Living donor renal transplant recipients tolerate early removal of bladder catheters

Evan S Glazer MD MPH¹, Kelly Benedict MD¹, Mohammad Akhavanheidari MD¹, Sam James MD¹, Ernesto Molmenti MD PhD MBA FICA²

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Recipients of living donor renal grafts enjoy numerous benefits compared with deceased donor kidney recipients. Bladder catheterization allows for the continuous determination of urinary output and, theoretically, may prevent urinary leaks. A series of 25 consecutive renal transplants was reviewed to evaluate the timing of removal of bladder

catheters after transplantation. Removing urinary catheters as early as 24 h to 48 h post-transplant showed no increase in undesirable outcomes. More than 50% of the patients had invasive bladder catheters in place for only one or two days. Early removal was associated with a lower rate of urinary tract infections, decreased length of hospitalization and possibly less discomfort, in the absence of detrimental effects.

Key Words: Catheter; Donor; Foley; Infection; Kidney; Live; Satisfaction; Transplant; Urinary

The use of bladder catheterization is standard in many operations. In short-duration operations with healthy individuals, its use is not clearly defined. However, in renal transplant recipients, there are many benefits. These include preparation of the bladder for anastomosis and monitoring subsequent urinary output. As the practice of surgery becomes increasingly evidence based, previously accepted practices are challenged. The purpose of the present study was to evaluate potential benefits and complications associated with early removal of invasive bladder catheters in the immediate post-transplant period after living donor renal transplantation. Almost 60% of bacteremias in renal transplant patients are reported to originate in the urinary tract, while catheters are the major source of nosocomial infections and sepsis (1,2). Although some studies (3,4) address duration of bladder catheterization, there does not seem to be a general consensus.

METHODS

A prospectively collected database of 25 consecutive live donor kidney transplant recipients was reviewed. All patients underwent transplantation by the same surgeon. Postoperative follow-up was shared between the abdominal transplant service and the nephrology service.

The surgical technique entailed performing the arterial and venous anastomoses and reperfusion of the kidney. Once this was achieved, the urinary bladder was filled with an iodine-based solution and incised. The ureter was trimmed to ensure a tension-free anastomosis, and was subsequently spatulated. The ureter-to-bladder anastomosis was constructed with full-thickness Maxon sutures of both the ureter and bladder. A nipple valve antireflux mechanism was also created. No stents were used. Routine ultrasound examinations performed in the immediate postoperative period allowed for baseline evaluation of allograft perfusion and lack of hydronephrosis.

Urinalyses were obtained on a routine basis at the time of removal of the bladder catheter irrespective of the presence of symptoms suggestive of urinary tract infections (UTIs). A UTI was defined as a culture with greater than 10,000 colony-forming units, a clinical examination with a urinalysis consistent with infection, or an uncontaminated urinalysis with pyuria and bacteria that subsequently grew in culture. End-stage renal disease was associated with hypertension and/or diabetes mellitus in 52% of cases.

Primary end points of the present study were inpatient hospital days, duration of bladder catheterization, delayed graft function or post-transplant dialysis, warm and cold ischemic times, UTIs and acute tubular necrosis (based on nuclear imaging). Any day or fraction of a day in which a catheter was in place was considered as a whole day regardless of the exact time of insertion and removal. Due to the very small number of patients with catheters in place for more than six days ($n=3$), the group was considered as a whole when performing the analysis.

The institutional review board approved the present study. Statistical analysis and modelling was performed using Excel 2008 (Microsoft Corp, USA) or Prism 5 (Graphpad Software Inc, USA). Statistical significance was defined as $P<0.05$.

RESULTS

Mean patient age was 52.9 years (range 22 to 70 years) with 17 men (68%) and eight women (32%). Mean donor age was 37.7 years (range 19 to 60 years). Cold ischemic time ranged from 18 min to 90 min, while warm ischemic time ranged from 18 min to 60 min (Table 1).

The UTI rate was approximately 16.0%, and it increased as catheterization duration increased (Table 1). The only patient who developed acute tubular necrosis had a catheter for six days. Two patients required dialysis post-transplant, and had catheters for four and nine days, respectively.

