are different approaches for partial nephrectomy, transperitoneal way is undertaken by most urologists over the world. Retroperitoneal approach also has its unique advantages, especially for those tumors located posterior side of the hilar, the kidney does not need to be mobilized around [(7)]. It saves time and makes the manipulation much more easily.

The nephrometry scoring system-R.E.N.A.L was reported in 2009 [(8)]. It gave a qualitative and standardized evaluation system for various tumors. Lots of other nephrometry scoring systems also emerged, PADUA classification, C-Index method, and NePhRO system et al. [(9-11)]. However, none of these scoring systems are correlated with different surgical approaches.

Especially for surgeons who are used to perform PN via retroperitoneal way, there is no evaluation criteria to be used.

The objectives of this study are (1) to propose a standardized scoring system of renal tumors suitable for partial nephrectomy based on mini-invasiveness and retroperitoneal approach; (2) to evaluate the effectiveness and predict overall complications after PN according to this classification system.

Methods

Patients and tumors

We prospectively included 122 patients who underwent Robot-Assisted Laparoscopic Partial Nephrectomy (RALPN) between January 2017 and December 2018. Inclusion criteria: (1) clinical stage 1 (cT1) renal tumors; (2) solitary kidney tumor; (3) age<80 years; (4) enhanced CT was performed in our medical center. Patients with abnormal coagulation function or acute inflammation (temperature>38.0℃) were excluded. Among these patients, 105 cases received the operation through retroperitoneal approach, 17 cases were via transperitoneal way. All these surgeries were performed by one surgeon (Dr. Wang), minimizing the methodological bias. All included patients received non-invasive renal angiography through computed tomography (CTA) examination. Three urologists independently read CT images and evaluated these parameters of each tumor: (1) diameter of the tumor (**R**adius); (2) **E**ndophytic; (3) relationships with anterior lip (**T**ransperitoneal/retroperitoneal); (4) relationships with renal vessel trunk (vessel **R**ete), vessel trunk includes the first and secondary renal artery/vein, or the diameter of the artery is larger than 3 mm; (5) relationships with renal polar (**O**rigin). We call it **RETRO** nephrometry classification system (Table 1).

When tumors locate in the front lip of the hilum, the manipulation will become difficult via retroperitoneal approach. The transperitoneal way is recommended. The definition of the "front lip" is that the space contains in the front side of the hilum, the inner boundary line is the inner edge of the kidney, the outer boundary is the line links the orifice of the hilum, the upper boundary is the line links the high point of the orifice and the up corner of the hilum, the inferior boundary is the line links the lower point to the orifice and the lower corner of the hilum (see Figure 1a). This space is a "forbidden zone" when the retroperitoneal approach is used. Tumors in this area are difficult to be handled, and it's hard for surgeon to do the resection and suture. Any tumor which "invades" this "forbidden zone" will be recommended to be removed from transperitoneal group (see Figure 1d). Otherwise, retroperitoneal way is suggested when tumors locate in other area of the kidney. The first parameter is an impression for the surgeon to judge which surgical approach is best for the patient.

The maximal diameter of the tumor is also a critical factor affecting the surgical manipulation. One point is given to tumors that are 2cm or smaller, 2 points are given to tumors between 2-4 cm, 3 points are given to tumors between 4-6 cm, and each 2 cm larger gets another 1 point. No ceiling of the score is set. The classification is different from the TNM staging system, because the retroperitoneal cavity is not as large as the peritoneal space, and the diameter plays a more sensitive role (see Figure 1b).

Another parameter is the percent of the protrusion of tumors. Exophytic masses are easily to be resected than endophytic one. Totally endophytic tumor is assigned 3 points. Tumors that are 50% or more endophytic are assigned 2 points. Tumors that are less than 50% endophytic are assigned 1 point (see Figure 1c).

The relationship between the tumor and main vessels also affects the surgical manipulation. Main vessels include the primary or secondary artery/vein, or those with diameter larger than 3mm. The distance that is 0.6cm or larger is assigned 1 point. The distance which is less than 0.6cm is assigned 2 points. If the tumor closely touches or compresses main vessels, or vessels go through the tumor, 3 points are assigned (see Figure 1e).

