


Prophylactic Ureteral Catheter Placement Appears to Reduce Intraoperative Ureteric Injury During Resection of Primary Retroperitoneal Liposarcoma

Technology in Cancer Research & Treatment
Volume 21: 1–7
© The Author(s) 2022
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/15330338221087831
journals.sagepub.com/home/tct


Xiaobing Chen, MD^{1,2,*}, Jun Chen, MD^{2,*} ,
Ferdinando Carlo Maria Cananzi, MD^{3,4}, Wenjie Li, MD²,
Vittorio Quagliuolo, MD⁴, Chenghua Luo, MD, PhD²,
and Yinmo Yang, MD, PhD¹

Abstract

Background: Prophylactic ureteral catheters placement (PUCP) was advocated as an effective strategy for decreasing ureteral morbidities in colorectal surgeries. However, whether it should be routinely used prior to primary retroperitoneal liposarcoma (PRLS) surgeries remains unknown. **Methods:** It was a retrospective study, conducted at a tertiary sarcoma center. Medical records of patients with PRLS undergoing surgeries from January 2015 through December 2018 were reviewed. Primary endpoint was the rate of ureteral morbidities during and after retroperitoneal liposarcoma resection procedures. Univariate and multivariate analyses determined risk factors associated with ureteral injury (UI) in patients undergoing surgeries. **Results:** A total of 55 patients of PRLS were included. Fourteen (25.5%) patients underwent PUCP, with 1 UI (7.1%) identified. In 41 patients with no PUCP, 15 (36.6%) exhibited UIs during and post surgeries. There were significant improvements of UIs in group PUCP, compared with patients without PUCP ($P < .05$). Resection surgeries combined with colectomy and tumor-ureter relationship were 2 risk factors significantly associated to UIs ($P < .01$). **Conclusions:** PUCP might be an effective way of preventing UIs in patients with PRLS. It could be suggested especially in patients with ureter encased by tumor or anticipated colectomy during the surgical process.

Keywords

primary retroperitoneal liposarcoma, prophylactic ureteral catheter placement, ureteral injury, surgery, complication

Abbreviations

PUCP, prophylactic ureteral catheters placement; PRLS, primary retroperitoneal liposarcoma; RPS, retroperitoneal sarcoma; LPS, liposarcoma; WBC, white blood cell; ASA, American Society of Anesthesiology; TARPSWG, Transatlantic Australasian Retroperitoneal Sarcoma Working Group

Received: November 6, 2021; Revised: January 20, 2022; Accepted: February 24, 2022.

¹ Peking University First Hospital, Beijing, China

² Peking University International Hospital, Beijing, China

³ Humanitas University, Pieve Emanuele-Milan, Italy

⁴ Sarcoma, Melanoma and Rare Tumors Surgery Unit, IRCCS Humanitas Research Hospital, Rozzano-Milan, Italy

* The two authors contributed equally to this work.

Corresponding Authors:

Chenghua Luo, MD, PhD, Department of Retroperitoneal Tumor Surgery, Peking University International Hospital, Beijing, 102206, China.
Email: luochenghua@pkuih.edu.cn

Yinmo Yang, MD, PhD, Department of General Surgery, Peking University First Hospital, Beijing, 100034, China.
Email: yangyinmo@263.net



Introduction

Primary retroperitoneal liposarcoma (PRLS) are rare and biologically heterogeneous tumors whose management may be extremely challenging due to their size and location.^{1,2} Large PRLS may simultaneously involve several organs potentially increasing the risk of post-operative complications, including urinary tract injuries.³ In particular, ureter could be displaced, compressed, or encased by these tumors in most cases. Generally, extended multivisceral resection with ipsilateral nephrectomy is advocated for the treatment of PRLS. However, the kidney may be preserved to balance between surgical margins adequacy and expected morbidity in specific situations.⁴⁻⁶ In particular, our surgical policy is achieving extended resection with ipsilateral lipectomy whereas kidney maybe spared in specific circumstances such as well-differentiated sarcomas, young patients, easy freeing from the tumor during operation, solitary kidney and presence of multiple comorbidities. Thus, renal preservation is required sometimes, and the surgeon has to identify and preserve the ipsilateral ureter, detaching it from the tumor. In these cases, the ureter can be accidentally transected, de-vascularized, kinked or ligated. Thermal injuries related to the use of energy devices have been also identified as possible causes of ureteral injuries (UIs).⁷ UIs may significantly affect the post-operative course, increasing morbidity and lowering the quality of life of the patients.⁸⁻¹⁰

