JOURNAL OF LAPAROENDOSCOPIC & ADVANCED SURGICAL TECHNIQUES
Volume 00, Number 00, 2018
© Mary Ann Liebert, Inc.
DOI: 10.1089/lap.2017.0657

Full Report

Trifecta and Pentafecta Rates After Robotic Assisted Partial Nephrectomy: Comparative Study of Patients with Renal Masses <4 and ≥4 cm

Roberto Castellucci, MD,[1,*] Giulia Primiceri, MD,[2,*] Pietro Castellan, MD,[1] Michele Marchioni, MD,[2] Carlo D'Orta, MD,[2] Francesco Berardinelli, MD,[1] Fabio Neri, MD,[1] Luca Cindolo, MD,[1] and Luigi Schips, MD[2]

Downloaded by SENCKENBERG/ZEITSCHRIFTEN from online.liebertpub.com at 03/02/18. For personal use only.

Abstract

Objectives: Robotic-assisted partial nephrectomy (RAPN) is preferred to radical nephrectomy because it guarantees superior functional outcomes in patients with small renal masses (RMs). Only a few studies so far have evaluated the feasibility of RAPN for the treatment of RM ≥4 cm.
The aim of this study is to evaluate the safety and feasibility of RAPN based on a comparison of trifecta and pentafecta rates for RMs ≥4 cm.
Material and Methods: We retrospectively analyzed prospectively collected data from an institutional database of patients undergoing RAPN from September 2013 to November 2016. Demographic and perioperative data were collected and statistically analyzed. Pentafecta is defined as achievement of trifecta (negative surgical margins, no postoperative complications, and warm ischemia time ≤25 minutes) with the addition of two other variables, namely, over 90% estimated glomerular filtration rate preservation and no chronic kidney disease stage progression 1 year after surgery.
Results: Overall, 123 patients underwent RAPN. Of those, 38 (30.9%) had RMs ≥4 cm. Trifecta was achieved in 72.9% of patients with RMs <4 cm and in 44.7% of those with ≥4 cm, whereas pentafecta was achieved by 23.5% of patients with RMs <4 cm and by 10.5% of those with RMs ≥4 cm. No significant predictive factors were found in connection with trifecta, whereas only one was found in connection with pentafecta, namely, age (odds ratio: 0.91; 95% confidence interval 0.85–0.98; $P = .01$).
Conclusions: RAPN may be considered a feasible and safe surgical approach ensuring good functional outcome even for patients with RMs ≥4 cm. Pentafecta rates after RAPN were comparable between RMs <4 and ≥4 cm in diameter.

Keywords: kidney cancer, partial nephrectomy, renal mass, robotic surgery, trifecta, pentafecta

Introduction

Kidney cancer is the 14th most common type of cancer in the world.[1] Over the last two decades, the incidence of renal masses (RMs) has increased both worldwide and in Europe, although it is not clear whether such an increase is genuine or simply due to greater use of abdominal imaging.[2,3] Evidence of small RMs at diagnosis has furthered the development and adoption of nephron sparing techniques with excellent outcomes. Nowadays, partial nephrectomy (PN) is preferred to radical nephrectomy because it guarantees superior functional outcomes even in patients with RMs larger than 4 cm.[4,5] In fact, the European Association of Urology's guidelines recommend PN also for RMs larger than 4 cm whenever feasible.[6] Moreover, robotic assisted partial nephrectomy (RAPN) simplifies the reconstruction step and thus allows conservative treatment of more complex and larger RMs.[7]

The trifecta concept, introduced to evaluate PN success rate as a surrogate of oncological and functional safety, is defined as a combination of negative surgical margins, warm ischemia time (WIT) less than 25 minutes, and no

[1]Department of Urology, ASL Abruzzo 2, Chieti, Italy.
[2]Department of Urology, SS. Annunziata Hospital, ''G. D'Annunzio'' University of Chieti, Chieti, Italy.
*These two authors contributed equally to this work.

perioperative complications.[4,8,9] For evaluating long-term outcomes, the notion of pentafecta has recently been introduced. Pentafecta is defined as achievement of trifecta with the addition of two other variables, namely, over 90% estimated glomerular filtration rate (eGFR) preservation and no chronic kidney disease (CKD) stage progression at 12-month postoperatively.[10–13]

In this study, we hypothesized that RAPN may be a safe and reliable procedure also in patients with RMs larger than 4 cm. We also hypothesized that trifecta and pentafecta rates, as surrogate measures of short- and long-term oncological and functional outcomes, would be similar in RMs smaller and larger than 4 cm treated with RAPN.