It is assigned 1 point if tumors originate from the middle 1/3 portion of the outer boundary edge. Tumors that originate from the superior or the inferior 1/3 of the outer edge are assigned 2 points. Based on 2 points, tumors which are on the ventral side of kidney are assigned as 3 points (see Figure 1f).

Patients received retroperitoneal RALPN in full flank (decubitus) position. Vessel clamping was routinely used. All tumors were removed with an adequate margin to make sure the integrity of pseudo capsule. Clinical features of all patients were collected: age, gender, BMI, preoperative blood test and imaging results, operation time (the time period starts from the skin incision to the final skin suture), estimated blood lost, clamping time, complications within 30 days, American Society of Anesthesiologists (ASA) score, pathology. Postoperative complications were evaluated by the Clavien-Dindo classification system [12,13].

Statistical analysis

The student *t* test was used for continuous variables, and they were given as the mean plus standard deviation (The homogeneity of variance of each test has been assessed). The Mann-Whitney U test was used for non-Normally distributed continuous variables, and they were given as the median and interquartile range (IQR). The Pearson or Likelihood Ratio χ^2 test was used for categorized variables. Both Logistic regression and ROC curve were used (The

multicollinearity of independent variables has been assessed). Backward: Conditional method was used in regression analysis. Y was a dependent variable, X_1, X_2, X_3--- were independent variables, $Y= b_0+b_1X_1+b_2X_2+---+b_kX_k$, probability $P=\frac{e^Y}{1+e^Y}$. A two-sided $p<0.05$ was considered statistically significant. All data were analyzed with the Statistical Package for Social Sciences software, v.20.0 (SPSS Inc., Chicago, IL, USA).

Results

In retroperitoneal group, 63 patients (60.0%) were male and 42 patients (40.0%) were female. The median age was 54y (IQR: 46-63), and the median BMI was 24.3 (IQR: 22.2-26.3). In transperitoneal group, 12 patients (70.6%) were male and 5 patients (29.4%) were female. The median age was 56y (IQR: 53-63), and the median BMI was 22.6 (IQR: 20.8-25.0) (Table 2). Among the perioperative characteristics, most were comparable between two groups. While BMI, operation time and overall complication rate were significantly different. Operation time was a little longer, and overall complication rate was also higher in transperitoneal group. BMI was higher in retroperitoneal group, that might because we preferred to use retroperitoneal approach for patients with relatively high BMI. The operation time was longer in transperitoneal group, that because the time of preparing patients' position, placement of trocars and the skin closure were longer. The post-operative complication rate (GradeI) was high in transperitoneal group, there were 14 cases (82.4%) after operation. The ischemia time was similar. It was 18 (IQR:15-22.5) minutes in retroperitoneal group, and 17 (IQR:12-27.5) minutes in transperitoneal group (p=0.891).

In univariate analysis (Table 3), symptoms, ASA score and RETRO score were related to postoperative complications in retroperitoneal group. The median RETRO score was 7 (IQR:

5-9). And the score of RETRO classification could significantly affected the postoperative complication rate ($p<0.05$). The other factors did not impact on complication, even the radius did not affect the overall complication rate. While in the transperitoneal group, the radius was the only factor which had a significant impact on complication rate.

In logistic regression analysis, the overall complication rate in retroperitoneal group was associated with symptoms, ASA score and RETRO score. The algorithm was extracted from the logistic analysis, $Y=-2.413+20.909X_1+0.729X_2+0.972X_3$, X_1 indicated symptoms, X_2 indicated ASA score, and X_3 indicated RETRO score. Complication probability $P=\frac{e^Y}{1+e^Y}$. RETRO score was classified into three categories, 4-6 was indicated 1 point, 7-10 was indicated 2 points, and ≥11 was indicated 3 points. If a patient had symptom ($X_1=1$), ASA score was 3 ($X_2=3$), RETRO score was larger than 11 ($X_3=3$), then $Y=-2.413+20.909x1+0.729x3+0.972x3=23.599$, $P=\frac{e^Y}{1+e^Y}\approx1$. This patient was most probably had a complication. Another finding from the regression analysis was that patients with RETRO scored 2 were 1.85-fold higher risk of complication compared to those patients with RETRO scored 1. The complication risk of patients with RETRO scored 3 points were dramatically higher compared to those with RETRO scored 1 point.