Several authors have proposed prophylactic ureteral catheter placement (PUCP) as possible strategy to facilitate the identification of the ureter and to prevent UI, in particular in colorectal surgery.^{11,12} A retrospective study including 51 125 patients undergoing colectomies showed that PUCP applied in 4.9% of colectomies was associated with a lower rate of UIs, although this reduction failed to reach a statistically significant level.¹³ Other studies demonstrated that PUCP could help to identify ureter without reducing the actual incidence of UIs.¹⁴⁻¹⁶ Nevertheless, urinary tract infection, urinary obstruction, and longer hospital stay were often observed in patients undergoing PUCP.^{17,18} In the last decades, cost-efficacy issues have been also raised when evaluating the use of PUCP in colorectal, urology, and gynecology surgery.^{19,20} Up to now, no data on the role of PUCP in retroperitoneal sarcoma (RPS) surgery have been reported in literature. The aim of this study is to evaluate the efficacy of PUCP in reducing the incidence of UI in PRLS surgery.

Methods

Study Design and Patients

This study was a retrospective study, conducted in accordance with the Declaration of Helsinki (as revised in 2013), following STROBE retrospective cohort guideline.²¹ It was approved by institutional review board of Peking University International Hospital (PKUIH-NO.2019-032(BMR)) and individual consent for this retrospective analysis was waived. Medical records of consecutive patients operated for PRLS at PKUIH from January 2015 through December 2018 were retrieved from our database.

All records were de-identified and stored in encrypted computer once data were collected. Patients who underwent surgeries for the first time with pathological findings of retroperitoneal liposarcoma were included in this study. Exclusion criteria were patients younger than 18 years, tumors located above the kidney at the preoperative CT scan, other histological subtypes of sarcoma, recurrent sarcoma, and tumors requiring nephrectomies. Demographics, surgical and pathologic variables were analyzed. PUCP was determined by sarcoma surgeons and catheters were placed by staff urologists via a rigid cystoscope at lithotomy position under general anesthesia prior to surgery. Intra-operative catheterizations were not considered as prophylactic catheter placement. All sarcoma operations were performed by same surgical team. As above mentioned, our surgical policy is achieving extended resection with ipsilateral lipectomy whereas kidney maybe spared under the following circumstances: well-differentiated sarcomas, younger age, lysised from tumor easier during operation, solitary kidney and multiple comorbidities.

UI comprised UI secondary to any damages during the surgical procedures or with any evidences of hydronephrosis, ureteral leakage postoperatively. As to relationships between tumor and ureter, tumor involvement of ureter larger than 180° was defined as encasement, while smaller than 180° was adjacent. Complications were evaluated through Clavien-Dindo Classification system in present study.²²

Primary endpoint was the rate of UIs during and after retroperitoneal liposarcoma resection procedures.

Statistics

Categorical variables were reported as frequency (%) and continuous variables were reported as mean with standard deviation (SD) or median with interquartile range (IQR). UIs were compared between groups PUCP and No PUCP through Fisher exact test. Risk factors of postoperative UIs were tested using univariate and multivariate analysis. A *P* value of less than .05 was considered statistically significant. Software of STATA Version 14.0 was used for statistics.

Results

Patient Characteristics

Fifty-five patients with PRLS were finally included in our study as reported in Figure 1. Main clinical and pathological characteristics of the analyzed patients are shown in Table 1. Fourteen out of fifty-five (25.5%) patients underwent PUCP. Patients' characteristics were compared between groups of PUCP and No PUCP. There was no statistically significant difference between the 2 groups, except slightly higher level of hemoglobin in the No PUCP group.

Operative Outcomes

Surgical and short-term outcomes are shown in Table 2. A total number of 25 organs were concomitantly resected in 19 patients.