The aim of this study is to evaluate the safety and feasibility of RAPN for RM $\geq$4 cm by comparing trifecta and pentafecta rates, thus contributing to fill a perceived gap in the literature.

Downloaded by SENCKENBERG/ZEITSCHRIFTEN from online.liebertpub.com at 03/02/18. For personal use only.

Materials and Methods

We retrospectively analyzed prospectively collected data from an institutional database. All 128 RAPNs were performed by a single expert surgeon (L.S.), from September 2013 to November 2016. From this cohort, 5 patients with solitary kidney were excluded.

Patient characteristics included age, gender, body mass index, hypertension, diabetes, and Charlson comorbidity index, in addition to preoperative hemoglobin, creatinine, eGFR calculated using the Cockcroft–Gault equation, and CKD stage. Tumor characteristics included tumor size, side, and preoperative aspects and dimensions used for an anatomical (PADUA) score.[14] Treatment characteristics included intraoperative data such as operative time (OT), WIT, estimated blood loss (EBL), and perioperative complications. Finally, pathology reports such as surgical margin status and postoperative renal function were investigated.

Trifecta is defined as a combination of negative surgical margins, no postoperative complications, and WIT less than 25 minutes.[9] Positive surgical margin is defined as the presence of tumor cells on the inked parenchymal margin at pathology report. Pentafecta is defined as achievement of trifecta with the addition of two other variables, namely, 12-month renal function expressed as over 90% eGFR preservation and no CKD stage progression.[10] Practice guidelines for CKD by the U.S. National Kidney Foundation attribute significance to CKD stages III, IV, or V, so CKD stage progressing beyond stage III is considered clinically significant.[15]

Descriptive statistics of categorical variables focused on frequencies and proportions. Means and standard deviations were reported for continuous variables. The chi-squared test and Student's *t* test were used to compare the statistical significance of differences for categorical and continuous variables, respectively. Odds ratios (ORs) and the corresponding 95% confidence interval (95% CI) for trifecta and pentafecta were calculated using a logistic regression model. In multivariate analysis, the final model included sex and age and only those variables (symptoms at diagnosis, tumor diameter, PADUA risk group, eGFR, Hb, EBL, and OT) that were statistically significant in univariate analysis. All statistical tests were two sided with a significance level set at <.05. All statistical analyses were performed using SAS version 9.2 (SAS Institute, Cary, NC).

Results

Overall, 123 patients underwent RAPN. Of those, 38 (30.9%) had RMs $\geq$4 cm. These patients were more frequently symptomatic at diagnosis (23.7% versus 8.2%, $P = .03$) and had high PADUA scores (13.2% versus 3.5%, $P = .02$) (Table 1). As expected, patients with RMs $\geq$4 cm had longer OT (133.4 minutes versus 105.9 minutes, $P < .01$),

Table 1. Demographic and Preoperative Characteristics of 123 Patients who Underwent Robotic Assisted Partial Nephrectomy

Variables	*Total* (n = *123*)	*Renal mass*		P
		<4 cm (n = *85*)	*≥4 cm* (n = *38*)	
Male, *n* (%)	70 (56.9)	50 (58.8)	20 (52.6)	.52
Age, years, mean (SD)	63.2 (13.6)	62.7 (14.1)	64.1 (12.8)	.60
BMI, kg/m^2, mean (SD)	26.8 (4.0)	26.6 (3.8)	27.3 (4.5)	.32
Symptoms at diagnosis, *n* (%)	16 (13)	7 (8.2)	9 (23.7)	.03
Hb, g/dL, mean (SD)	14.3 (1.6)	14.2 (1.4)	14.5 (1.8)	.42
Creatinine, mg/dL, mean (SD)	0.9 (0.3)	0.9 (0.3)	0.9 (0.4)	.77
eGFR, mean (SD)	90.6 (34.5)	90.2 (34.1)	91.4 (36.2)	.86
CKD stage				
I	53 (43.1)	36 (42.4)	17 (44.7)	
II	50 (40.7)	36 (42.4)	14 (36.8)	
III	18 (14.6)	12 (14.1)	6 (15.8)	
IV	2 (1.6)	1 (1.2)	1 (2.6)	.89
PADUA score				
Missing	33 (26.8)	23 (27.1)	10 (26.3)	
Low	54 (43.9)	43 (50.6)	11 (29.0)	
Medium	28 (22.8)	16 (18.8)	12 (31.6)	
High	8 (6.5)	3 (3.5)	5 (13.2)	.02

BMI, body mass index; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; PADUA, preoperative aspects and dimensions used for an anatomical score.

