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Surgery in Motion

Retrosigmoid Versus Traditional Ileal Conduit for Urinary Diversion After Radical Cystectomy

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Abstract

Background: Ureteroileal anastomotic stricture (UAS) after ileal conduit diversion occurs in a non-negligible proportion of patients undergoing radical cystectomy (RC). Surgical techniques aimed at preventing this potential complication are sought.
Objective: To describe our surgical technique of retrosigmoid ileal conduit, and to assess perioperative outcomes and postoperative complications with a focus on UAS rate.
Design, setting, and participants: A prospective single-centre, single-surgeon cohort of 67 consecutive patients undergoing open RC with ileal conduit urinary diversion between July 2013 and April 2017 was analysed. A study group of 30 patients receiving retrosigmoid ileal conduit was compared with a control group of 37 patients receiving standard Wallace ileal conduit.
Surgical procedure: Retrosigmoid versus Wallace ileal conduit diversion after open RC.
Measurements: Operative room (OR) time, estimated blood loss (EBL), transfusion rate, and 90-d postoperative complications were recorded and compared between the two groups. In particular, rate of UAS, defined as upper collecting system dilatation requiring endourological or surgical management, was assessed and compared.
Results and limitations: The two groups were comparable with regard to all demographic, clinical, and pathological variables. No differences were observed in terms of OR time ($p = 0.35$), EBL ($p = 0.12$), and transfusion rate ($p = 0.81$). Ninety-day postoperative complications were observed in 11 (36.7%) patients who underwent a retrosigmoid ileal conduit and 20 (54.1%) patients who received a traditional ileal conduit ($p = 0.32$). Major complications (grade 3–4) were observed in three (10%) cases in the former group and in 12 (32.4%) cases in the latter group ($p = 0.08$). Mean (standard deviation) follow-up time was 10.8 ± 4.0 mo in the study group and 27.5 ± 9.5 mo in the control group ($p < 0.001$). No single case of UAS was observed in the study group, whereas six (16.2%) cases of UAS occurred in the control group ($p = 0.02$). The main limitation is a nonrandomised comparison of a relatively small cohort with short-term follow-up.
Conclusions: In our study, we observed a significantly reduced rate of UAS and no increase in postoperative complications with the retrosigmoid ileal conduit diversion compared with standard Wallace ileal conduit diversion after open RC.
Patient summary: We describe our surgical technique of retrosigmoid ileal conduit as urinary diversion after open radical cystectomy. Compared with traditional techniques, our technique for ileal conduit was found to be safe and reduce the risk of ureteric strictures.

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1. Introduction

Ureteroileal anastomotic stricture (UAS) is a threatening complication after radical cystectomy (RC) and urinary diversion because it may result in an irreversible damage to the corresponding renal unit and/or in infectious sequelae. The initial endourological treatment has a relatively high failure rate [1,2], and the following surgical revision may require complex reconstruction and carry additional morbidity.

The long-term rate of UAS after ileal conduit diversion is reported to be as high as15% [3], with several studies showing a prevalence of involvement of the left ureter in up to approximately 70% of cases [4–7]. Apart from patient- and disease-related risk factors, UAS can be a consequence of a poor surgical technique of ureteroileal anastomosis, or of an ischemic injury following ureteric mobilisation. Indeed, the most popular techniques for ileal conduit include extensive mobilisation of the left ureter and its contralateral transposition through a retrosigmoid tunnel [8,9]. This manoeuvre may jeopardise the blood supply to the distal tract of the ureter increasing the risk of stricture. Moreover, the retrosigmoid ureteric tract may be prone to angulation, kinking, and compression from the mesentery, leading to obstruction.

In order to prevent this potential complication, some authors have proposed a novel technique consisting of the transposition of the ileal conduit to the left body side through a retrosigmoid tunnel [10,11]. In this manner, there is no need for wide mobilisation of the left ureter, and a longer tract can be resected in case of tumour involvement or visible nonvital tissue. This technique has been evaluated in relatively small case-series studies and has been only little popularised.

The objectives of this study were to (1) describe our surgical technique of retrosigmoid ileal conduit and (2) compare perioperative outcomes, complications, and UAS rate in a contemporary series of patients who underwent open RC with retrosigmoid versus traditional ileal conduit.

