

# A Rational Solution for Megaureter in Infants with Solitary Kidney: Temporary Loop Cutaneous Ureterostomy

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

In patients with solitary kidneys, it is essential to prevent further possible bladder problems in order to decrease the risk for renal insufficiency. By performing this technique in patients with ureterovesical obstruction and solitary kidney, we can protect the kidney from possible side effects and bring the patient to the last treatment age while maintaining the bladder cycle and development.

## Abstract

**Objective:** To define and discuss the new concept which using loop cutaneous ureterostomy (LCU) in patients with obstructing megaureter and solitary kidney.

**Materials and Methods:** Two patients with solitary kidney with obstructive pattern were included. Both patients underwent LCU within the 1<sup>st</sup> month to reduce the obstruction and to relieve the pelvicaliceal system. Thereafter, parents were taught to dilate the ureter and irrigate the bladder with sterile saline by a disposable 6F catheter via antegrade fashion through the distal ureter. Initially, 10 cc saline was used once a day, then it was increased to 20 cc once a day after 2 months. When the bladder capacity was sufficient (50 mL capacity at the 6<sup>th</sup> month or by cystoscopic evaluation intraoperatively), we performed undiversion with ureteroneocystostomy and Double-J-stent placement.

**Results:** Ureterorenal dilatations were followed-up by ultrasonography and renal function tests. No bladder dysfunction and renal insufficiency were observed during follow-up. At the postoperative controls, patients' renal function tests were compatible with their ages and they had no voiding dysfunction.

**Conclusion:** Patients with solitary kidney and obstructing megaureter require urgent diversion. After diversion, bladder cycling is required to prevent bladder dysfunction by protecting and developing bladder capacity. Using this concept, the kidney can be protected from further damage and treatment can be finalized around 6 months of age with minimum morbidity.

**Keywords:** Megaureter, solitary kidney, bladder cycling, urinary diversion

## Introduction

Ureteral reimplantation in patients with massive hydronephrosis (HUN) has technical limitations infants due of low bladder capacity and carries the risk of deteriorating bladder development (1-3). Therefore, a temporary loop or end cutaneous ureterostomy (CU) is easy to perform and effectively provides the decompression of the system (4,5). If remains untreated, it can lead to end-stage renal failure; especially in patients with a solitary kidney.

By using loop CU in patients with obstructing megaureter and solitary kidney, we intended to protect the kidney from possible adverse effects and finalize the treatment earlier while maintaining bladder cycling and development. This article aims to define and discuss this new concept.

## Materials and Methods

Two patients with a solitary kidney and megaureter with obstructive pattern were included. Patients were intervened

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after urosepsis. In both cases, we tried and failed to pass a guide wire up to the kidney using endoscopic approach. Both patients underwent loop CU (LCU) within the 1<sup>st</sup> month. Bladder irrigation was performed by professionals, on the first postoperative day and by the family under the supervision of professionals on the other days. After that, parents were taught to dilate the ureter and irrigate the bladder with sterile saline by a disposable 6F catheter via antegrade fashion through the surgically dissected and dilated distal ureter (Figures 1,2). We consider that we reached capacity as soon as the baby became restless and started crying. It was almost a rule that each time the baby reached that state he/she started to urinate. Initially, 10 cc saline was used once a day, then it was increased to 20 cc once a day after 2 months. When the bladder capacity was sufficient (50 mL capacity at the 6<sup>th</sup> month or by cystoscopic evaluation intraoperatively), we performed undiversion with ureteroneocystostomy (UNC) and Double J-stent (DJS)



**Figure 1.** Loop cutaneous ureterostomy in first patient



**Figure 2.** Bladder irrigation with sterile saline by a disposable 6F catheter via antegrade fashion through the distal ureter

placement. The patient was followed-up by ultrasonography (USG) and renal function tests. urinary tract infection did not develop in either patient after surgery. No bladder dysfunction or renal insufficiency was observed during follow-up. This study was approved by the local ethical committee (GO-18/267).

#### **1<sup>st</sup> patient: Female.**

She was diagnosed with antenatal hydronephrosis (HN) before birth and uterine didelphys, right renal agenesis. Grade 4 HUN was detected by USG on the postnatal 4<sup>th</sup> day. We performed loop CU on the patient whose findings were compatible with ureterovesical (UV) stenosis on cystourethroscopy performed at the 4<sup>th</sup> week. After surgery, bladder cycling was initiated. At the age of 4 months, we performed undiversion with Cohen UNC and DJS placement. At the age of 1 year, serum creatinine level was 0.4 mg/dL and clinically asymptomatic grade 2-3 HN was present on USG. At the age of 3 years, serum creatinine level was 0.48 mg/dL, no reflux was detected on voiding cystourethrography and renal emptying was sufficient on retrograde pyelography.

