

A Technique Which We Should Consider More: Temporary Cutaneous Ureterostomy

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What's known on the subject? and What does the study add?

Cutaneous ureterostomy (CU) is an easy method of decompressing the upper urinary system. Although the techniques and methods have changed over the years, CU still protect the patients from possible damages.

Abstract

Objective: To evaluate the feasibility, efficacy and complications of cutaneous ureterostomy (CU) in different indications.

Materials and Methods: Data from 83 patients who underwent CU between 1991 and 2019 were reviewed retrospectively. Patients with neurogenic bladder, posterior urethral valves, solitary kidney and bilateral kidney involvement were excluded. A total of 53 patients aged <2 years were included in the analysis. Indications to perform CU were ureterovesical junction obstruction (UVJO) and high-grade vesicoureteral reflux (VUR) with dilatation. Ureteroureterostomy or ureteroneocystostomy methods were preferred for undiversion according to the dilatation status of the ureter.

Results: The mean patient age was 4.47 ± 3.6 months, 40 (75.5%) were male and 13 (24.5%) were female. The mean follow-up time was 57.4 ± 41.4 (6-150) months. Loop and end CU were performed in 18 (34%) and 35 (66%) patients, respectively. The indications for CU were UVJO in 26 (49%) and high-grade VUR in 27 patients. Two (3.7%) patients needed dilatation because of stenosis that occurred after CU. Within the follow-up time, 39 patients underwent undiversion. The clinical improvement rate was 94.3%.

Conclusion: CU is a simple method with satisfactory results when performed in patients with megaureter and massive dilatation. Despite the less frequent use, it is still an important alternative to the increasingly used conservative methods.

Keywords: Cutaneous ureterostomy, urinary diversion, hydronephrosis, megaureter, vesicoureteral reflux, ureterovesical junction obstruction

Introduction

Megaureter arises from a functional or anatomical abnormality of the ureterovesical junction and is classified according to the presence of reflux or obstruction (1). Smith classified megaureters into four categories, namely, obstructed, refluxing, refluxing with obstruction and non-refluxing/non-obstructing. Later, King subdivided megaureters into primary and secondary (1,2). Ureteric diameter >7 mm was defined as abnormal (3), and it is often diagnosed in the infantile period and regresses in most cases. In the vast majority of patients, a megaureter does not lead to clinical problems and loss of renal function (4,5). However, surgical intervention may be necessary when progressive massive dilation and loss of renal function occur. Cutaneous

ureterostomy (CU) is a simple method of decompressing the upper urinary system (6). Although the techniques and methods have changed over the years, CU still protects the patients from possible kidney damage. Thus, this study aimed to evaluate the feasibility, efficacy and complications of CU in patients with vesicoureteral reflux (VUR) and ureterovesical junction obstruction (UVJO) and extremely dilated ureters.

Materials and Methods

Data from 83 patients who underwent CU between 1991 and 2019 were reviewed retrospectively. Patients with neurogenic bladder (n=10), posterior urethral valves (n=12), solitary kidney (n=2) and bilateral CU cases (n=4) were excluded from this study.

