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A modified cutaneous ureterostomy provides satisfactory short and midterm outcomes in select cases

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ABSTRACT

Objective: We present the outcomes of modification of cutaneous ureterostomy by extreme lateralization of the stoma and use of skin flap for formation of ureterostomy.

Material and methods: Between June 2012 and June 2016, 36 patients had modified cutaneous ureterostomy for ureteral obstruction due to pelvic malignancy or genitourinary tuberculosis. Transureteroureterostomy was made with cutaneous stoma at anterior axillary line between iliac crest and lower rib cage, instead of spinoumbilical line. To prevent stenosis a 'V' shaped skin was fed into the stoma. Double J stents were used in all patients for 6 weeks. Perioperative morbidity and mortality were evaluated. All patients were followed up at 3 month intervals.

Results: Of 36 patients, 22 had radical cystoprostatectomy (including nephroureterectomy in 2 patients) and 7 had palliative cystectomy. Others had locally advanced prostate cancer (n=1), locally advanced cervical cancer (n=3), ovarian cancer (n=1) and genitourinary tuberculosis with small capacity bladder along with a large vesicovaginal fistula (n=1). One patient developed ureteral necrosis requiring conversion to ileal conduit. Three patients developed stomal stenosis: two were managed by self-dilatation while one required revision of stoma. Thirteen patients died of the disease at a median follow up of 6 months with functioning stoma. Remaining 19 patients survived without any complications at a median follow-up of 20.5 months (5.5-43.5 months). None of the patients had any problem related to ureterostomy bag application.

Conclusion: Modified lateral cutaneous ureterostomy provides relatively straighter and shorter retroperitoneal course of ureter with acceptable morbidity and avoids use of bowel in selected patients.

Keywords: Cutaneous ureterostomy; stenosis; stoma.

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Introduction

Cutaneous ureterostomy (CU) was first described in 1967 by A. Roth, by wrapping the ureters with the greater omentum.[1] It represents a simplified alternative for urinary diversion after palliative surgery for advanced genitourinary and pelvic malignancies in unfit patients. Conventional ureterostomy is associated with fewer inherent complications as compared to ileal conduit.[2] Most of the complications associated with conventional ureterostomy involving anterior abdominal wall are due to ureteral obstruction either at the level of stoma or along its entire course due to ureteral kinking, ureteral ischemia, extramural ureteral compression due to associated retroperitoneal fibrosis or compression by intraperitoneal structures.[3] Many modifications have been described to bring down the stoma related complications.[4-7]

None of the studies have stressed the importance of the course of the ureters encountered during ureterostomy, especially intraperitoneal cross over ureter. We hypothesized that as the ureter curves from posterior wall to anterior wall, its course through the peritoneal cavity is not straight so it remains under tension. We present our novel technique of lateral CU with extreme lateralization of stoma at anterior axillary line with relatively straighter, shorter retroperitoneal course of the ureter. The objective of this study was to

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highlight the advantages of this technique in terms of stomal and nonstomal complications.

Material and methods

Study design and patients characteristics

In a retrospective cohort study, clinical, pathological and operative parameters were recorded for 36 patients who underwent modified lateral CU as urinary diversion after previously performed different surgeries listed in Table 1, between June 2012 and June 2016. The decision for CU was based on primary pathology, renal function and comorbidities of the patients. The decision for CU in those with locally advanced or metastatic bladder cancer, locally advanced prostate cancer and gynaecological malignancies was taken into consideration as a palliative treatment while for those with localized bladder cancer CU was offered if they had hydronephrosis due to malignant infiltration of one or both ureters. Transposing right or left ureter was an intraoperative decision depending upon the available length of the ureter and the degree of dilatation. Larger ureter was used as cutaneous stoma. If both ureters were nondilated and comparable, we preferred exteriorizing the right ureter along with left to perform right transureteroureterostomy. This is technically easier for right handed surgeon and is simpler to take care for a right handed patient. Stoma position was in extremely lateral position at anterior axillary line between the iliac crest and the lower rib cage, instead of on the spino-umbilical line (Figure 1).