Table 2. Perioperative Characteristic and Outcomes After Robotic Partial Nephrectomy

Variables	Total (n = 123)	Renal mass		P
		<4 cm (n = 85)	≥4 cm (n = 38)	
Hg, g/dL, mean (SD)	11. 8 (1.4)	11.9 (1.4)	11.5 (1.4)	.11
Creatinine, mg/dL, mean (SD)	1.0 (0.4)	1.0 (0.4)	1.1 (0.5)	.6
Estimated blood loss, mL, mean (SD)	204.7 (194.7)	166.3 (162.8)	287.4 (231.7)	<.01
Operative time, minutes, mean (SD)	114.5 (35.7)	105.9 (31.4)	133.4 (37.8)	<.01
WIT >25 minutes, *n* (%)	10 (8.1)	— (—)	10 (26.3)	<.01
Positive surgical margins, *n* (%)	14 (11.4)	10 (11.8)	4 (10.5)	.84
CD classification, *n* (%)				
II	15 (12.2)	8 (9.4)	7 (18.4)	
III	7 (5.7)	6 (7.1)	1 (2.6)	
IV	1 (0.8)	1 (12)	—	.37
90% eGFR preservation, *n* (%)	54 (43.9)	35 (41.2)	19 (50.0)	.38
Postoperative upstaged to CKD III-IV-V	32 (26.0)	23 (27.1)	9 (23.7)	.66
Trifecta achievement, *n* (%)	79 (64.2)	62 (72.9)	17 (44.7)	<.01
Pentafecta achievement, *n* (%)	24 (19.5)	20 (23.5)	4 (10.5)	.08

CD, Clavien Dindo; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; WIT, warm ischemia time.

higher EBL (287.4 mL versus 166.3 mL, $P < .01$), and more frequently showed WIT >25 minutes (0% versus 26.3%, $P < .01$). Mean pathologic tumor size was 2.4 cm in patients with RMs smaller than 4 cm and 4.8 cm in those with RMs larger than 4 cm. In our study, no significant differences in postoperative complications were found between these two groups. Fifteen of our patients had Clavien Dindo (CD) grade II complications (13 postbleeding anemia treated with transfusions, 1 fever, and 1 myocardial infarction), 7 had CD complications graded as III (6 patients undergoing embolization for renal bleeding and 1 pneumothorax), and finally 1 patient was classified as CD IV (intestinal perforation and sepsis) (Table 2). Overall, trifecta and pentafecta were achieved in 64.2% and 19.5% of cases, respectively. When patients were stratified according to tumor size, trifecta was achieved in 72.9% of those with RMs <4 cm and in 44.7% of those with RMs ≥4 cm, whereas achievement rates for pentafecta were 23.5% and 10.5%, respectively (Table 2). In logistic regression models, patients with RMs ≥4 cm were less likely to achieve trifecta ($P < .01$); however, RMs ≥4 cm were not associated with lower pentafecta rates ($P = .08$) (Table 2). On multivariable regression analysis, no significant predictive factors were found in connection with trifecta, whereas with regard to pentafecta the only significant predictor was age (OR: 0.91; 95% CI 0.85–0.98; $P = .01$) (Tables 3 and 4).

Discussion

We hypothesized that RAPN would be a safe and reliable procedure even in patients with RMs larger than 4 cm. We also hypothesized that achievement of trifecta and pentafecta,

Table 3. Univariate and Multivariate Analysis of the Factors Predicting Trifecta Achievement After Robotic Assisted Partial Nephrectomy

Variables	Univariable		Multivariable	
	OR (95% CI)	P	OR (95% CI)	P
Age (years)	1.00 (0.98–1.03)	.83	1.01 (0.96–1.07)	.66
BMI (kg/m^2)	1.03 (0.94–1.13)	.54		
Symptoms at diagnosis	0.27 (0.09–0.82)	.02	0.36 (0.07–1.75)	.21
Preoperative CKD				
I	Ref.			
II	1.09 (0.48–2.44)	.84		
III–IV	0.84 (0.29–2.41)	.74		
Tumor diameter (cm)				
<4	Ref.		Ref.	
≥4	0.30 (0.14–0.67)	<.01	0.63 (0.20–2.03)	.44
PADUA score				
Low	Ref.		Ref.	
Medium	0.32 (0.12–0.84)	.02	0.46 (0.14–1.49) 0.34	.19
High	0.27 (0.06–1.25)	.10	(0.05–2.09)	.24
Preoperative eGFR (mL/minutes)	1.01 (0.99–1.02)	.31	1.01 (0.98–1.03)	.65
EBL (mL)	1.00 (0.99–1.01)	.08	1.00 (0.99–1.00)	.96
Operative time (minutes)	0.99 (0.98–1.00)	.06	0.99 (0.97–1.01)	.36