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In total, 53 patients aged <2 years were included in the analysis. After diagnosis, all patients were started antibiotic prophylaxis. Surgery was performed in two groups of patients: primary high-grade VUR group and UVJO group. Indications for surgery were refractory urinary tract infection (UTI) in patients with VUR and increasing severity of hydronephrosis (HN) in patients with UVJO who were unsuitable for reimplantation into a small bladder. Ultrasonography (US) is the primary imaging modality in the prenatal period and initial study in the symptomatic group. Voiding cystourethrography (VCUG) was performed to assess for the presence of VUR and to further delineate the anatomy of the bladder and outlet. Mercaptoacetyltriglycine-3 scintigraphy was used to evaluate and follow the obstruction status. After the loop or end CU, the patients who have shown resolution of the dilatation in the renal unit and completed their bladder development underwent undiversion procedures. The choice of the UC type mostly depends on the underlying pathology. In patients with primary UVJO, we tried to perform end UC as the standard approach. However, at the beginning of this series, some patients with VUR underwent end CU. As the experience improved over time, we started to perform loop CU to understand whether it may be a good alternative that keeps the chance of further ureteroureterostomy without bladder surgery in some patients whose VUR was resolved. In every patient, diagnostic cystoscopy is performed, the ureter is catheterised with a 3-Fr or 4-Fr catheter, a retrograde pyelography is performed to visualise the renoureteral unit and the catheter is left in the ureter. The surgery is performed through a 2 cm incision at the lateral border of Pfannenstiel incision at the lower quadrant with a muscle splitting technique. The peritoneum is deviated medially, and the ureter is found in the retroperitoneal area, turned with a tape and brought outside to the incision. The tortuosity of the ureter is straightened. In end CU, the ureter is ligated at the most distal part, the proximal ureteral end is brought to the incision with the proper length to prevent kinking and a 10-Fr feeding catheter is indwelled into the ureter for 7 days. In loop CU, the ureter is incised by a no.15 scalpel, and the ureter is anastomosed to the skin. Both the proximal and distal parts of ureterostomy are catheterised by an 8-Fr or 10-Fr feeding catheter for 7 days. In both techniques, the ureter is fixed to the fascia with four stitches to prevent the inside retraction of the ureter. The timing of undiversion was decided by evaluating the resolution of HN using US and assessing the bladder volume and shape by VCUG. Ureteroureterostomy and ureteroneocystostomy (UNC) with remodelling methods were preferred for undiversion according to the dilatation status of the ureter. In patients with bilateral kidney involvement, the more affected side in the dimercaptosuccinic acid (DMSA) scan and the side with a higher HN grade on US were chosen for surgical intervention.

Patient demographics, complaints and underlying diseases were recorded preoperatively. After preoperative evaluation using US, VCUG and DMSA or mercaptoacetyltriglycine scan, postoperative follow-up was performed using US at regular intervals. Patients with serum creatinine levels higher than the age-specific reference values were considered to have chronic renal disease. Status of improvement was assessed by the radiological and clinical course of the patient.

Complications were assessed according to the Clavien-Dindo classification. Evaluation of HN grades on US was based on the Society of Fetal Urology (SFU) criteria, whereas the evaluation of VCUG was based on the criteria of the International Reflux Study Committee. This study was approved by the local ethical committee (GO-18/267).

Statistical Analysis

Statistical analyses were performed using SPSS version 17.0 (SPSS Inc., Chicago, IL, USA). Mann-Whitney, chi-square, Fisher's exact test and t-tests were used where appropriate. P-value <0.05 indicated significance.

Results

The mean patient age at the time of surgery was 4.47 ± 3.6 (1-15) months. The median age was 3 months, 40 (75.5%) were male and 13 (24.5%) were female. The mean follow-up time was 57.4 ± 41.4 (6-150) months.

Indications for CU were primary UVJO and high-grade VUR in 26 and 27 patients, respectively. Moreover, 41 (77.4%) patients had SFU grade 4 HN, while 10 patients had grade 3 HN. HN was also detected in the contralateral kidney in 18 patients. Scarring was detected on preoperative DMSA scan in 52.8% (28/53) of the patients. The clinical improvement rate was 94.3%.

CU was performed in 27 patients with primary VUR (with high-grade reflux causing recurrent febrile UTI), while the clinical or radiological improvement rate was 92.6% (25/27). The mean patient age was 4.81 ± 4.3 months, and loop CU was performed in 59.3% (16/27) of the patients. The mean follow-up time was 68.2 ± 44.4 months. Two patients underwent nephrectomy due to loss of renal function.

Furthermore, 26 patients underwent CU for primary UVJO, and the clinical or radiological improvement rate was 96.2% (25/26). The mean patient age was 4.12 ± 2.8 months, and 92.3% (24/26) of the patients underwent end CU. The mean follow-up time was 46.1 ± 35.3 months. When patients with primary VUR and primary UVJO were compared, the difference in the type of CU (loop vs end) and presence of a renal scar on DMSA were found significant ($p=0.009$, $p<0.001$) (Table 1).