Cutaneous ureterostomy

After ureterolysis, the contralateral ureter was brought to the side of better and more dilated ureter and 1.5 cm incision was made over the dilated (recipient) ureter followed by end-to-side ureteroureterostomy using 4-0 vicryl® sutures (Figure 2). Wide-mouthed stoma was made with incorporation of 'V' shaped skin flap into spatulated ureteral end to prevent stomal stenosis (Figure 3). While creating a stoma, an excess of the underlying fat was trimmed off till external oblique sheath was reached. A cruciate incision was made on the sheath and after splitting the underlying muscle the ureteral end was taken out and held with a suture.

Peritoneum was closed in all patients to keep the ureter in extraperitoneal location. Rectus sheath was closed before fashioning the stoma. For stoma, the ureteral end was spatulated inferomedially after ruling out any kink by inserting an 8F feeding tube. The ureter was fixed at three points on the sheath with Vıcryl® 4-0 sutures. Then the ureteral margins were sutured to the skin using 4-0 Monocryl® sutures by interrupted stitches. Polyurethane 6/26 double-J ureteral stents were inserted into both the ureters over 0.035" hydrophilic floppy tip Teflon guide wire, which were secured to the skin and removed 6 weeks after the surgery.

Ureterostomy care

Ureterostomy wafer was applied after placing a ring of hydrocolloid paste around the stoma. Double J stents were removed after 6 weeks and patients' attendants were taught to dilate the stoma with 6 or 8 F feeding tube to be inserted for 3 to 4 cm inside every time they changed the bag.

Follow-up

Perioperative morbidity and mortality were evaluated. All patients were followed up at 3 monthly intervals evaluating blood chemistry, renal function test results, upper urinary tract status and for complications of ureterostomy, i.e. stomal stenosis. Postoperative complications were recorded according to the modified Clavien-Dindo classification system.[8]

Results

Details of patients with CU are shown in Table 1. Presurgical treatment included chemotherapy in 7 patients who had palliative cystectomy and 2 patients with radical nephroureterectomy and cystoprostatectomy, androgen deprivation therapy in the patient with prostatic cancer, chemoradiation in 3 patients with cervical cancer, chemotherapy in the patient with ovarian cancer and 6 months of antituberculostatic therapy in the patient with genitourinary tuberculosis. During postoperative period, 54 complications were recorded in 24 patients (Table 2). Most of them (45/54) were low- grade complications (Grades I and II). Nine (16.67%) were of Clavien grade 3 and higher. Four patients developed stoma- related complications. Two of them had radical cystoprostatectomy as the primary procedure while one patient had palliative cystectomy for intractable hematuria and frozen pelvis due to cervical carcinoma. When divided according to the time after surgery, There were 36 early (within

Figure 1. A patient with modified cutaneous ureterostomy. (Black circle indicates the usual location of the stoma)