#### **2<sup>nd</sup> patient: Male**

He was diagnosed with antenatal HN and right renal agenesis. Left HUN was detected by USG and serum creatinine level was 0.5 mg/dL on the 5<sup>th</sup> day after birth. After detecting the findings compatible with UV stenosis on cystourethroscopy performed at the 1<sup>st</sup> month, we performed loop CU. After surgery, bladder cycling was initiated. At the age of 6 months, we performed undiversion with Cohen UNC and DJS placement. At the age of 1 year, serum creatinine level was 0.5 mg/dL and clinically asymptomatic grade 3 left HN was present on USG. Grade 2 left HN was detected and serum creatinine level was 0.34 at the age of 2 years. In the final control at the 13<sup>th</sup> year of age, serum creatinine was 0.48, and grade 3 residual left HN persisting. The patient is voiding without any residual urine and has no voiding dysfunction.

## **Discussion**

The placement of a nephrostomy catheter is easy to perform and has low complication rates, keeping the nephrostomy tube for long-term is technically difficult and there is increased risk of infection (6). Cutaneous diversion of the ureter is the preferred method when prolonged drainage is required in patients with obstructed megaureters. CU is a safe and effective procedure to decompress the system (4).

The placement of a JJ stent is technically challenging and often impossible endoscopically in the infants, requires open intervention and carries a high risk of infection (7). Endoscopic treatment is also technically limited because of the size of the child and the ureter (8,9).

Jayanthi et al. (10) reported further bladder dysfunction in 25% of patients who underwent mandatory cutaneous diversion. In similar studies, bladder diversions reduce bladder capacity and compliance (11). The capacity begins to decrease in long-term dysfunctional bladders. Especially in infants who have immature and still-developing bladder dynamics, bladder dysfunction may lead to some voiding problems in older ages. Our method included regular cycling with saline to provide a bladder rehabilitation because of the disabled bladder. Similarly, the lack of fully developed bladder capacity makes the undiversion technically and functionally difficult.

Refluxing ureteral reimplantation technique for the obstructive megaureter was defined by Lee et al. (12). The technique is much more complex especially in a new born. Moreover, this technique is also not well defined and doing a reimplantation on the dome of the bladder is not only reflux persists but there is a risk of distal kinking when the bladder is full. Moreover, we are not sure which is better for bladder dynamics, as there is a continuous high grade reflux increasing the bladder load and therefore the volume. One can argue that this may actually have more long-term problems as there has been one surgery on the bladder much earlier in life and the bladder physiology could not yet be considered as normal.

Obstructed megaureter of a single system is a very rare condition, which requires some unique, challenging and often individualized management and both patients were clinically suitable candidates for this procedure. The main challenge is of course to maintain the bladder cycling and function once the single ureter is diverted. We performed undiversion as early as possible in our 2 patients to prevent the bladder capacity and compliance from reducing. Although bladder cycling prevents the bladder capacity from reducing, it is not completely sufficient because it is not permanent and natural. We did not measure the pressure but monitored how baby reacted to the fillings while in discomfort or when crying. We consider that we reached capacity as soon as the baby became restless and started crying. It was almost a rule that each time the baby reached that state he/she started to urinate. Therefore, it was difficult and probably unreliable to measure of pressure and we relied on signs and occurrence of voiding when the capacity is reached. If the capacity is not sufficient the frequency of daily installations can be increased. In patients, particularly with solitary kidneys, it is essential to prevent further possible bladder problems order to decrease the risk of renal insufficiency.

The main advantage of this approach is that the initial procedure (LCU) is easy and later can be followed with another easy and standard procedure (reimplantation) after the ureteric diameter has down-sized. The second procedure can be performed as

soon as the ureteric dilatation has gone down and the bladder capacity is within acceptable volumes. It is difficult to name what period is needed before reimplantation we could do that at 4 and 6 months. Therefore, based on this experience, we believe it can be done before or around 6 months as a definitive procedure.

The preservation of existing renal functional reserves is critical in patients with solitary kidney. After diagnosis, urinary diversion should be performed as soon as possible to reduce the system pressure. Prophylactic antibiotics should be administered to protect patients from possible infections. The frequent follow-up is essential after surgery to be alert for possible complications.

### Study Limitations

The main limitations of this study are the retrospective nature, the lack of randomization and the small number of patients. It cannot be evaluated clearly that the capacities will be affected and whether the dysfunction will occur if cycling is not performed. However, we think that bladder cycling improves the bladder capacity and the patients, for this reason, are not adversely affected in their future life. Another limitation is the inability to perform a standard evaluation such as voiding cystourethrography and MAG-3 scan for the prenatal HUN because these patients were hospitalized with urosepsis in the neonatal period and urgent urinary diversion was planned.

### Conclusion

Patients with solitary kidneys and an obstructing megaureter require urgent diversion. After a diversion, bladder cycling must prevent bladder dysfunction by protecting and developing bladder capacity. Using this concept, in clinically appropriate patients, the kidney can be protected from further damage and treatment can be finalized around 6 months of age with minimum morbidity.

### 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: S.T., H.S.D., Concept: S.T., B.Ç., Design: S.T., B.Ç., H.S.D., Data Collection or Processing: B.Ç., T.C., Analysis or Interpretation: S.T., B.Ç., H.S.D., Literature Search: S.T., B.Ç., H.S.D., Writing: S.T., B.Ç., H.S.D., T.C.

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