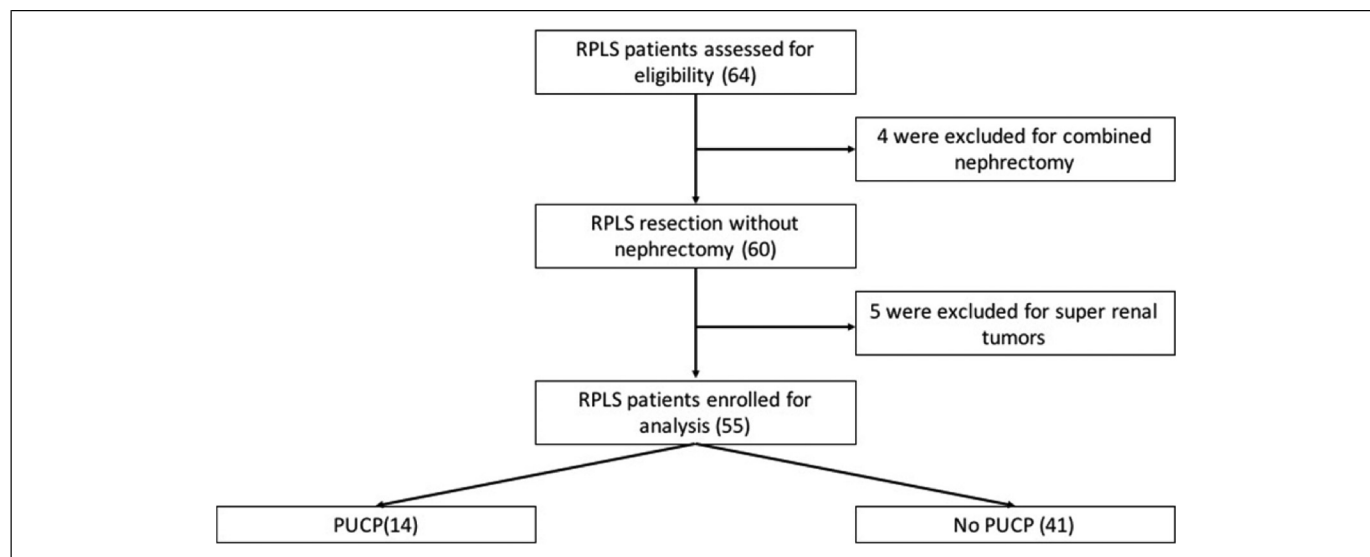


Figure 1. Flow chart of patients.

Abbreviations: RPLS, retroperitoneal liposarcoma; PUCP, prophylactic ureteral catheter placement.

Table 1. Clinical and Pathologic Characteristics of the Patients and Comparisons Between PUCP Group With No PUCP Group.

Characteristics	Overall (n = 55)	No PUCP (n = 41)	PUCP (n = 14)	P-value
Age (mean ± SD)	55.2 ± 11.8	54.6 ± 12.0	56.9 ± 11.4	.548
Male gender (%)	29 (52.7)	22 (53.7)	7 (50)	.813
BMI (mean ± SD)	23.1 ± 3.1	23.4 ± 3.2	22.2 ± 2.7	.207
Comorbidities (%)				
Hypertension	13 (23.6)	8 (19.5)	5 (35.7)	.218
Heart disease	2 (3.6)	1 (2.4)	1 (7.1)	1.000
Diabetes	3 (5.5)	2 (4.9)	1 (7.1)	1.000
Tobacco use (%)	15 (27.3)	12 (29.3)	3 (21.4)	.825
Chronic steroid use (%)	2 (3.6)	2 (4.9)	0	1.000
Preoperative labs				
WBC (*10 ⁹ /l)	5.7 ± 1.7	5.8 ± 1.7	5.5 ± 1.4	.558
Hemoglobin (g/dl)	122.5 ± 19.7	125.5 ± 19.9	113.5 ± 16.8	.048
Platelets (*10 ¹² /l)	259.8 ± 108.9	248.8 ± 98.1	292.1 ± 134.7	.201
Albumin (g/l)	36.8 ± 4.9	37.5 ± 5.0	34.9 ± 4.4	.093
Creatinine (mmol/l)	69.9 ± 19.6	70.8 ± 20.3	67.1 ± 17.7	.540
ASA score	2.0 ± 0.6	2.0 ± 0.4	2.3 ± 0.9	.075
Tumor size (cm)	23.3 ± 9.2	23.3 ± 9.4	23.4 ± 9.1	.952
Tumor focality (%)				.817
Uni-focal	27 (49.1)	21 (51.2)	6 (42.9)	
Multi-focal	28 (50.9)	20 (48.8)	8 (57.1)	

Abbreviations: PUCP, prophylactic ureteral catheter placement; WBC, white blood cell.