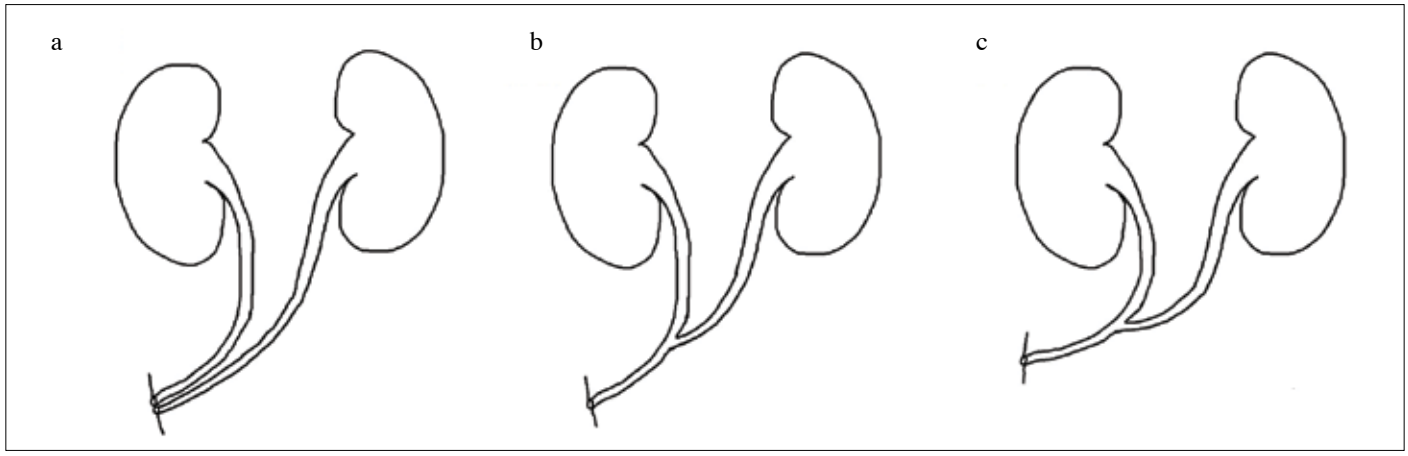

Figure 2. a-c. Different types of cutaneous ureterostomy: (a) both ureters brought to the skin, (b) transureteroureterostomy with single cutaneous ureterostomy, and (c) transureteroureterostomy with lateralization of cutaneous ureterostomy

Figure 3. A "V" shaped flap was fed in, which formed more than half of the circumference of the cutaneous ureterostomy

90 days), and 18 late (>90 days) postoperative complications (Table 3).

One of the initially treated patients who had radical cystoprostatectomy developed necrosis of the ureteral segment distal to the ureteroureterostomy three weeks after surgery and was salvaged by conversion to ileal conduit. This patient had extensive desmoplastic reaction in the pelvis and had bilateral pelvic lymphadenopathy. He did not receive any preoperative chemotherapy or radiotherapy. Three patients had stomal stenosis at postoperative 2nd, 3rd and 25th months. One of them underwent revision of the stoma and remaining 2 patients did well on the self-dilatation of the stoma with infant feeding tube at the time of change of the bag.

None of the patients had other known complications of CU as calculus formation, recurrent or persistent urinary tract infections, and renal failure. Thirteen patients died at the median follow up of 6 months (range: 1-24 months) with a functioning stoma. The remaining 19 patients survived without complications at a median follow up of 20.5 months (range: 5.5-43.5 months).

Sixteen patients had chronic kidney disease (CKD) before surgery. Of these, six patients had a solitary kidney. Of 20 patients with normal renal function, four had a solitary kidney. The median preoperative serum creatinine value in those with CKD was 1.9 mg/dL while the median postoperative serum creatinine was 2.1 mg/dL (p=0.52). In 4 patients without CKD, serum creatinine levels increased during the postoperative period. In 3 patients, it resolved with observation alone and one required double J stenting.

Discussion

Cutaneous ureterostomy is widely used as urinary diversion in children with ureteral valves, megaureter and ectopia and rarely in adults as a temporary or definitive alternative.[9-11] Use of native ureter for stoma has an inherent advantage of avoiding the complications like metabolic complications, prolonged ileus, intestinal obstruction, and ureteroileal strictures associated with the use of ileum.[2] Despite these advantages, most of the authors have preferred to use CU in selected patients who are elderly, highly risky (American Society of Anesthesiologists score 3 or more) or those in whom there is an absolute or relative contraindication to use bowel for urinary diversion.[12-15] Hence, we sought to study the benefits of modified CU in relatively healthier patients who would otherwise be offered an

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Table 1. Patient demographics and characteristics

Patient variables	Value/ No. of patients
Mean age in years (±SD)	62.5 (±8.7)
Mean BMI in kg/m^2 (±SD)	25.2 (±1.9)
Mean Charlson comorbidity score (±SD)	4.4 (±1.6)
Median follow up after surgery in months (range)	14.25 (5.5-43.5)
Surgery	
• Radical cystoprostatectomy	20
• Palliative cystectomy	7
• Radical nephroureterectomy with cystoprostatectomy	2
• Locally advanced carcinoma cervix with frozen pelvis, and bilateral hydroureteronephrosis with renal failure	3
• Excision of gangrenous neobladder	1
• Locally advanced prostate cancer with renal failure and bilateral hydroureteronephrosis with renal failure	1
• Left ovarian mass with bilateral ureter encasement (left ovarian cystectomy)	1
• GUTB with small capacity bladder with VVF and Rt NFK (Left end ureterostomy)	1
Median hospital stay in days (range)	13.5 (7-31)

BMI: body mass index; SD: standard deviation; GUTB: genitourinary tuberculosis; VVF: vesicovaginal fistula; NFK: non-functioning kidney

ileal conduit to avoid the complications associated with the use of bowel segments. The aim was to find out if our modification can address the most notorious complication of CU: stomal or ureteral stenosis.