¹Department of Surgery, The University of Arizona, Tucson, Arizona; ²Department of Surgery, North Shore University Hospital, Manhasset, New York, USA

Correspondence: Dr Ernesto Molmenti, Department of Surgery, North Shore University Hospital, 300 Community Drive, Manhasset, New York 11030, USA. Telephone 516-562-3152, fax 516-562-1523, e-mail emolment@nshs.edu

TABLE 1
Patient demographics, outcomes and transplantation characteristics according to duration of bladder catheterization (n=25)

Catheter duration, days		1	2	3	4	5	6	7 or more	P
Patients, n		2	11	7	1	0	1	3	
Age, years	Mean	59.5	51.9	47	64	–	52	58.3	0.895*
	Minimum	59	22	30	64	–	52	51	
	Maximum	60	70	64	64	–	52	66	
Gender, n (%)	Male	2 (100)	7 (64)	3 (43)	1 (100)	–	1 (100)	3 (100)	0.441*
	Female	0 (0)	4 (36)	4 (57)	0 (0)	–	0 (0)	0 (0)	
Donor age, years	Mean	46	35	34	37	–	37	42.3	0.929*
	Minimum	35	19	20	37	–	37	30	
	Maximum	57	60	42	37	–	37	49	
Cold ischemic time, min	Mean	60	30	42	30	–	24	24	0.062*
	Minimum	60	18	30	30	–	24	18	
	Maximum	60	60	90	30	–	24	36	
Warm ischemic time, min	Mean	30	30	36	30	–	30	30	0.738*
	Minimum	30	18	30	30	–	30	30	
	Maximum	30	30	60	30	–	30	36	
Pretransplant dialysis, n (%)		2 (100)	10 (91)	4 (57)	1 (100)	–	1 (100)	3 (100)	0.615*
Post-transplant dialysis, n (%)		0 (0)	0 (0)	0 (0)	1 (100)	–	0 (0)	1 (33.3)	0.6171**
Acute tubular necrosis, n (%)		0 (0)	0 (0)	0 (0)	0 (0)	–	1 (100)	0 (0)	0.361**
Urinary tract infection, n (%)		0 (0)	1 (9.1)	2 (28.6)	0 (0)	–	0 (0)	1 (33.3)	0.475**
Length of stay, days	Mean	3	4	4	12	–	12	13.7	0.011**
	Minimum	3	2	4	12	–	12	6	
	Maximum	3	5	4	12	–	12	22	

P values are based on a multiple linear regression model used to predict duration of catheterization at the time of transplant (*) or the relationship between outcome variables listed and catheter duration (**)

Excluding catheterization for five days (when no catheters were removed), there was a significant correlation between bladder catheterization duration and length of stay ($r^2=0.84$, $P=0.01$; Table 1).

DISCUSSION

Infections are always of concern, especially in immunocompromised transplant patients. The rate of reported UTIs in transplant recipients (8% to 14%) (3) may be an underestimation. Our UTI rate of 16% is likely to be more accurate because no patient received prophylactic antibiotics, our definition of UTI was very stringent, and all recipients were tested, not just those with clinical findings. Bladder catheterization does have reported benefits, such as monitoring urine output, allowing for adequate urinary drainage, and potentially avoiding urinary leaks and fistulas (4).

Although immunosuppression is associated with a higher incidence of infections, it does not seem to interfere significantly with the natural defenses of the lower urinary tract (2). Patients continue to receive prophylaxis for cytomegalovirus and *Pneumocystis jiroveci* pneumonia (2,5). However, antimicrobials are not without side effects, such as development of resistance and drug-related toxicities (3). Excluding the duration of bladder catheterization, other risk factors for UTIs, such as female gender, history of chronic UTIs, and possibly diabetes mellitus (5), are not modifiable. Early discontinuation of bladder catheters appears to be an effective method to decrease UTIs in these patients.

CONCLUSION

Our results support the safety of early removal of bladder catheters after renal transplantation. There is a slight increase in the rate of UTIs with each day a bladder catheter is left in place. Removing urinary catheters early showed no increase in undesirable outcomes. In our series, more than 50% of patients had invasive bladder catheters for only one or two days. We did not encounter any detrimental effects. Finally, we believe that such an approach is probably more comfortable for patients.

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