Median blood loss was 600 mL (range 100-5000 mL) and operative time was 222 min (range 100-490 min). Median hospital stay was 29 days (IQR 22, 35). Fifteen out of 55 patients (27.3%) developed various post-operative complications, of which gastroplegia was the most common one (7.3%). Five (9.1%) had major morbidities (Clavien-Dindo complication grade ≥3), including 3 admitted in ICU for cardiac arrest, 1 intestinal fistula, and 1 urinary leak. There was no operative mortality. There were no significant differences in terms of morbidities, type of resection, and

length of hospital stay (LOH) between the 2 groups (PUCP and No PUCP; Table 2).

Ureteral Injuries

A total of 16 patients (29%) developed UIs intraoperatively with 2 confirmed post-operatively through urography phase imaging. Causes or presentations of UIs were listed in detail (Table 3). Fifteen out of 16 patients did not undergo PUCP,

Table 2. Comparisons of Operative Outcomes Between Groups PUCP and No PUCP.

Characteristics	Overall (n = 55)	No PUCP (n = 41)	PUCP (n = 14)	P-value
Combined organs resection ^a	25	20	5	.154
Colectomy	12	10	2	.678
Partial duodenectomy	1	1	0	
Proctectomy	1	1	0	
Appendectomy	2	2	0	
Adrenalectomy	3	1	2	
Partial cystectomy	1	0	1	
Adnexectomy	1	1	0	
Orchiectomy	1	1	0	
Resection of IVC	2	2	0	
Diaphragmectomy	1	1	0	
Operative time (min) (median)	222	223	195	.330
Blood loss (ml) (median)	600	600	1000	.643
Postoperative complications (%)	19 (34.5)	16 (29.1)	3 (5.4)	
Gastroplegia	4 (7.3)	4	0	
Cardiovascular events	4 (7.3)	3	1	
Abdominal infectious	2 (3.6)	2	0	
Hydronephrosis	2 (3.6)	2	0	
Ureteral leak	1 (1.8)	1	0	
Deep venous thrombosis	1 (1.8)	0	1	
Intestinal fistula	1 (1.8)	1	0	
Digestive tract bleeding	1 (1.8)	0	1	
Epididymitis	1 (1.8)	1	0	
Myelodysplastic syndrome	1 (1.8)	1	0	
Fluid accumulation	1 (1.8)	1	0	
Clavien-Dindo				.846
Grade I-II	14	12	2	
Grade III-IV	5	4	1	
Histologic subtype (%)				.425
Well-differentiated LPS	30 (54.5)	24 (58.5)	6 (42.9)	
Other LPS	24 (45.5)	16 (41.5)	8 (57.1)	
Length of stay(d) (median)	29	28	29.5	.909

^aPatients with combining nephrectomies were excluded from the cohort.

Abbreviation: PUCP, prophylactic ureteral catheter placement.

Table 3. Detailed Causes and Presentation of UIs in the Patients.

UIs	Overall	PUCP (%)	No PUCP (%)
Total	16 (100)	1 (6.3)	15 (93.7)
Non-intended complete transection	3 (18.7)	0 (0)	3 (18.7)
Accidental partial injuries	11 (68.8)	1 (6.3)	10 (62.5)
Ureteral stricture with postoperative hydronephrosis	2 (12.5)	0 (0)	2 (12.5)

Abbreviation: PUCP, prophylactic ureteral catheter placement.

while only 1 patient received prophylactic PUCP. There were significant differences of UIs between PUCP group and No PUCP group ($P < .05$) (Table 4). In univariate analysis, significant differences of BMI, tumor-ureter relationship, co-colectomy were shown between Groups UIs positive and negative, while in multivariable analysis, co-colectomy and tumor-ureter relationship were the 2 risk factors associated to UIs ($P = .045$, 95%CI [1.05-62.36] and $P = .010$, 95%CI [1.66-41.43]) (Table 5).