In the present study, we have described two technical aspects of CU: lateralization of CU and 'V' shaped skin flap at the stoma. The conventional dissection for the left ureter is undeniably extensive, putting the distal ureter at risk of ischemia.[3] We believe that the retroperitoneal course of the ureter opening anterolaterally rather than on the anterior abdominal wall would lead to a shorter and straighter course, which would require lesser ureteral dissection. Moreover, as described in some series if ureter is not retroperitonealized, it may get entangled with gut loops leading to the ureteral or intestinal obstruction.[16-18] Using both ureters as stoma, as described by Lusuardi et al.[19], would unnecessarily put tension on the transposed ureter if it is brought to the surface which is not commonly practiced. Various V and U-shaped skin flaps, horseshoe flaps or Z- plasty of the skin have been used for inversion into the spatulated ends of the ureter at the ureterostomy. These techniques have enabled surgeons to maintain tubeless ureterostomy in 82% to 90% of the cases.[2] We have used V shaped skin flaps in our series. Cutaneous ureterostomy is still rarely done in adults and it is primarily used as a palliative diversion in terminal cases or when bowel resection can not be performed. All of our CUs were stented for 6 weeks to decrease the risk of early obstruction due to edema and tissue sloughing. Use of the modified skin flap could probably explain the lack of need for prolonged stenting and an acceptable rate of stomal stenosis in our patients. The rate of stomal stenosis is however lower after ileal conduit than after CU.[12]

In the present study average incidence of major complications alone was 16.67%. Roghmann et al.[20] also reported major complications in one-fifth of the patients undergoing radical cystectomy. The lower incidence of major complications in the present study could be due to the fact that CU is devoid of bowel-related complications that are seen in patients with ileal conduit or an orthotopic neobladder.[21] Bowel-related morbidity is common with the use of intestinal segments for urinary diversion and CU could potentially offer a simpler alternative for ileal conduit in selected patients. A comparative study has

Table 2. Surgical complications as per Clavien-Dindo classification

Grade	Complications	Number of patients
Grade I (20)	Paralytic ileus	2
	Superficial wound Infections	7
	Transient elevation of creatinine	3
	Lymphorrhea	5
	Urinary leak	3
Grade II (25)	Blood transfusions for anemia	16
	Wound infection requiring secondary suturing	2
	Pyelonephritis	2
	Pneumonia	3
	Ileus requiring treatment	2
Grade IIIa (5)	Urinary leakage requiring PCN	1
	Lymphocele	1
	JJ stenting	1
	Stoma dilatation	2
Grade IIIb (2)	Stoma revision	1
	Conversion to ileal conduit	1
Grade IVa (0)	-	-
Grade IVb (1)	Sepsis	1
Grade V (1)	Death	1

PCN: percutaneous nephrostomy

shown that despite having higher ASA scores, patients with CU had lesser diversion-related complication rates than ileal and colonic conduit (18.1% and 5.8%, respectively).[13] Most of the complications of CU are due to ureteral obstruction either at the level of stoma, ureteral kinks or obstruction due to extensive retroperitoneal lymphadenopathy and retroperitoneal fibrosis. The complications reported in various studies have been summarized in Table 3. On comparing with other studies, the rate of nonstomal complications appears high since we have included even minor adverse developments such as postoperative ileus and blood transfusion requirement as a complication.