2. Patients and methods

2.1. Patients

A prospectively maintained database for RC patients has been active at the Urology Unit of the Academic Medical Centre in Udine since 1 July 2013. For the purpose of the present study, all patients undergoing open RC for either malignant or benign conditions and for ileal conduit as urinary diversion were selected. Excluded from the present study were patients undergoing palliative RC. Since 1 March 2016, we used the retrosigmoid technique for construction of ileal conduit after RC. All consecutive patients treated with this technique until 30 April 2017 were compared with a control group consisting of all consecutive patients treated with open RC and traditional ileal conduit between 1 July 2013 and 28 February 2016. No neoadjuvant chemotherapy was offered at our institution during the study period. All patients accepted to participate and authorised data collection for scientific purposes.

2.2. Surgical technique

All surgical procedures were performed under general anaesthesia by one expert, high-volume surgeon (V.F.), who had extensive experience in RC with Wallace ileal conduit before the start of the study. After completing RC and, whenever indicated (ie, all malignant cases), extended pelvic lymph node dissection, the ileocecal valve and distal ileum were identified. Approximately 20 cm proximal to the ileocecal valve, a 20-cm long ileal segment in the study group and a 15-cm long ileal segment in the control group were isolated. While the incision of the mesentery at the level of the distal end of the selected ileal segment was straight in both groups, the incision of the mesentery at the level of the proximal end in the study group was longer and directed in a more oblique plane compared with the control group, in order to accommodate the retrosigmoid passage of the ileal conduit with no tension (Fig. 1). In both cases, the mesentery incision was performed using the Harmonic Focus Long Shears (Ethicon Endo-Surgery Inc., Cincinnati, OH, USA) or the LigaSure Maryland Jaw (Covidien, Mansfield, MA, USA). A side-to-side ileoileal anastomosis was performed using GIA 80 mm and TA 60 mm (Covidien) staplers. The mesentery window was closed with interrupted sutures. The isolated ileal segment was then flushed with copious amounts of saline and povidone iodine until the irrigant was clear.

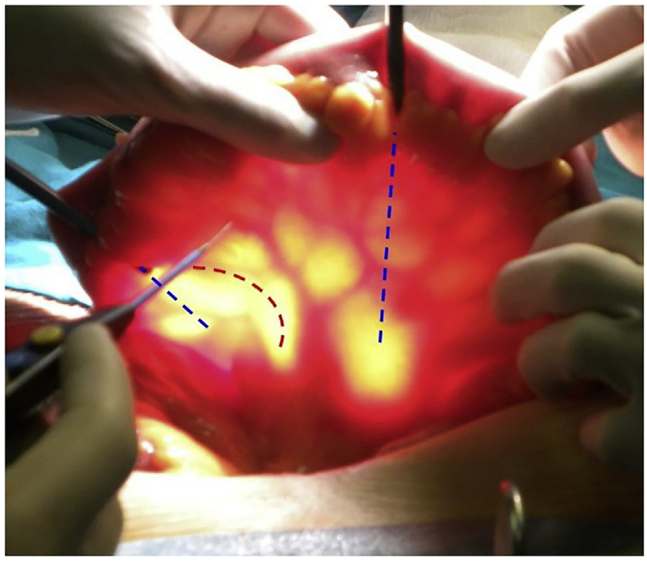

Fig. 1 – Incision of the mesentery at the level of the proximal end of the selected ileal segment for the conduit was longer and directed in a more oblique plane in the study group (red dotted line) compared with the control (blue dotted line) group. This manoeuvre is aimed at favouring the retrosigmoid passage of the ileal segment with no tension on the mesentery.

In the study group, the proximal end of the ileal segment was closed with a TA 30 mm (Covidien) stapler, and a stay suture was left at each end of the closing line. A wide, bluntly dissected, retrosigmoid tunnel was created at the level of the sacral promontory. The ileal segment was then transposed from the right to the left side through the retrosigmoid tunnel by gently pulling the stay sutures with a curved clamp. The proximal end of the ileal segment was then fixed to the psoas muscle tendon with two or three interrupted 3-0 Vicryl sutures (Fig. 2). During the passage of the ileal segment, correct position of the mesentery was checked so as to avoid angulation and excessive compression leading to ischaemia. The redundant tract of the left distal ureter was resected in order to obtain a tension-free ureteroileal anastomosis without angulation. The ureter was then spatulated along its posterior face and anastomosed to the anterior face of the proximal portion of the ileal segment. The right ureter was spatulated along its anterior aspect and anastomosed to the most caudal point of the right distal portion of the ileal segment. Both ureteroileal anastomoses were performed with four interrupted 4-0 Vicryl sutures over a 6-Ch ureteric catheter according to

