Bladder Function Evaluation Before Renal Transplantation in Nonurologic Disease: Is It Necessary?

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OBJECTIVE To determine whether preoperative cystometry and a pressure flow study (PFS) are necessary in patients with end-stage renal disease from nonurologic causes who will undergo renal transplantation.

METHODS From April 2009 to June 2010, 30 patients scheduled to undergo renal transplantation were prospectively evaluated with cystometry and PFS. The evaluation was performed immediately before and 6 months after renal transplantation. The inclusion criteria were age >18 years and end-stage renal disease secondary to nonurologic disease.

RESULTS Improvement in the cystometry and PFS parameters was observed after the return of diuresis at 6 months after transplantation. The parameter changes from baseline to the 6-month evaluation were as follows: first sensation of bladder filling, 88.8-168.7 mL ($P = .0005$); first desire to void, 137.2-251.1 mL ($P < .0001$); maximal cystometric capacity, 221.2-428.7 mL ($P < .0001$); bladder compliance, 73.9-138.6 mL/cm H_2O ($P = .03$); and maximal flow rate, 8.1-15.8 mL/s ($P < .0001$). The Abrams-Griffiths number in the men decreased from 31.8 to 15.2 ($P = .002$). No significant changes were observed in the detrusor pressure at the maximal flow rate or the postvoid residual urine volume. Patients with a 24-hour urine output <200 mL tended to have had significantly worse parameters before transplantation.

CONCLUSION Significant improvement in the cystometry and PFS parameters was observed in patients with end-stage renal disease, without urologic disease, 6 months after transplantation, and was associated with recovery of the glomerular filtration rate and urine output by the renal graft. UROLOGY 83: 406–410, 2014. © 2014 Elsevier Inc.

Progression of renal disease to end-stage renal disease (ESRD) is associated with a reduction of the glomerular filtration rate and urine output. It occurs regardless of the etiology of the primary renal failure.[1] In patients receiving renal replacement therapy, the maintenance of residual diuresis is rare, and the reduction in urinary flow can produce bladder alterations, known as a defunctionalized or dysfunctional bladder (DB).

The need for analysis of bladder function in patients on the waiting list for transplantation remains controversial. Investigators' opinions diverge on whether DB should be investigated or treated before transplantation. No conclusive data are available; thus, perhaps the lack of a definition for DB has contributed to the controversy. The classification of bladder dysfunction secondary to a nonurologic or urologic etiology is the first point to be considered. Bladder dysfunction can occur as a consequence of reduced renal function resulting from nonurologic etiologies, such as diabetes, hypertension, and glomerulonephritis, or can result from alterations in the urinary tract, such as posterior urethral valves, neurogenic bladder, bladder tuberculosis, benign prostatic hyperplasia, prostate cancer, retroperitoneal fibrosis, and urinary lithiasis. Several investigators have supported the investigation and treatment of bladder function before renal transplantation, with most of the studies including urologic etiologies.[2-7] However, although a nonurologic etiology has been the main cause of ESRD, studies analyzing the indications for bladder function investigation, the best point for evaluation, and guidelines for treatment are lacking.[8,9]

The urodynamics study has been considered the reference standard for bladder function evaluation. It includes

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uroflowmetry, cystometry, pressure flow study (PFS), and voiding cystourethrography. DB usually presents with changes in the cystometry and PFS parameters, such as a reduced maximal cystometric capacity, detrusor overactivity, and reduced bladder compliance.[9-11] Anecdotal reports and retrospective series have shown recovery of bladder function after an increase in the post-transplant urine output.[12] Serrano et al[13] observed bladder function recovery during long-term follow-up in a series of patients with ESRD from urologic causes, including previous surgical urinary diversion. In 2003, Zermann et al[14] suggested the importance of urodynamics study before kidney transplantation in patients with nonurologic ESRD with lower urinary tract symptoms and dysfunctional voiding. Nonetheless, no post-transplant urodynamics evaluation was performed, and some patients could not be classified as having DB because of a high urinary output.[14]

Therefore, we evaluated the follow-up cystometry and PFS parameters of patients with nonurologic ESRD who had undergone kidney transplantation.

