

## Transplantation/Vascular Surgery

# TERMINAL LOOP CUTANEOUS URETEROSTOMY IN RENAL TRANSPLANTATION: AN UNDER UTILIZED URINARY DIVERSION TECHNIQUE

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### ABSTRACT

**Purpose:** We evaluated the effectiveness of terminal loop cutaneous ureterostomy as a means of urinary drainage in kidney transplant recipients during a 20-year period.

**Materials and Methods:** Five cadaveric and 2 living related patients underwent kidney transplantation with terminal loop cutaneous ureterostomy between 1984 and 2004. These patients had no usable bladder or they were not suitable candidates for intermittent catheterization.

**Results:** Followup was 20 months to 17 years. One patient underwent stomal revision 5 months after renal transplantation. Current serum creatinine 4 years later was 166  $\mu\text{mol/l}$ . The remaining 6 patients had no evidence of ureteral obstruction and rarely had bacteriuria or urinary tract infections. Four patients had a functioning allograft with normal serum creatinine. One patient died with a normally functioning allograft and the remaining patient lost his graft due to chronic rejection. No patient in this series lost the graft due to a urological cause. Overall outcomes included excellent allograft function with minimal infection or stomal stenotic complications.

**Conclusions:** Terminal loop cutaneous ureterostomy is a simple, safe and alternative means of urinary diversion in patients with renal transplant and a defunctionalized lower urinary tract.

**KEY WORDS:** kidney, transplantation, ureterostomy, urinary diversion

Renal transplantation into patients with lower urinary tract dysfunction has been a difficult clinical challenge.<sup>1</sup> Clean intermittent catheterization<sup>2</sup> and several types of suprapubic urinary diversion have been used in these instances, including ileal conduits,<sup>3</sup> augmentation enterocystoplasty,<sup>4,5</sup> continent diversion<sup>6,7</sup> and native cutaneous ureterostomy.<sup>8</sup> End cutaneous ureterostomy as a means of suprapubic urinary diversion for normal caliber ureters has been largely abandoned due to its high rate of failure, resulting from stomal stenosis and pyelonephritis.<sup>9–11</sup> Kuss et al first reported renal transplantation with terminal loop cutaneous ureterostomy (TLCU) in 1951 but the results were poor in most of their cases.<sup>12</sup> Later Martin et al reported 4 cases of renal transplantation with similar ureterocutaneostomy in 1969 but determined that there was no future for this type of urinary diversion because of unsatisfactory long-term results.<sup>13</sup> Prieto et al reported on 6 patients who underwent kidney transplantation with similar cutaneous ureterostomy with a better long-term outcome. However, most of these patients required periodic stomal dilation due to stenosis.<sup>14</sup>

Despite these earlier discouraging results Amin et al reported on 7 renal transplant recipients with TLCU with good long-term results.<sup>15–17</sup> There were no complications attributable to ureterostomy and allograft function was good. Our group has previously reported 3 cases of renal transplantation with TLCU with satisfactory long-term results.<sup>18</sup> We now report followup in these 3 patients as well as the out-

come in 4 additional transplant recipients with cutaneous ureterostomy.

### MATERIALS AND METHODS

Between December 1984 and December 2004, 7 patients underwent kidney transplantation with TLCU, including 5 cadaveric and 2 living related procedures. The 5 men and 2 women were 32 to 50 years old. Four patients were born with neurogenic bladder and the 3 others had bladder exstrophy, posterior urethral valves or interstitial cystitis. All patients had preexisting suprapubic urinary diversion, including 6 with ureteroenteric and 1 with ureterocutaneous drainage. Recurrent or persistent pyelonephritis and renal calculi were the main causes of renal failure in these patients. Moreover, 1 patient underwent cadaveric kidney transplantation using an existing ileal conduit for urinary drainage but the postoperative course was difficult and the allograft was lost 3 months later because of chronic pyelonephritis and rejection. Two patients had previously undergone radical cystectomies for bladder cancer.

Our surgical technique is similar to that reported by Amin et al.<sup>15</sup> The standard kidney transplant Gibson incision in the lower quadrant of the abdomen was made and the usual arterial and venous anastomoses were formed. A generous oval disc of skin was excised from a pre-marked stomal site. The distal end of the ureter was ligated with heavy absorbable ligature and brought through muscle, fascia and subcutaneous tissue to the stomal site. A generous longitudinal incision was made on the anterior ureteral wall, leaving about 1.5 to 2 cm of ureter distal, which was then buried in the subcutaneous tissue. The edges of the ureter and skin

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were sutured with fine absorbable sutures and a ureteral stent was left in place for several days postoperatively.

Prophylactic antibiotics were not given and stomal dilation was not required. A standard stomal appliance was applied onto the stoma site. We also tested the possibility of reflux by filling the urine collection bags of the first 2 patients with contrast medium. The patients were requested to move through various postures but no reflux of contrast medium into the ureteropelvic system was demonstrated radiographically.

In addition to pertinent blood studies, urinalyses and urine cultures during the hospital stay following transplantation, sonograms of the renal allograft and nuclear renal scan were done. Prophylactic antibiotics were not given and stomal dilation was not required. After hospital discharge patients were followed at the outpatient transplant clinic 3 times in week 1 and then weekly for 1 month, biweekly for 2 months, monthly for 3 months, every 3 months for year 1 and every 6 months thereafter. Serum creatinine, serum urea, urinalysis and urine culture were obtained routinely at each visit. Other laboratory tests or imaging procedures were ordered when indicated.