During the 1-year follow-up, two cases in transperitoneal group relapsed. The pathology is clear cell renal carcinoma (ccRCC, Fuhrman grade III) and papillary renal cell carcinoma (pRCC). The recurrence rate in transperitoneal group was significantly higher than that in retroperitoneal group ($p=0.008$). The 2-year progression-free survival rate in retroperitoneal group was 99%, while it was 88.2% in transperitoneal group.

Discussion

This study originally proposed a new nephrometry scoring system for PN via retroperitoneal approach. It was named "RETRO" scoring system. Furthermore, a formula was extracted from the logistic analysis, which could predict the probability of the post-operative complication rate. The main factors affecting the complication rate were symptoms, ASA score and RETRO score. The fat round the kidney, especially the adhesive perinephric fat would bring difficulties during the surgery [14]. The adhesive perinephric fat did have a significant influence during the laparoscopic single-site donor nephrectomy [15]. All patients included in this study received operations under robot-assisted laparoscope. RALPN had lower morbidity and incidence of CKD upstaging [16-18]. A novel trifecta for RALPN was conceived[19]. Off-clamp technique was recommended since it decreased the probability of severe chronic kidney disease in the long-term[20].

The "RETRO" classification system includes five major parameters. The "T" indicates the approach for operation. Tumors those invades "forbidden zone" do not mean that they cannot be removed through retroperitoneal way. It indicates the manipulation via retroperitoneal cavity will become very complicated. It needs more operation time and retroperitoneal experience. The other four parameters are quantitative factors. According to our experience, the nearness to major vessel is more critical than that to the collecting system. And under the 3D scope, the collecting system is more easily to be noticed and repaired. On the contrary, the vessel trunks near the mass should be more taken care of. It was reported that the hemorrhage was among 4%-5% after partial nephrectomy, and they needed invasive treatment instead of blood transfusion [21,22]. Thus, in our series, all cases received robot-assisted laparoscopic nephrectomy and were performed by the same surgeon. It avoided the heterogeneity caused by

the surgical tools and different manipulation skills. The fourth parameter is the polar location of the mass. Under retroperitoneal way, it will be easier if the mass nears the renal equator. The two polar tumors are more difficult to be exposed and make the suture more complicated.

Conclusions

Different renal tumor conditions need individualized treatment strategy. The "RETRO" scoring system provides an approach selection and evaluation criterion for surgeons, especially for those used to perform PN via retroperitoneal approach under mini-invasive platform, and predicts a postoperative complication rate estimation. RETRO nephrometry system is a beneficial addition to REANL and PADUA scoring systems.

Table 1. The specific score associated with each retroperitoneal anatomical feature included in RETRO classification.

Table 2. Perioperative characteristics of included patients.

Table 3. Factors related to complications: univariate analysis.

Figure 1. (a) The blue square space is the "front lip"; (b) tumor size classification; (c) endophytic degree of tumors; (d) if tumor invades the "front lip", transperitoneal approach is recommended; (e) The relationship with major vessels; (f) polar location of the tumor.

Figure 2. RETRO score, 2+2+1+1=6; RENAL score, 1+2+1+a+3=7a.

References:

1. Ljungberg B, Albiges L, Abu-Ghanem Y, et al. European Association of Urology Guidelines on Renal Cell Carcinoma: The 2019 Update. *European urology.* May 2019;75(5):799-810.

2. Westerman ME, Cheville JC, Lohse CM, et al. Long-Term Outcomes of Patients With

Low Grade Cystic Renal Epithelial Neoplasms. *Urology.* Nov 2019;133:145-150.

3. Capitanio U, Terrone C, Antonelli A, et al. Nephron-sparing techniques independently decrease the risk of cardiovascular events relative to radical nephrectomy in patients with a T1a-T1b renal mass and normal preoperative renal function. *European urology.* Apr 2015;67(4):683-689.

4. Simone G, Tuderti G, Anceschi U, et al. Oncological outcomes of minimally invasive partial versus minimally invasive radical nephrectomy for cT1-2/N0/M0 clear cell renal cell carcinoma: a propensity score-matched analysis. *World journal of urology.* May 2017;35(5):789-794.

5. Mir MC, Derweesh I, Porpiglia F, Zargar H, Mottrie A, Autorino R. Partial Nephrectomy Versus Radical Nephrectomy for Clinical T1b and T2 Renal Tumors: A Systematic Review and Meta-analysis of Comparative Studies. *European urology.* Apr 2017;71(4):606-617.