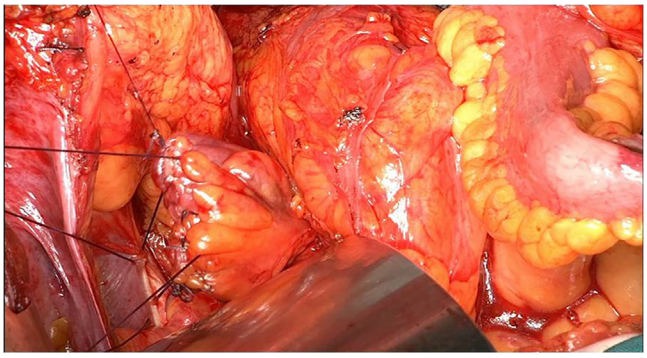

Fig. 2 – The proximal end of the ileal segment is passed through a wide retrosigmoid tunnel from the right to the left body side, and fixed to the psoas muscle tendon.

the standard direct end-to-side Nesbit technique [12] and were covered by the posterior peritoneum.

In the control group, the left ureter was widely mobilised and transposed to the right side through a retrosigmoid tunnel. The ureters were then spatulated over their anterior aspect, and sutured to each other and then to the proximal end of the isolated ileal segment with two running 4-0 Vicryl sutures according to the standard Wallace I technique [9].

Finally, in both groups, an abdominal nipple stoma in the right iliac fossa was performed. In detail, the distal end of the ileal segment was first anchored to the rectus fascia with interrupted 3-0 Vicryl sutures and then to the skin. An 18-Ch Foley catheter was placed in the ileal conduit to allow for postoperative flushing. Two tubular 24-Ch drains were placed in the cystectomy cavity.

2.3. Postoperative management

Antibiotic therapy with piperacillin/tazobactam was continued for 4 d. Starting from 1 July 2014, an enhanced recovery after surgery (ERAS) pathway was introduced at our institution, as described elsewhere [13]. Briefly, the main differences of the ERAS pathway with the standard perioperative care included no preoperative dietary restrictions, no bowel preparation, opioid-sparing general anaesthesia with restrictive fluid administration, no nasogastric tube, no postoperative stay in the intensive/intermediate care unit, standardised postoperative pain control, no total parenteral nutrition, early nutritionist-guided oral diet, and early mobilisation.

Pelvic drains were removed between postoperative days (PODs) 2 and 4. Starting from POD 4, the ileal conduit was flushed with low-pressure saline through the Foley catheter. Ureteric catheters were removed on PODs 7 and 8. In the study group, this was performed after retrograde ureterography had ruled anastomotic leakage out (Fig. 3).

Criteria for hospital discharge included passage of stool, tolerance to regular solid diet, satisfactory pain control with oral agents alone, no fever, removal of drains and urinary catheters, good competence with urinary stoma, and planning of home healthcare if needed.

Patients were followed up 1 mo after the surgical procedure and then at 3-mo intervals for the 1st year, at 6-mo intervals for the 2nd year, and annually thereafter. Routine follow-up studies included a physical examination and serum studies, including electrolytes, creatinine, liver function tests, and abdomen/pelvis ultrasound examination. Chest X-ray and computed tomography of the abdomen/pelvis were performed at 6 mo after cystectomy and yearly thereafter for 5 yr or when clinically indicated.

2.4. Data collection and study outcomes

The following demographic and clinical variables were recorded: age, gender, body mass index, Eastern Cooperative Oncology Group performance status, Charlson comorbidity index, American Society of Anesthesiologists score, clinical tumour stage assigned according to the 2010 tumour-node-metastasis (TNM) staging system [14], and preoperative upper collecting system status. Moreover, the following intraoperative variables were recorded: operative room (OR) time, estimated blood loss (EBL), and intraoperative complications.

Surgical specimens were processed according to standard pathological procedures and reviewed by experienced uropathologists. Pathological extension of the primary tumour and lymph node involvement were assigned according to the 2010 TNM staging system [14].

Length of stay (LOS), defined as the number of PODs from RC until discharge, was recorded. Ninety-day postoperative complications were classified according to the Dindo modification of the Clavien system [15]. Specifically, the occurrence of UAS, defined as upper collecting system dilatation requiring endourological or surgical treatment, was assessed.