Table 1. Comparison of patients with primary VUR and primary UVJO

Patient characteristics	Primary VUR	Primary UVJO	p
No. of patients	27 (51%)	26 (49%)	
Mean age (months)	4.81±4.3	4.12±2.8	0.767
Gender (M/F)	20/7	20/6	0.810
Renal scar on DMSA (%)	70.4%	34.6%	0.009
Indication for surgery (HN/ infection)	17/10	21/5	0.150
Type of cutaneostomy (end/ loop)	11/16	24/2	<0.001
Type of undiversion (UNC/ ureteroureterostomy)	16/2	21/0	0.206
Interval between CU and undiversion (months)	15.4±10.4	11.9±6.57	0.460
Mean age at undiversion	18.5±8.5	15.9±7.5	0.269
Mean follow-up (months)	68.2±44.4	46.1±35.3	0.081
Follow-up (radiological/ clinical)	20/7	24/2	0.142
Complication (yes/no)	0/27	3/26	0.069
Clinical or radiologic improvement (%)	92.6%	96.2%	0.575
Postoperative UTI	7/27	8/26	0.696

CU: Cutaneous ureterostomy, VUR: Vesicoureteral reflux, UVJO: Ureterovesical junction obstruction, UTI: Urinary tract infection, DMSA: Dimercaptosuccinic acid, HN: Hydronephrosis, UNC: Ureteroneocystostomy

In this study, loop and end CU were performed in 18 (34%) and 35 patients, respectively. None of the patients who underwent loop CU and two patients who underwent end CU required revision due to stomal stenosis. In addition, 15 (28.3%) patients developed postoperative UTI, of which six developed two or more. Postoperative UTI was found in 22.2% (4/18) of the patients in the loop CU group and in 31.4% (11/35) of the patients in the end CU group. Postoperative UTI was found in 25.9% (7/27) of the patients in the primary VUR group and in 30.8% (8/26) of the patients in the primary UVJO group (Table 2).

Of the 53 patients who underwent CU, four had follow-up shorter than 6 months. Of the 39 patients (39/53, 73.6%) who underwent undiversion, 37 underwent UNC (Cohen UNC in 30, Lich-Gregoir UNC in 1, Politano-Leadbetter UNC in 3 and extravesical UNC in 3), and ureteroureterostomy was performed in two patients. Ureteroureterostomy was performed in patients with VUR after confirming the complete resolution of VUR by preoperative VCUG and intraoperative positioned instillation of contrast cystography. The mean patient age at undiversion was 17.1±7.9 (7-44) months, and the average time between CU and undiversion was 12.7±7.7 (5-42) months. After undiversion, the clinical or radiological improvement rate and complication rates were 100% (39/39) and 10.2% (4/39), respectively. One patient developed postoperative urinoma, and one patient had persistent asymptomatic VUR. Percutaneous nephrostomy was

Table 2. Comparison of loop and end CU

Patient characteristics	Loop CU	End CU	p
No. of patients	18 (34%)	35 (66%)	
Mean age (months)	4.2±3.8	4.6±3.6	0.554
Indication for surgery (HN/ infection)	11/7	27/8	0.220
Type of undiversion (UNC/ ureteroureterostomy)	10/2	27/0	0.089
Interval between CU and undiversion (months)	13.3±10.5	12.5±6.3	0.360
Mean follow-up (months)	59.6±44.8	56.3±40.2	0.506
Complication (yes/no)	18/0	32/3	0.201
Clinical or radiologic improvement	94.4%	94.3%	0.556
Postoperative UTI	4/18	11/35	0.481

CU: Cutaneous ureterostomy, UTI: Urinary tract infection, DMSA: Dimercaptosuccinic acid, UNC: Ureteroneocystostomy, HN: Hydronephrosis

performed in one patient for worsening HN that was resolved during follow-up. One patient underwent reoperation because of Double-J stent (DJS) displacement.

Undiversion was not performed in 14 patients because four patients had follow-up <6 months, four patients had kidney function <10%, two patients had chronic failure and four patients had inadequate bladder volume for undiversion.

Discussion

CU is known as an old-fashioned method of decompressing massive dilatation in the ureter presented early in infancy with a high risk of loss of renal function and recurrent febrile UTI. In addition to from CU, various urinary diversions and methods, such as vesicostomy, pyelostomy, DJS insertion, nephrostomy and balloon dilatation, have also been shown to be applicable in megaureters (7-10). However, these methods will not remove the anatomical/functional problem and have lower clinical or radiological improvement rates than CU. CU lowers the pressure of the urinary system without disturbing the bladder function, and under certain conditions, CU is even successful even when closed only by ureteroureterostomy without reimplantation. In our series, we performed ureteroureterostomy without an additional UNC after CU in two patients, and all patients achieved clinical improvement. This possibly supports the opinion that the anatomical and physiological development of UVJ continues after birth and that CU provides time for this development.