6. Tuderti G, Brassetti A, Mastroianni R, et al. Expanding the limits of nephron-sparing surgery: Surgical technique and mid-term outcomes of purely off-clamp robotic partial nephrectomy for totally endophytic renal tumors. *International journal of urology : official journal of the Japanese Urological Association.* Apr 2022;29(4):282-288.

7. Chiruvella M, Ghouse SM, Tamhankar AS. "Polar flip" technique for transperitoneal laparoscopic partial nephrectomy - Evolution of a novel technique for posterior hilar tumors. *Indian journal of urology : IJU : journal of the Urological Society of India.* Jul-Sep 2019;35(3):230-231.

8. Kutikov A, Uzzo RG. The R.E.N.A.L. nephrometry score: a comprehensive standardized system for quantitating renal tumor size, location and depth. *The Journal of urology.* Sep 2009;182(3):844-853.

9. Ficarra V, Novara G, Secco S, et al. Preoperative aspects and dimensions used for an anatomical (PADUA) classification of renal tumours in patients who are candidates for nephron-sparing surgery. *European urology.* Nov 2009;56(5):786-793.

10. Simmons MN, Ching CB, Samplaski MK, Park CH, Gill IS. Kidney tumor location measurement using the C index method. *The Journal of urology.* May 2010;183(5):1708-1713.

11. Hakky TS, Baumgarten AS, Allen B, et al. Zonal NePhRO Scoring System: A Superior Renal Tumor Complexity Classification Model. *Clin Genitourin Canc.* Feb 2014;12(1):E13-E18.

12. Clavien PA, Sanabria JR, Strasberg SM. Proposed classification of complications of surgery with examples of utility in cholecystectomy. *Surgery.* May 1992;111(5):518-526.

13. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Annals of surgery.* Aug 2004;240(2):205-213.

14. Davidiuk AJ, Parker AS, Thomas CS, et al. Mayo Adhesive Probability Score: An Accurate Image-based Scoring System to Predict Adherent Perinephric Fat in Partial Nephrectomy. *European urology.* Dec 2014;66(6):1165-1171.

15. Yanishi M, Kinoshita H, Koito Y, et al. Adherent Perinephric Fat Is a Surgical Risk Factor in Laparoscopic Single-Site Donor Nephrectomy: Analysis Using Mayo

Adhesive Probability Score. *Transplantation proceedings.* Jan - Feb 2020;52(1):84-88.

16. Xia L, Wang X, Xu T, Guzzo TJ. Systematic Review and Meta-Analysis of Comparative Studies Reporting Perioperative Outcomes of Robot-Assisted Partial Nephrectomy Versus Open Partial Nephrectomy. *Journal of endourology.* Sep 2017;31(9):893-909.

17. Chang KD, Abdel Raheem A, Kim KH, et al. Functional and oncological outcomes of open, laparoscopic and robot-assisted partial nephrectomy: a multicentre comparative matched-pair analyses with a median of 5 years' follow-up. *BJU international.* Oct 2018;122(4):618-626.

18. Garisto J, Bertolo R, Dagenais J, et al. Robotic versus open partial nephrectomy for highly complex renal masses: Comparison of perioperative, functional, and oncological outcomes. *Urologic oncology.* Oct 2018;36(10):471 e471-471 e479.

19. Brassetti A, Anceschi U, Bertolo R, et al. Surgical quality, cancer control and functional preservation: introducing a novel trifecta for robot-assisted partial nephrectomy. *Minerva urologica e nefrologica = The Italian journal of urology and nephrology.* Feb 2020;72(1):82-90.

20. Simone G, Capitanio U, Tuderti G, et al. On-clamp versus off-clamp partial nephrectomy: Propensity score-matched comparison of long-term functional outcomes. *International journal of urology : official journal of the Japanese Urological Association.* Oct 2019;26(10):985-991.

21. Jung S, Min GE, Chung BI, Jeon SH. Risk factors for postoperative hemorrhage after partial nephrectomy. *Korean journal of urology.* Jan 2014;55(1):17-22.

22. Baumann C, Westphalen K, Fuchs H, Oesterwitz H, Hierholzer J. Interventional management of renal bleeding after partial nephrectomy. *Cardiovascular and interventional radiology.* Sep-Oct 2007;30(5):828-832.