2.5. Statistical analyses

Parametric continuous variables were reported as mean ± standard deviation (SD), whereas median and interquartile ranges were used for nonparametric continuous variables. Categorical variables were reported as frequency and percentages. Student *t* test, Mann-Whitney *U* test, and

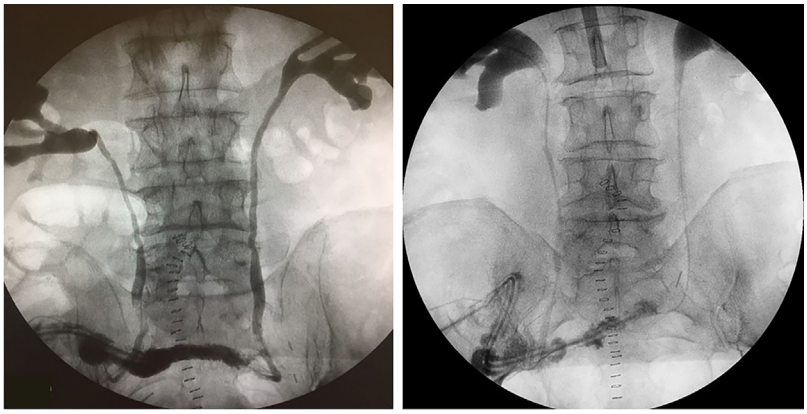

Fig. 3 – Retrograde ureterography on postoperative day 7 in two patients of the study group, showing regular opacification of both ureters and of the retrosigmoid ileal conduit with no anastomotic leakage.

Table 1 – Demographic, preoperative, and pathological characteristics of the 67 patients included in the comparative analysis stratified by type of ileal conduit diversion after radical cystectomy

Variable	Total cases (n = 67)	Retrosigmoid ileal conduit (n = 30)	Traditional ileal conduit (n = 37)	p value
Median (IQR) age, yr	74 (68–79)	73 (67.7–78.2)	74 (69–79)	0.63
Male gender, n (%)	49 (73.1)	22 (73.3)	27 (73)	0.97
Median (IQR) body mass index, kg/m^2	27 (23.6–30.5)	26 (23–31)	27.4 (24.5–29.9)	0.67
ECOG performance status, n (%)				0.95
0–1	59 (89.4)	26 (89.7)	33 (89.2)	
>1	7 (10.6)	3 (10.3)	4 (10.8)	
Charlson comorbidity index, n (%)				0.08
0	26 (38.8)	15 (50)	11 (29.7)	
>0	41 (61.2)	15 (50)	26 (70.3)	
Mean (SD) clinical tumour size (cm)	1.96 ± 1.2	2.02 ± 1.3	1.92 ± 1.9	0.75
Clinical tumour stage, n (%)				0.08
≤T1	9 (13.4)	3 (10.0)	6 (16.2)	
T2	46 (68.6)	24 (80.0)	22 (59.5)	
T3–4	8 (12.0)	1 (3.3)	7 (18.9)	
Not applicable	4 (6.0)	2 (6.7)	2 (5.4)	
ASA score, n (%)				0.33
2	33 (49.3)	12 (40.0)	21 (56.7)	
3	34 (50.7)	18 (60.0)	16 (43.3)	
Upper collecting system dilatation, n (%)				0.37
Absent	54 (80.6)	22 (73.3)	32 (86.5)	
Unilateral	7 (10.4)	4 (13.3)	3 (8.1)	
Bilateral	6 (9)	4 (13.3)	2 (5.4)	
Pathological tumour stage (pT), n (%)				0.69
T0	4 (6.0)	2 (6.7)	2 (5.4)	
T1/carcinoma in situ	7 (10.5)	2 (6.7)	5 (13.5)	
T2	23 (34.3)	11 (36.6)	12 (32.4)	
T3	22 (32.8)	9 (30.0)	13 (35.1)	
T4	7 (10.4)	4 (13.3)	3 (8.1)	
Not applicable	4 (6.0)	2 (6.7)	2 (5.4)	
Pathological lymph node invasion, n (%)	7 (10.5)	5 (16.7)	2 (5.4)	0.49
Soft tissue surgical margins, n (%)				0.19
Negative	65 (97)	30 (100.0)	35 (94.6)	
Positive	2 (3)	0 (0.0)	2 (5.4)	

ASA = American Society of Anesthesiology; ECOG = Eastern Cooperative Oncology Group; IQR = interquartile range; SD = standard deviation.