#### RESULTS

The table shows the followup of kidney transplant recipients with TLCU (range 20 months to more than 17 years). Patient L. G. died of gastrointestinal bleeding, myelodysplasia and gram-positive septicemia following cholecystectomy for infected gallstones 10 years after cadaveric kidney transplantation with TLCU. In this female patient serum creatinine was generally around 125  $\mu\text{mol/l}$  during the 10 years and allograft sonograms were normal. Autopsy revealed no evidence of hydronephrosis or chronic rejection in the transplanted kidney. Patient R. M. underwent allograft nephroureterectomy 12 years after cadaveric kidney transplantation with TLCU because of chronic vascular rejection. He had had no episodes of asymptomatic or symptomatic urinary infection (UTI). The removed kidney showed normal pelvicaliceal structure.

Four patients (cadaveric in 3 and living related in 1) had normally functioning allografts 17 years 2 months (RH), 10 years 2 months (RD), 9 years 3 months (PK) and 20 months (TF) after kidney transplantation with TLCU. Allograft sonograms were normal and urine cultures were always sterile or infrequently positive, which seldom required treatment.

The seventh patient (GG) underwent living related kidney transplantation with TLCU but because of obesity the donor ureter had less than ample length. The temporary ureteral stent was removed several days after transplantation but it was reinserted and left indwelling because of oliguria and hydronephrosis. The stent fell out a few weeks later and was left out for several weeks because of good urine output. Subsequently she had urosepsis and stomal stenosis was discovered. Stomal revision was done by dissecting out the distal

ureter for 4 to 5 cm, leaving as much tissue around the ureter longitudinally and reanastomosing the ureter to the skin, thus, creating a fairly large stoma. To date there has been no recurrence of stomal stenosis but there appeared to be some partial obstruction at the ureteropelvic junction (UPJ) (see figure). Five years after transplantation serum creatinine was stable at 166  $\mu\text{mol/l}$  and UTIs have been treated as they occur.

Urine leakage around the stomal appliance was not a difficulty in our series because most patients were not obese except for GG. However, after stomal revision proper fit of the stomal bag was still achieved. We would suggest that this technique should be used preferentially in nonobese patients.

#### DISCUSSION

With improvements in immunosuppression more patients with lower urinary tract abnormalities are being accepted for renal transplantation. It has been the general experience as well as the accepted view of surgeons that end cutaneous ureterostomy is a poor means of urinary diversion because of its high failure rate due to stomal stenosis and pyelonephritis. Therefore, it has seldom been used in renal transplantation. Early pessimistic reports in patients undergoing renal transplantation with TLCU seemed to further confirm this view.<sup>12,13</sup>

This study shows that TLCU in transplant recipients is a feasible alternative for supravescical urinary diversion. The major challenges facing kidney transplant recipients with lower urinary dysfunction have been long-term graft function, infections and stenosis. In 1966 Kelly et al reported 7 cases of renal transplantation with ileal conduit diversion, of which only 1 failed because of breakdown in the ureteroileal anastomosis.<sup>19</sup> Since then, this procedure has been recommended by many groups in kidney transplant recipients when supravescical urinary diversion is required. However, some reports suggest a significant complication rate as well as significant morbidity associated with this procedure. Glass et al reported a 32% conduit related complication rate, including a 13% mortality rate due to urosepsis.<sup>20</sup> Furthermore, Surange et al reported a 39% complication rate related to the ileal conduit and 65% of patients had symptomatic UTIs with 63% graft survival at 5 years.<sup>3</sup> When comparing ileal conduits and continent reservoirs, graft function was similar at about 70% at 5 years.<sup>6</sup>

Although ileal conduits or continent diversions appear to have good long-term results, most of these cases were reported as staged procedures or extensive surgeries during transplantation. Alternatively clean intermittent catheterization has been used in transplant recipients and it has been related to significant morbidities.<sup>2</sup> Renal transplantation in patients in whom neurogenic bladder is managed by clean intermittent catheterization shows about a 50% incidence of bacteriuria or clinical UTI.<sup>21</sup> This compares favorably with the almost 100% incidence of bacteriuria in patients with an intestinal conduit. However, in

Pt	Pt No.	End Stage Renal Disease Cause	Transplantation Date	UTI	Obstructive Uropathy	Current Serum Creatinine ( $\mu\text{mol/l}$ )	Current Status
LG	1	Neurogenic bladder	12/1/84	Very rare	None		Died with functioning graft on 7/25/94
RM	2	Neurogenic bladder	12/12/85	None	None		Nephroureterectomy 5/30/97 for chronic rejection
RH	3	Bladder exstrophy	5/11/87	Rare	None	201	Well
RD	4	Neurogenic bladder	5/10/94	None	None	124	Well
PK	5	Neurogenic bladder	4/24/95	None	None	70-80	Well
TF	6	Posterior urethral valves	10/14/02	None	None	130-150	Well
GG	7	Interstitial cystitis	9/28/99	Fairly frequent before stomal revision	Stomal stenosis, partial UPJ obstruction	130	Stomal revision 2/23/00

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