BMI, body mass index; CI, confidence interval; eGFR, estimated glomerular filtration rate; CKD, chronic kidney disease; EBL, estimated blood loss; OR, odds ratio; PADUA, preoperative aspects and dimensions used for an anatomical score.

Downloaded by SENCKENBERG/ZEITSCHRIFTEN from online.liebertpub.com at 03/02/18. For personal use only.

Table 4. Univariate and Multivariate Analysis of the Factors Predicting Pentafecta Achievement After Robotic Assisted Partial Nephrectomy

	Univariable		*Multivariable*	
Variables	*OR (95% CI)*	P	*OR (95% CI)*	P
Age (years)	0.96 (0.93–0.99)	.01	0.91 (0.85–0.98)	.01
BMI (kg/m^2)	0.99 (0.88–1.11)	.82		
Symptoms at diagnosis	0.01 (0.25–4.05)	.99	3.88 (0.53–28.44)	.18
Preoperative CKD				
I	Ref.			
II	1.26 (0.49–3.26)	.95		
III–IV	—			
Tumor diameter (cm)				
<4	Ref.		Ref.	
≥4	0.36 (0.11–1.15)	.08	0.39 (0.08–4.90)	.25
PADUA score				
Low	Ref.		Ref.	
Medium	0.53 (0.13–2.11)	.37	0.76 (0.12–4.89)	.77
High	0.99 (1.17–5.66)	.99	0.01 (0.11–9.02)	.99
Preoperative eGFR (mL/minutes)	1.01 (0.99–1.03)	.12	0.99 (0.96–1.02)	.56
EBL (mL)	1.00 (0.99–1.01)	.62	1.00 (0.99–1.01)	.54
Operative time (minutes)	1.00 (0.98–1.01)	.50	1.00 (0.98–1.02)	.88

BMI, body mass index; CI, confidence interval; CKD, chronic kidney disease; EBL, estimated blood loss; OR, odds ratio; PADUA, preoperative aspects and dimensions used for an anatomical score; eGFR, estimated glomerular filtration rate.

Downloaded by SENCKENBERG/ZEITSCHRIFTEN from online.liebertpub.com at 03/02/18. For personal use only.

as surrogate markers of surgical success, as well as of short- and long-term functional outcomes, would be similar for RMs smaller or larger than 4 cm treated with RAPN. We tested our hypothesis in an institutional database. Since previous studies had shown that the surgeon's learning curve is a predictive factor of trifecta rate in small RMs,[8] we decided to include only patients operated by the same experienced surgeon to minimize intersurgeon bias resulting from varied degrees of surgical experience and skill.

Finally, we evaluated the main predictive factors for achievement of trifecta and pentafecta. In our study, surgical outcomes such as WIT, OT, and EBL were shorter for RMs <4 cm. These results are expected because resection time for larger masses may well be longer. Our data overlap favorably with data available in the literature. In a recent review and meta-analysis, Pavan et al. analyzed data from a cohort of 5465 patients (4441 with renal tumor <4 cm and 1024 with renal tumors >4 cm) and found no significant differences with regard to positive surgical margins in patients undergoing PN for RMs smaller or larger than 4 cm.[16] Our study reports similar findings, namely, no significant differences in positive margin rates between patients with RMs smaller and larger than 4 cm ($P = .84$) (Table 2).

As regards perioperative complications after RAPN for larger RMs, data from the literature are controversial. Patel and Ficarra reported higher complication rates for tumors >4 cm, than for tumors <4 cm (26.6% versus 8.9% and 26.5% versus 9.4%, respectively).[17,18] In a multicenter study, Petros et al. analyzed data of 445 patients, 83 of whom had RMs >4 cm, and found no increased risk of perioperative complications after RAPN.[19] In our study, patients with RMs smaller or larger than 4 cm had similar perioperative complication rates, again with no significant differences ($P = .37$). Likewise, no significant differences were recorded in connection with postoperative 90% eGFR preservation in RMs <4 or ≥4 cm ($P = .38$).