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Table 1 The specific score associated with each retroperitoneal anatomical feature included in RETRO classification.

Retroperitoneal anatomical features	Score*
Radius (R)	
⩽2cm	1
2-4cm	2
4-6cm	3
6-8cm	4
…	…
Endophytic (E)	
⩽50%	1
50-100%	2
100%	3
Trans-anterior lip (T)	
Not involved	Retroperitoneal approach
Involved	Transperitoneal approach
Relationship with renal vessel trunk (R)	
⩾0.6cm	1
0-0.6cm	2
0	3
Originate from (O)	

Middle 1/3 part	1
Upper or lower 1/3 part	2
Ventral side plus upper or lower 1/3 part	3

* Easy: 4-6 points; Moderate: 7-10 points; Difficult: ⩾11 points.

Table 2 Perioperative characteristics of included patients

	Retroperitoneal (n=105)	Transperitoneal (n=17)	p value
Sex			0.405
Male	63 (60%)	12 (70.6%)	
Female	42 (40%)	5 (29.4%)	
Age			0.427
Median	54	56	
IQR	46-63	53-63	
BMI			0.039
Median	24.3	22.6	
IQR	22.2-26.3	20.8-25.0	
Charlson score			0.691
⩽1	82	14	
>1	23	3	

Symptoms			0.358
Yes	5	0	
No	100	17	
ASA score			0.929
1	56	9	
2	34	5	
3	15	3	
Location			0.684
Left	50	9	
Right	55	8	
Size			0.146
Median	3.3	3.6	
IQR	2.3-4.1	2.8-4.9	
Endophytic			0.958
⩽50%	58	9	
>50%	37	6	
=100%	10	2	
Operation time			**0.010**
Median	90	111	
IQR	75-109	97.5-136	
Ischemia time			0.891

Median	18	17	
IQR	15-22.5	12-27.5	
Clavien-Dindo classification	60 (57.1%)	14 (82.4%)	0.048
Grade I	55	14	
Grade II	5	0	
Pathology			
ccRCC (Fuhrman grade)			
I	12	1	
II	53	8	
III	9	1	
IV	1	1	
Papillary RCC	6	1	
Chromophobe carcinoma	3	1	
Oncocytoma	5	0	
Angiomyolipoma	11	2	
others	5	2	

Table 3 Factors related to complications: univariate analysis

Surgical approaches	Retroperitoneal (n=105)			Transperitoneal (n=17)		
	Present	Absent	P value	Present	Absent	P value
Sex			0.421			0.218
Male	34 (32.4%)	29 (27.6%)		9 (53.0%)	3 (17.6%)	
Female	26 (24.8%)	16 (15.2%)		5 (29.4%)	0 (0%)	
Age (yr)			0.285			0.761
⩽60	42	27		8	2	
>60	18	18		6	1	
BMI			0.687			0.659
⩽25	35	28		11	2	
>25	25	17		3	1	
Charlson score			0.376			0.432
⩽1	45	37		12	2	
>1	15	8		2	1	
Symptoms			0.047			-
Yes	5	0		0	0	
No	55	45		14	3	
ASA score			0.049			0.673
1	26	30		8	1	

2	21	13		4	1	
3	12	3		2	1	
Location			0.310			0.761
Left	26	24		8	1	
Right	34	21		6	2	
Radius (cm)			0.074			0.043
⩽4	40	37		9	0	
>4	20	8		5	3	
Endophytic			0.921			0.755
⩽50%	33	25		7	2	
>50%	20	16		5	1	
=100%	5	5		2	0	
Vessel Rete (cm)			0.643			0.659
⩾0.6	36	29		3	1	
<0.6	24	16		11	2	
Origin			0.08			0.633
Not polar	18	21		1	0	
Polar or ventral hilum side	42	24		13	3	
Operation time (min)			0.080			0.377

⩽90	27	28		3	0	
>90	33	17		11	3	
Ischemia time (min)			0.071			0.29
⩽25	53	44		10	3	
>25	7	1		4	0	
RETRO score			0.031			0.523
4-6	21	22		2	0	
7-10	34	23		11	3	
⩾11	5	0		1	0	
Recurrence	1	104	0.008*	2	15	/

*comparison between retro and transperitoneal group.