Table 4. Comparison of UIs Between PUCP and No PUCP Groups.

UIs	N	PUCP (%)	No PUCP (%)	χ^2	P
Total	55	14	41	4.386	.045
Yes	16	1(7.1)	15(36.6)		
No	39	13(92.9)	26(63.4)		

Abbreviation: PUCP: prophylactic ureteral catheter placement.

Discussion

Prophylactic urinal stenting was discussed and advocated as a potential strategy to prevent UIs by colorectal surgeons, urologists, and gynecologists. However, debates over this topic never stopped and there were no evidence-based guidelines existing regarding indications for PUCP during pelvic surgery.²³ Ureteral catheterization did not lead to a decrease of iatrogenic UI as expected according to some studies.^{16,24} Nevertheless, the procedure of catheterization itself could also cause ureteric perforation, urinal bleeding, etc.^{17,25} Besides, postoperative hematuria, urinary tract infection, prolonged operative time, and

Table 5. Univariate and Multivariate Analyses of Ureteral Injury in all Patients Undergoing Primary Retroperitoneal Liposarcoma Resection.

Variables	N	UIs		Uni-variate <i>P</i>	Multivariate		
		+	-		OR	95% CI	<i>P</i>
Total	55	16	39	.598			
Age (mean ± SD)	55.2 ± 11.8						
Male gender	29	9	20	.737			
BMI (mean ± SD)	23.1 ± 3.1			.047	1.25	0.97-1.62	.084
Comorbidities							
Hypertension	13	5	5	.395			
Diabetes	3	2	1	.200			
Tobacco use	15	4	11	1.000			
Diameters (mean ± SD) (cm)	23.3 ± 9.2			.994			
Hemoglobin	122.5 ± 19.7			.838			
Albumin	36.8 ± 4.9			.457			
Co-colectomy	12	7	5	.012	7.81	1.11-55.21	.039
Histologic subtype				.665			
Wdlps	30	8	22				
Other lps	25	8	17				
Relationship between tumor and ureter				.001	6.93	1.51-31.89	.013
Adjacent	32	4	28				
Encasement	23	12	11				
Operative time (min) (median)	222			.06	1.00	0.99-1.01	.596
Estimated blood loss (ml) (median)	600			.149			

hospital stay were commonly reported associating with catheterization. Hematuria occurs in nearly a hundred percent of patients after ureteral catheterization.¹⁴ Thus, whether we should place ureteral catheter prior to pelvic surgeries remains conflation.

In terms of RPS surgeries, unlike pure colorectal or gynecological surgeries, ureters were often compressed, displaced, and encased by bulky and invasive tumor.²⁶ PUCP is more likely to be recommended in surgeries involving retroperitoneal and pelvic area preoperatively due to its aids on identification and guidance of ureter.^{27,28} Unfortunately, there is no study found specifically focused on the utilization of catheter and intraoperative UIs in RPS surgeries before. The largest RPS series reported from TARPSWG only disclosed a 0.4% (4/1007) percentage of urinal leak after RPS surgeries.²⁹ No data about PUCP or other urinal morbidities were collected in that work. In this study, all 16 patients who had UIs received prophylactic, intermittent, or postoperative stent placements. Three of sixteen (18.8%) postoperative urinal events comprising of 1 ureteric leak and 2 hydronephrosis were documented. And the patient who had ureteric leak underwent a reconstruction surgery for rescuing the leakage followed with stenosis.

Regarding PUCP, patients presented with solitary kidney, tumor infiltrated to/encased with kidney, ureter or bladder, too big size, pelvic tumor, preoperative hydronephrosis were considered at high risk of intraoperative UIs and were suggested undergoing PUCP. Encouragingly, only 1 case out of 14 patients who underwent PUCP developed with UI postoperatively. Patients without PUCP had much higher probability of UIs, comparing with PUCP group. Experiences from our surgical practice showed that, skilled surgeons would proactively find the ureteral

catheter in patients with PUCP during surgeries which was very helpful for preventing from UIs. On the opposite, surgeons sometimes were even unaware of the UI during surgeries in patients without PUCP, because of their overconfidence of surgical technique or misidentification of ureter. A total of 86.7% (13/15) patients without PUCP developed with UI in this study due to these causes (Table 3). Ureter transected intendedly during surgeries in order to achieve en-bloc resection was not considered of iatrogenic UI and calculated in this study. Those with ureter encased by tumor had significant risks of UI compared with patients with ureter adjacent to tumor.