Based on pediatric urology reports the incidence of stomal stenosis with end CU varies from 8% to 22%.[9-11] In 2007, Kitchens et al.[22] showed that 1 of 29 children had stomal stenosis 2.5 years after CU. The reasons for success of CU in the pediatric population are use of dilated ureter and diversion for a shorter duration.[9] Many reports of CU in adults revealed a greater than 50% incidence of stomal stenosis and the need for periodic dilation or long-term intubation.[14,23] This was attributed to undilated ureters and ischemia of the distal end as a result of excessive mobilization to bring the ureter out. Ureters with a diameter of greater than 8 to 10 mm showed a lower incidence of stricture/stenosis when used for end-CU.[24] However, for ureters which are not dilated there is no single solution. Since its first description by A. Roth in 1967 the CU has been modified by several surgeons with variable outcomes.[1] Leonardo et al.[4] in 1965 described a technique of ileo-ureteral nipple with reduced risk of stomal stenosis. As another alternative, a definitive ureteral stent was left in as a method to decrease the complication rate.[5] In a recent publication on bilateral CU in 311 patients, stomal stenosis rate has been described as 4.5% on the left side and 0% on the right side.[6] This was attributed to the modification of the surgical technique as well as prolonged stenting and stent exchanges. Their technique involved left ureter transposition above the inferior mesenteric artery, repositioning of the bowel above both ureters, fixation of the ureters to abdominal wall hiatus and YV plasty of the ureters with edge-to-edge anastomosis at the skin. This technique along with the one used by Longo et al.[7] is entirely different from our technique since we do not bring both ureters up to the abdominal wall. It is hence conceivable that both authors suggested prolonged stent exchanges as the left ureter was under undue stress, coming all the way up to the surface from retroperitoneum. Since there is a difference in the types of CU across various studies such as transureteroureterocutaneostomy, bilateral CU (single stoma/two stomas) and unilateral CU, it would not be pertinent to compare the duration of stenting across these heterogenous groups.[25-29] We used stents for 6 weeks and had not unusually high rates of ureteral or stomal stenosis.

In our series except for one patient who had necrosis of distal ureter, none of the patients developed unsalvageable ureteral obstruction. This patient had extensive desmoplastic reaction in the pelvis along with bilateral pelvic lymphadenopathy and it is likely that mobilization of the pelvic ureter could have damaged its vascularity. Three patients who had stomal stenosis could be managed by self-dilatation and regular double J stent change. Stent change too is a simple procedure and can be done with the patient awake and on an out-patient basis and precludes cystoscopy.[6] CU also facilitates restenting and, if necessary, ureteroscopy for oncological reasons or stone management.

A significant limitation to this study is its shorter follow- up period as most of the patients died with a functional stoma. Further, the retrospective design of this study and lack of control group limit the generalizability of this technique. Ureteral recurrence is another concern inherent to this procedure (as it

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Table 3. Comparison of short term and long term complications in various studies on cutaneous ureterostomy

Author	Year	No. of patients with CU	Short term/early complications (n)		Long term complications		Mean/median follow up (months)
			Stomal complications	Non-stomal complications	Stomal complications	Non-stomal complications	
Kim et al.[26]	2004	79 renal units	0	12	0	6	34
Deliveliotis et al.[12]	2005	29	0	14	2	3	68
Kilciler et al.[27]	2006	34	0	8	2	4	37
Pycha et al.[13]	2008	41	1	12	2	7	16
Rodríguez et al.[6]	2011	272	#	Not stated	#	Not stated	25
Kozacıoğlu et al.[28]	2013	27	$	$	$	$	Not mentioned
Huang et al.[29]	2015	114	3	18	10	45@	60
Longo et al.[7]	2016	35	0	10	Not studied	Not studied	43
Present study	2017	36	3	33	1	17	14

#A total of 36 patients developed ureteral obstruction.
$One patient developed ureteral stenosis and 3 patients pyelonephritis.
@Includes mortality from complications
CU: cutaneous ureterostomy

is a transureteroureterostomy) but the incidence of upper tract recurrence is very low.[30] The social aspect including quality of life is another outcome measure which should be considered for future studies.

In conclusion, modified lateral CU with extreme lateralization of stoma at anterior axillary line with relatively straighter, shorter course of extraperitoneal ureter represents an improvement over the conventional technique with a lower rate of complications. It can be performed quickly and provides a safeguard against bowel-related complications in a very high risk patients needing ileal conduit as urinary diversion.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Sanjay Gandhi Post Graduate Institute of Medical Sciences.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - A.M., S.K.S.; Design - A.M.; Supervision - A.M.; Resources - P.G., D.S.; Materials - V.M., P.G.; Data Collection and/or Processing - D.S., V.M., P.G.; Analysis and/or Interpretation - P.Y., V.M.; Literature Search - P.Y., V.M.; Writing Manuscript - P.Y., V.M.; Critical Review - S.K.S., A.M.

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