Table 1. Demographic data from study patients (n = 30)

Variable	Value
Age (y)	
Median	49.5
Range	18-66
Gender (n)	
Male	19 (63)
Female	11 (37)
Dialysis duration (mo)	
Median	48
Range	13-168
Uri24h (mL)	
Median	200
Range	0-800
ESRD etiology (n)	
Hypertension	8 (26)
Glomerulonephritis	8 (26)
Diabetes mellitus	4 (14)
Polycystic kidney disease	4 (14)
Indeterminate	4 (14)
Hemolytic uremic syndrome	1 (3)
Systemic lupus erythematosus	1 (3)

ESRD, end stage renal disease; Uri24h, 24-hour urine output.
Data in parentheses are percentages.

MATERIAL AND METHODS

The Scientific Review Committee at Campinas University reviewed and approved the protocol for the present study. All participants provided written informed consent before beginning the study.

In the present case-control study, we evaluated 30 of 148 consecutive patients who had undergone kidney-deceased donor transplantation at our institution from April 2009 to June 2010. Because of difficulties related to the unpredictable interval to deceased donor transplantation and logistical issues, we could only access 63 of 148 patients before renal transplantation. Of these 63 patients, 33 were excluded, because they had not satisfied the inclusion and/or exclusion criteria.

The inclusion criteria were age >18 years, ESRD from nonurologic causes, renal replacement therapy for >12 months, and 24-hour urine output <800 mL, measured using a bladder diary. The exclusion criteria were previous urologic surgery and abnormal urinary tract ultrasound or cystourethrography findings (these examinations were mandatory for all candidates for renal transplantation at our institution).

The 30 patients had undergone cystometry and PFS immediately before and 6 months after successful renal transplantation. The group included 11 female and 19 male patients, aged 18-66 years (average 46.5). They had required dialysis for 130-168 months (average 57). The primary cause of ESRD was hypertension in 8, chronic glomerulonephritis in 8, diabetes mellitus in 6, adult polycystic kidney disease in 4, and other nonurologic etiologies in 6 (Table 1).

The data were processed using a 6-six channel urodynamic device (Uro-Master II, version 4.2, SP/BR, DynaMed, Ipswich, MA). Cystometry and PFS were done according to the good practices recommended by the International Continence Society.[15] Cystometry was performed with all subjects in the standing position. PFS was performed with the men standing and the women seated. Bladder filling was achieved at a rate of 20 mL/min with saline solution through an 8F urethral catheter. Intravesical pressure was assessed using a 6F urethral catheter, and the abdominal pressure was measured using a 6F catheter with a balloon attached to the tip.

The terminology used to describe the studied parameters followed the American Urological Association Guidelines for Adult Urodynamics and International Continence Society recommendations.[16,17]

The parameters assessed during cystometry were first sensation, first desire to void, maximal cystometric capacity (MCC), bladder compliance, and the presence of detrusor overactivity (DO). The parameters assessed during the PFS were maximal flow rate (Qmax), average flow rate, detrusor pressure at Qmax, and postvoid residual urine volume. In the men, the Abrams-Griffiths (AG) number was calculated. By definition, this number cannot be used with women.[18]

Statistical Analysis

A descriptive analysis was obtained with a frequency table of categorical variables and position and dispersion measures of numeric variables. The Wilcoxon test was used in related samples to compare variables between the 2 points (before and 6 months after renal transplantation). Spearman's correlation coefficient was applied to check the linear association among the parameters. This coefficient presents a variation ranging from −1 to 1. Values closer to the extremes indicate a positive or negative correlation, and values closer to 0 do not indicate a correlation. Statistical significance was considered at P <.05, and the statistical analysis was done using the SAS System for Windows, version 9.2 (SAS Institute, Cary, NC).

RESULTS

All the cystometry and PFS parameters were compared individually before and 6 months after renal transplantation. Significant improvement was seen in all the parameters, except for the detrusor pressure at Qmax and the postvoid residual urine volume, which were normal before transplantation (Table 2). The average preoperative AG number was 31.8 (the uncertain zone for