Nevertheless, if the colon was involved or infiltrated by the sarcoma, hemicolectomy was often combined in order to achieve a better surgical vision and exposure of retroperitoneal space as well as a better oncological outcome. And the ureter locating between the sarcoma and colon in the retroperitoneal space would be inevitable injured during this procedure. In our study, resection surgeries combining colectomies were calculated as an independent risk factor associated to UI through uni- and multivariate analysis regardless PUCP or not (Table 4).

This study has its intrinsic limitations. It was conducted as a retrospective review with small samples. And the decision to place ureteral catheters was at the surgeon's discretion though all patients were operated by the same team. Patients with recurrent RPS were not enrolled in this study for avoiding potential selection bias of patients. Besides, our institution is the first and largest RPS center all over China. Therefore, most of our patients were transferred from other 3-tier institutions because of extreme complexities of tumors. More than half (27/55) of these patients received combined organ resections and 60.7%

(34/55) patients received ipsilateral or total lipectomy. That could be an explanation of relatively higher urinal morbidities, compared to previous reported data. Well-designed prospective study is needed to better understand the impact of PUCP as a risk stratification model in avoidance of UI in PRLS patients.

Conclusion

In conclusion, PUCP might be an effective option of decreasing intraoperative UIs in PRLS patients, when kidney preservation is required, especially in patients with ureter encased by tumor or anticipated colectomy during surgical process.

Acknowledgments

Partial results were previously reported in 2019 Connective Tissue Oncology Society (CTOS) Annual Conference.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.


Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The present study was kindly supported by a grant from Development Center for Medical Science & Technology, National Health Commission of the People's Republic of China (WA2020RW29).

Ethical Statement

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by institutional review board of Peking University International Hospital (NO.2019-032(BMR)) and individual consent for this retrospective analysis was waived.