Pearson's chi-square test were used to compare continuous parametric, nonparametric, and categorical variables, as appropriate. All clinical records were inserted in a dedicated database and analysed using SPSS v. 21.0 (IBM Corp., Armonk, NY, USA) software. All reported p values were two sided and statistical significance was set at $p < 0.05$.

3. Results

Of 171 patients undergoing RC in the study period, 67 (39%) received an ileal conduit, 62 (36%) an ileal neobladder, and 42 (25%) a cutaneous ureterostomy.

The study and control groups included 30 (44.8%) and 37 (55.2%) patients, respectively. The two groups were comparable with regard to all demographic, clinical, and pathological variables (Table 1).

Mean (SD) OR time was 279 ± 70 min in the study group and 293 ± 45 min in the control group (p = 0.35). Mean (SD) EBL was 417 ± 243 ml in the retrosigmoid group and 525 ± 306 ml in the traditional ileal conduit group (p = 0.12). Intraoperative blood transfusions were required in five (16.7%) patients in the study group and in seven (18.9%) in the control group (p = 0.81). No intraoperative complications were observed in either group.

An ERAS protocol was applied to 29 (96.7%) patients in the study group and to 27 (56.8%) in the control group ($p < 0.001$). When considering only patients in both groups managed with ERAS protocol, no difference in terms of time to resumption of bowel sounds (1.41 ± 0.62 vs 1.48 ± 0.87, p = 0.77), time to passage of flatus (2.28 ± 0.88 vs 2.38 ± 1.07, p = 0.70), and time to passage of stool (3.34 ± 0.97 vs 3.71 ± 2.1, p = 0.41) was observed in the study and control groups, respectively. In the study group, no single case of anastomotic leakage was observed on retrograde ureterography performed on POD 7. Mean LOS was 13 ± 4.2 d in the study group and 15.2 ± 6.2 d (p = 0.11) in the control group.

Ninety-day postoperative complications were observed in 11 (36.7%) patients who underwent a retrosigmoid ileal conduit and in 20 (54.1%) patients who received a traditional ileal conduit (p = 0.32; Table 2). In detail, major complications (grade 3–4) were observed in three (10%) cases in the former group and in 12 (32.4%) in the latter group (p = 0.08).

No patients were lost to a minimum of 6-mo follow-up. Mean (SD) follow-up time was 10.8 ± 4.0 mo in the study group and 27.5 ± 9.5 mo in the control group ($p < 0.001$). In the study group, no single case of UAS was observed, whereas in the control group, six (16.2%) cases of UAS were observed at the last follow-up (p = 0.02). The stricture involved the left ureteroileal anastomosis in four patients

Table 2 – Overall 90-d postoperative complications classified according to Clavien-Dindo grading system in the 67 patients included in the comparative analysis

Grade	Overall complications (n = 31) (46.3%)	Retrosigmoid ileal conduit (n = 11) (36.7%)		Traditional ileal conduit (n = 20) (54.1%)		Complication type	Treatment
2	16 (20.9%)	8 (26.7%)	5	8 (21.6%)	7	Anaemia	Blood transfusions
			3		1	Febrile urinary tract infection	Antimicrobials
3a	7 (10.4%)	1 (3.3%)	–	6 (14.2%)	3	Ureteric stricture	Ureteric catheter placement
			–		2	Lymphocele	Percutaneous drainage
			–		1	Ileum conduit leakage	Temporary bilateral nephrostomy tube
			1		–	Atrioventricular block	Atrioventricular pacemaker implantation
3b	6 (9%)	1 (3.3%)	–	5 (13.5%)	3	Small bowel obstruction	Lyse of ileal adhesions/ileal resection
			1		2	Wound dehiscence	Surgical synthesis
4	2 (3%)	1 (3.3%)	–	1 (2.7%)	1	Sepsis	Antimicrobials, inotropic drugs

and both ureteroileal anastomoses in one patient. All cases of UAS occurred within the initial 6-mo follow-up and were treated endoscopically with the placement of a permanent MJ ureteric catheter.

4. Discussion

Our results confirmed the feasibility of the retrosigmoid ileal conduit in patients undergoing RC, with similar perioperative outcomes and complications, but a significantly decreased rate of UAS at a short-term follow-up, compared to the standard Wallace ileal conduit.

The reported prevalence of UAS in ileal conduit patients ranges from approximately 2% to 15% for both a Wallace and a Bricker anastomotic technique [16]. Data observed in the control group of the present study confirmed those previously described in the literature. Prevalence for involvement of the left side (ie, 5/6 cases) was also proved.