The success of partial nephrectomy may be evaluated with reference to trifecta and pentafecta rates. No standardized definition has been developed for trifecta,[10,20,21] and achievement rates range between 58 and 81.[9,22,23] Pentafecta, on the other hand, has been examined only in a few studies.[10,11] Zargar et al. reported a rate of trifecta and pentafecta achievement of 70% and 38.5%, respectively, in pT1a patients only.[11] To the best of our knowledge, only Kim et al. examined differences in trifecta and pentafecta rates in patients with pT1a and pT1b tumors. In their study, 65.3% of pT1a patients and 43.3% of pT1b patients achieved trifecta, while pentafecta was achieved by 38.3% of pT1a patients and by 26.7% of pT1b patients.[10] Our results corroborate data from the literature, with overall trifecta and pentafecta rates being achieved in 64.2% and 19.5% of cases, respectively. When patients were stratified according to tumor size, trifecta was achieved in 72.9% of those with RMs <4 cm and in 44.7% of those with RMs ≥4 cm, whereas achievement rates for pentafecta were 23.5% and 10.5%, respectively. In logistic regression models, patients with RMs ≥4 cm were less likely to achieve trifecta ($P < .01$), whereas no differences in pentafecta rates were found between patients with RMs smaller or larger than 4 cm ($P = .08$). In the short term we found a statistically significant difference in trifecta rates between patients with RMs <4 and ≥4 cm, which does not translate, however, into an equally significant difference in long-term renal function. Our results therefore suggest that RAPN may be considered a safe and reliable option even in patients with larger RMs.

As a secondary endpoint, we evaluated all predictive factors for assessing trifecta and pentafecta rates. No significant predictive factors were found in connection with trifecta, whereas age was the only predictor for pentafecta ($P = .01$) (Tables 3 and 4).

Our study has some limitations. In terms of design, this is a retrospective, nonrandomized single-center study with a

limited patient cohort. More importantly, no standardized definition exists for trifecta and pentafecta nor are these measures universally accepted: without further validation and more widespread adoption their usefulness may therefore be deemed marred.

Conclusion

RAPN is a feasible and safe procedure with good long-term renal outcomes even for patients with large RMs ($\geq$4 cm). Trifecta and pentafecta are important tools for evaluating both short- and long-term perioperative and functional renal outcomes.

Disclosure Statement

No competing financial interests exist.

Downloaded by SENCKENBERG/ZEITSCHRIFTEN from online.liebertpub.com at 03/02/18. For personal use only.