In patients with bilateral high-grade reflux causing recurrent febrile UTI, unilateral loop CU has been a very good temporising diversion by creating a refluxing stoma. The refluxing stoma helps not only the resolution of dilatation in the diverted renal unit but also in the non-diverted contralateral side by reducing the bladder pressures.

CU aims to relieve obstruction and to prevent the deleterious effect of VUR by avoiding possible side effects of bladder surgery and gain time, specifically in small babies, until definitive ureterovesical junction surgery. The repair can be performed with or without remodelling. Particularly, undiversion is not recommended in children aged <1 year because of the unwanted effects on the development of bladder functions (3,11). Massively dilated ureters mostly require tapering surgeries during reimplantation, and temporary CU has the potential to decrease this necessity. Indeed, our experience revealed that only 25.6% (10/39) of the patients required tapering during reimplantation.

The choice of the CU type mostly depends on the underlying pathology. End CU may be preferred for patients with UVJO. However, loop CU may be a good alternative, which keeps the chance of further ureteroureterostomy in some patients. For bilateral VUR cases, we often prefer the less functioning kidney for loop CU. This approach enables the cessation of VUR on the worse side and provides effective cycling of the bladder by the urine of the better functioning side and gives the option of performing clean intermittent catheterisation in patients requiring it.

Some studies have reported up to 91% of clinical or radiological improvement rate in CU with permanent repair (6,12-14). In our series, the overall clinical or radiological improvement rate was 94.3%, while the clinical or radiological improvement rate in 39 patients who underwent undiversion was 100%.

Some authors have presented balloon dilatation and stent placement both as temporary and definitive treatments for UVJO. Stent placement is not easy as expected in these patients and as described in some series of open stent placement (15). In some cases, stent placement may worsen the patients' condition, cause UTI and will not provide improvement of dilatation. The CU is advantageous in these aspects over stent placement (9,10). Ortiz et al. (16) reported 87.3% success rate of endoscopic balloon dilatation in patients with obstructive megaureter. The postoperative VUR rate was 21.5% in this series. However, only a few studies have reported about balloon dilatation; thus, further studies are needed. Placement of percutaneous nephrostomy can be preferred to provide drainage and evaluate renal function. However, prolonged use of a nephrostomy tube during the waiting period to decrease the ureter calibre may lead to complications, such as infection or tube dislodgement. Lee et al. (17) proposed an alternative temporary solution for infants with UVJO. They created a refluxing ureteral implant by an extravesical approach through a Pfannenstiel incision. It may appear advantageous, as it prevents the anxiety of parents about caring for a CU. However, this approach has associated risk for ureter kinking during bladder filling and emptying. Moreover, it still places the upper tract at risk of VUR. CU enables

improvement of ureter calibre for future reimplantation and accurate evaluation of renal function without misinterpretation due to persisting VUR.

Study Limitations

The main limitation is the retrospective nature of this study and the lack of prospective randomisation or stratification. Another limitation is the lack of data on renal scans and glomerular filtration rate values in each patient, which help in assessing renal function. However, to the best of our knowledge, this is one of the largest series from a single centre. Although CU is a technique that has been described a long time ago, it is an easy and reliable method and helps decrease the pressure of the upper urinary system. Our experience showed that it is a feasible method and can be utilised in patients with certain indications.

Conclusion

CU is a simple method with satisfactory results when performed in patients with megaureter and massive dilatation. Despite the less frequent use, it is still an important alternative to the increasingly used conservative and minimally invasive methods. CU can be performed with high success rates in patients with primary megaureter with VUR or UVJO.

Ethics

Ethics Committee Approval: This study was approved by the local ethical committee (GO-18/267).

Informed Consent: Retrospective study.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: B.Ç., H.S.D., T.C., M.A., S.T., Concept: B.Ç., H.S.D., S.T., Design: B.Ç., H.S.D., S.T., Data Collection or Processing: B.Ç., T.C., M.A., Analysis or Interpretation: B.Ç., H.S.D., Literature Search: B.Ç., H.S.D., S.T., Writing: B.Ç., H.S.D., S.T.

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