Apart from technical errors, UAS can be due to the ischemic damage to the distal portion of the ureters during their mobilisation. Specifically, construction of a traditional ileal conduit requires more extensive isolation of the left ureter to allow for its tension-free transposition to the right side, which may explain the reported higher rate of UAS involving the left compared with the right ureter [4–7].

The rational for the retrosigmoid ileal conduit is to reduce the risk of the left UAS by avoiding ureteric transposition. To the best of our knowledge, only two retrospective case series evaluated the use of retrosigmoid ileal conduit for urinary diversion after RC [10,11]. In the former report, no major perioperative complications were observed in the analysed 42 patients [10]. In detail, after a median follow-up of 18.6 mo, no single case of UAS was reported and only one case of abdominal stoma stricture was observed. In the latter study, 40 patients were analysed [11]. Unlike previous experience, ureteroileal anastomoses were performed with 1-cm seromuscular suturing of the terminal ureter to the ileal wall. All patients had a follow-up of 1 yr, and none developed UAS. Both studies reported longer follow-up compared with our study, but are limited by the absence of a control group. Moreover, perioperative outcomes and complications were not measured and/or reported according to standardised systems. Our study confirmed the absence of UAS in patients receiving retrosigmoid transposition of the ileal conduit. Moreover, for the first time in the literature, we showed comparable perioperative outcomes and postoperative complications between retrosigmoid and traditional ileal conduit. Interestingly, UAS rate in the control group was significantly higher compared with that in the study group. Therefore, this technique should be considered in all candidates for ileal conduit, and strongly recommended in special cases in which transposition of the left ureter cannot be possible because of a more extensive ureteric demolition or particular anatomic conditions.

We are also aware of further technique modification of the traditional ileal conduit, which includes no transposition of the left ureter [17]. In 100 patients, the ileal conduit was fixed anteriorly to the sigmoid, and the ureters were anastomosed to the conduit each on its naïve side. The control group included a historical cohort of 100 patients who had received a standard Bricker conduit. After a median follow-up of approximately 5 yr for both groups, UAS rate was 5% in the study group versus 15% in the control group. However, UAS laterality was not reported, a 5% rate of ureteroileal anastomotic fistula was observed in the study group, and no detailed analysis of perioperative outcomes and postoperative complications was performed. Moreover, unlike the technique of the retrosigmoid conduit, this technique does not allow one to maintain the ureteroileal anastomoses completely retroperitoneal.

Our study is not devoid of limitations. First, this is a nonrandomised study using a contemporary historical cohort as a control group and includes a relatively limited sample. Second, mean follow-up time in the study group is significantly shorter than that in the control group. However, minimum follow-up time in the study group was7 mo, and all cases of UAS in the control group were detected within 6 mo; thus, we judge this time span to be reliable for a meaningful comparison. Obviously, long-term complications remain undetermined in both groups. Third, the control group included patients undergoing a Wallace ileal conduit instead of a Nesbit anastomosis performed in the study group. It remains unknown whether a different type of ileal conduit (eg, Bricker with Nesbit anastomosis) would have been associated with a similar rate and characteristics of UAS. However, a recent systematic review with meta-analysis of four comparative studies found no

significant difference in the incidence of UAS in Bricker or Wallace ureteroileal anastomoses after >2 yr of follow-up [16]. Finally, our data of an open RC series await confirmation when a robot-assisted approach is adopted.

5. Conclusions

In our study, we observed a significantly reduced rate of UAS at short-term follow-up, and no increase in intra- or postoperative complications with the retrosigmoid ileal conduit diversion compared with standard Wallace ileal conduit diversion after open RC. These preliminary data seem to corroborate the hypothesis that the preservation of the naïve location of, and blood supply to, the left ureter with no transposition to the contralateral side may contribute to a lower risk of UAS. Further, adequately powered, comparative, ideally randomised studies with long-term follow-up are warranted to confirm the promising early results of this technique.

Author contributions: Vincenzo Ficarra had full access 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: Ficarra, Pansadoro.
Acquisition of data: Crestani, Palumbo, Rossanese.
Analysis and interpretation of data: Ficarra.
Drafting of the manuscript: Giannarini.
Critical revision of the manuscript for important intellectual content: Ficarra, Valotto, Inferrera.
Statistical analysis: Ficarra.
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Supervision: None.
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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at https://doi.org/10.1016/j.eururo.2018.06.023

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