References

1. Ferlay J, Shin H-R, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. Int J Cancer 2010;127:2893–2917.
2. Sun M, Thuret R, Abdollah F, Lughezzani G, Schmitges J, Tian Z, et al. Age-adjusted incidence, mortality, and survival rates of stage-specific renal cell carcinoma in North America: A trend analysis. Eur Urol 2011;59:135–141.
3. Kyllo RL, Tanagho YS, Kaouk JH, Stifelman MD, Rogers CG, Hillyer SP, et al. Prospective multi-center study of oncologic outcomes of robot-assisted partial nephrectomy for pT1 renal cell carcinoma. BMC Urol 2012;12:11.
4. Hung AJ, Cai J, Simmons MN, Gill IS. ''Trifecta'' in partial nephrectomy. J Urol 2013;189:36–42.
5. Pahernik S, Roos F, Röhrig B, Wiesner C, Thüroff JW. Elective nephron sparing surgery for renal cell carcinoma larger than 4 cm. J Urol 2008;179:71–74; discussion 74.
6. Ljungberg B, Bensalah K, Canfield S, Dabestani S, Hofmann F, Hora M, et al. EAU guidelines on renal cell carcinoma: 2014 update. Eur Urol 2015;67:913–924.
7. Borghesi M, Schiavina R, Gan M, Novara G, Mottrie A, Ficarra V. Expanding utilization of robotic partial nephrectomy for clinical T1b and complex T1a renal masses. World J Urol 2013;31:499–504.
8. Osaka K, Makiyama K, Nakaigawa N, Yao M. Predictors of trifecta outcomes in laparoscopic partial nephrectomy for clinical T1a renal masses. Int J Urol 2015;22:1000–1005.
9. Khalifeh A, Autorino R, Hillyer SP, Laydner H, Eyraud R, Panumatrassamee K, et al. Comparative outcomes and assessment of trifecta in 500 robotic and laparoscopic partial nephrectomy cases: A single surgeon experience. J Urol 2013;189:1236–1242.
10. Kim DK, Kim LHC, Raheem AA, Shin TY, Alabdulaali I, Yoon YE, et al. Comparison of trifecta and pentafecta outcomes between T1a and T1b renal masses following robot-assisted partial nephrectomy (RAPN) with minimum one year follow up: Can RAPN for T1b renal masses be feasible? PLoS One 2016;11:e0151738.
11. Zargar H, Allaf ME, Bhayani S, Stifelman M, Rogers C, Ball MW, et al. Trifecta and optimal perioperative outcomes of robotic and laparoscopic partial nephrectomy in surgical treatment of small renal masses: A multi-institutional study. BJU Int 2015;116:407–414.
12. Sejima T, Morizane S, Fujiwara K, Ashida K, Saito H, Taniguchi Y, et al. The first pilot comprehensive evaluation of the outcomes of different types of robotic surgeries in the different surgical departments: The penta, tetra and trifecta achievements in robotic surgeries. Yonago Acta Med 2016; 59:135–142.
13. Iannetti A, Gnech M, Rossanese M, Abbinante M, De Giorgi G, Mottrie A, et al. Robot-assisted renal surgery: Current indications and results. Minerva Urol Nefrol 2014; 66:15–24.
14. Ficarra V, Novara G, Secco S, Macchi V, Porzionato A, De Caro R, et al. Preoperative aspects and dimensions used for an anatomical (PADUA) classification of renal tumours in patients who are candidates for nephron-sparing surgery. Eur Urol 2009;56:786–793.
15. Levey AS, Coresh J, Balk E, Kausz AT, Levin A, Steffes MW, et al. National Kidney Foundation practice guidelines for chronic kidney disease: Evaluation, classification, and stratification. Ann Intern Med 2003;139:137–147.
16. Pavan N, Derweesh IH, Mir CM, Novara G, Hampton LJ, Ferro M, et al. Outcomes of laparoscopic and robotic partial nephrectomy for large (>4 cm) kidney tumors: Systematic review and meta-analysis. Ann Surg Oncol 2017;24:2420–2428.
17. Patel MN, Krane LS, Bhandari A, Laungani RG, Shrivastava A, Siddiqui SA, et al. Robotic partial nephrectomy for renal tumors larger than 4 cm. Eur Urol 2010;57:310–316.
18. Ficarra V, Bhayani S, Porter J, Buffi N, Lee R, Cestari A, et al. Robot-assisted partial nephrectomy for renal tumors larger than 4 cm: Results of a multicenter, international series. World J Urol 2012;30:665–670.
19. Petros F, Sukumar S, Haber G-P, Dulabon L, Bhayani S, Stifelman M, et al. Multi-institutional analysis of robot-assisted partial nephrectomy for renal tumors >4 cm versus $\leq$4 cm in 445 consecutive patients. J Endourol 2012;26:642–646.
20. Porpiglia F, Bertolo R, Amparore D, Fiori C. Margins, ischaemia and complications rate after laparoscopic partial nephrectomy: Impact of learning curve and tumour anatomical characteristics. BJU Int 2013;112:1125–1132.
21. Buffi N, Lista G, Larcher A, Lughezzani G, Ficarra V, Cestari A, et al. Margin, ischemia, and complications (MIC) score in partial nephrectomy: A new system for evaluating achievement of optimal outcomes in nephron-sparing surgery. Eur Urol 2012;62:617–618.
22. Carneiro A, Sivaraman A, Sanchez-Salas R, Di Trapani E, Barret E, Rozet F, et al. Evolution from laparoscopic to robotic nephron sparing surgery: A high-volume laparoscopic center experience on achieving ''trifecta'' outcomes. World J Urol 2015;33:2039–2044.
23. Lista G, Buffi NM, Lughezzani G, Lazzeri M, Abrate A, Mistretta A, et al. Margin, ischemia, and complications system to report perioperative outcomes of robotic partial nephrectomy: A European Multicenter Observational Study (EMOS project). Urology 2015;85:589–595.

Address correspondence to:
Roberto Castellucci, MD
Department of Urology
ASL Abruzzo 2
Via dei Vestini no. 1
Chieti 66100
Italy

E-mail: roberto.castellucci@gmail.com