ORCID iD

Jun Chen, MD  <https://orcid.org/0000-0003-3974-3605>

References

- Porter GA, Baxter NN, Pisters PW. Retroperitoneal sarcoma: a population-based analysis of epidemiology, surgery, and radiotherapy. *Cancer*. 2006;106(7):1610-1616.
- Gutierrez JC, Perez EA, Franceschi D, Moffat FL Jr, Livingstone AS, Koniaris LG. Outcomes for soft-tissue sarcoma in 8249 cases from a large state cancer registry. *J Surg Res*. 2007;141(1):105-114.
- Stiller CA, Trama A, Serraino D, et al. Descriptive epidemiology of sarcomas in Europe: report from the RARECARE project. *Eur J Cancer*. 2013;49(3):684-695.
- Trans-Atlantic RPSWG. Management of primary retroperitoneal sarcoma (RPS) in the adult: a consensus approach from the Trans-Atlantic RPS working group. *Ann Surg Oncol*. 2015;22(1):256-263.
- Callegaro D, Fiore M, Gronchi A. Personalizing surgical margins in retroperitoneal sarcomas. *Expert Rev Anticancer Ther*. 2015;15(5):553-567.
- Fairweather M, Gonzalez RJ, Strauss D, Raut CP. Current principles of surgery for retroperitoneal sarcomas. *J Surg Oncol*. 2018;117(1):33-41.
- Delacroix SE Jr, Winters JC. Urinary tract injuries: recognition and management. *Clin Colon Rectal Surg*. 2010;23(2):104-112.
- Halabi WJ, Jafari MD, Nguyen VQ, et al. Ureteral injuries in colorectal surgery: an analysis of trends, outcomes, and risk factors over a 10-year period in the United States. *Dis Colon Rectum*. 2014;57(2):179-186.
- Raassen T, Ngongo CJ, Mahendeka MM. Diagnosis and management of 365 ureteric injuries following obstetric and gynecologic surgery in resource-limited settings. *Int Urogynecol J*. 2018;29(9):1303-1309.
- Damiano R, Autorino R, De Sio M, et al. Does the size of ureteral stent impact urinary symptoms and quality of life? A prospective randomized study. *Eur Urol*. 2005;48(4):673-678.
- Borowiec AM, Gill RS, Birch DW, Karmali S. The utility of lighted ureteral stents in laparoscopic colorectal resection: a survey of Canadian surgeons. *Gastroenterology Res*. 2011;4(4):143-148.
- Douissard J, Meyer J, Ris F, Liot E, Morel P, Buchs NC. Iatrogenic ureteral injuries and their prevention in colorectal surgery: results from a nationwide survey. *Colorectal Dis*. 2019;21(5):595-602.
- Coakley KM, Kasten KR, Sims SM, Prasad T, Heniford BT, Davis BR. Prophylactic ureteral catheters for colectomy: a national surgical quality improvement program-based analysis. *Dis Colon Rectum*. 2018;61(1):84-88.
- Boyan WP Jr, Lavy D, Dinallo A, et al. Lighted ureteral stents in laparoscopic colorectal surgery; a five-year experience. *Ann Transl Med*. 2017;5(3):44.
- Dumont S, Chys B, Meuleman C, Verbeke G, Joniau S, Van der Aa F. Prophylactic ureteral catheterization in the intraoperative diagnosis of iatrogenic ureteral injury. *Acta Chir Belg*. 2021;121(4):261-266.
- Merola J, Arnold B, Luks V, et al. Prophylactic ureteral stent placement vs no ureteral stent placement during open colectomy. *JAMA Surg*. 2018;153(1):87-90.
- Pathak RA, Taylor AS, Alford S, et al. Urologic-induced complications of prophylactic ureteral localization stent placement for colorectal surgery cases. *J Laparoendosc Adv Surg Tech A*. 2015;25(12):966-970.
- Okawa M, Komatsu H, Iida Y, et al. Evaluating the efficacy and safety of ureteral stent placement as a preoperative procedure for gynecological cancer surgeries: a retrospective cohort study. *J Obstet Gynaecol Res*. 2021;47(8):2752-2757.
- Hassinger TE, Mehaffey JH, Mullen MG, et al. Ureteral stents increase risk of postoperative acute kidney injury following colorectal surgery. *Surg Endosc*. 2018;32(7):3342-3348.
- Sakellariou P, Protopapas AG, Voulgaris Z, et al. Management of ureteric injuries during gynecological operations: 10 years experience. *Eur J Obstet Gynecol Reprod Biol*. 2002;101(2):179-184.

21. von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Ann Intern Med.* 2007;147(8):573-577.
22. 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. *Ann Surg.* 2004;240(2):205-213.
23. da Silva G, Boutros M, Wexner SD. Role of prophylactic ureteric stents in colorectal surgery. *Asian J Endosc Surg.* 2012;5(3):105-110.
24. Hird AE, Nica A, Coburn NG, Kulkarni GS, Nam RK, Gien LT. Does prophylactic ureteric stenting at the time of colorectal surgery reduce the risk of ureteric injury? *A Syst Rev Meta-Anal.* 2021;23(5):1060-1070.
25. Geskin AA, Westney OL, Graber WJ, Smith Iii TG, Chapin BF, Gregg JR. Complications of peri-operative ureteral catheter placement: experience at a major cancer center. *Urology.* 2021.S0090-4295(21)00646-4.
26. Stahl CC, Schwartz PB, Ethun CG, et al. Renal function after retroperitoneal sarcoma resection with nephrectomy: a matched analysis of the United States sarcoma collaborative database. *Ann Surg Oncol.* 2021;28(3):1690-1696.
27. Nakamura K, Nagata D, Kajikawa K, et al. Retroperitoneal approach for laparoscopic nephroureterectomy with stripping technique: extracorporeal ligation of ureter and ureteral catheter. *Asian J Endosc Surg.* 2012;5(1):42-45.
28. Merritt AJ, Crosbie EJ, Charova J, et al. Prophylactic preoperative bilateral ureteric catheters for major gynaecological surgery. *Arch Gynecol Obstet.* 2013;288(5):1061-1066.
29. MacNeill AJ, Gronchi A, Miceli R, et al. Postoperative morbidity after radical resection of primary retroperitoneal sarcoma: a report From the Transatlantic RPS Working Group. *Ann Surg.* 2018;267(5):959-964.