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Does bladder augmentation negatively affect renal transplant outcome in posterior urethral valve patients?

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KEYWORDS

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Abstract *Objective:* Although renal transplant (RT) is a safe and effective treatment for end-stage renal disease, the outcome of RT has been mixed for posterior urethral valve (PUV) patients. In addition, some PUV patients need an augmentation cystoplasty (AC), which may negatively affect their RT outcome. The aim of this study is to compare RT outcome between PUV children with and without AC.

Materials and methods: Between 1985 and 2012 a total of 309 children received 369 RTs at our institution. Among these patients, 36 were had classified as having PUV. Of these, 12 underwent an AC before RT (AC group) and 24 did not (controls). Data, including age at transplant, allograft source, urological complications, urinary tract infection (UTI) incidence, the presence of vesicoureteral reflux (VUR), and patient and graft survival, were compared between groups.

Results: Mean age at RT and mean follow-up were 7.6 versus 7.9 years and 8.9 versus 7.9 years in the AC group and in the control group, respectively (not significant [NS]). Allografts were from living donors in 50% of the AC group and in 41.6% of the controls (NS). The rate of UTI was 0.02 UTI/patient/year and 0.004 UTI/patient/year in the AC and control group, respectively ($p = 0.001$). Of the nine patients with UTI in the augmented group, five (55.5%) had VUR, while 5/8 (62.5%) patients in the control group with UTI had VUR. All patients with VUR in either group had UTIs previously. Of the five AC patients with more than three UTIs, two (40%) were non-compliant with clean intermittent catheterization (CIC), and UTI incidence was not associated with either a Mitrofanoff conduit or the urethra being used for CIC. Graft function at the end of study was 87.8 ± 40.5 ml/min/m² in the AC group and 88.17 ± 28.20 ml/min/m² in the control group (NS). The 10-year graft survival rate was 100% in AC group and 84.8% in controls. Two patients in the AC group lost their grafts (mean follow-up 13.3 ± 0.8 years) and five in the control group (mean follow-up 7.1 ± 4.7 years).

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Conclusions: Bladder augmentation does not negatively affect renal outcome in PUV patients undergoing transplantation. However, recurrent UTIs are more frequent in transplanted PUV patients with an AC than in those without AC, and they are generally related to non-compliance with CIC or the presence of VUR but, mostly, they will not result in impaired graft function.

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Introduction

Patients with posterior urethral valves (PUV) are at high risk for end-stage renal disease (ESRD) given the impact of obstructive uropathy on their renal parenchyma and urinary tract, the latter effect resulting in bladder dysfunction. This condition still remains the single most common urologic cause of renal transplant (RT) in children (16.5%), according to the North American Paediatric Renal Trials and Collaborative Studies' 2010 annual report [1].

Although RT is a safe and effective treatment for ESRD in children, the outcome of RT among PUV patients has been mixed [2–8]. The discrepancy between the different studies may be attributed to valve bladder syndrome, which is reported to occur in 13–38% of PUV patients and can negatively affect RT outcome [9]. In addition, some PUV patients will need an augmentation cystoplasty (AC) to create a compliant low-pressure reservoir that will protect the eventual renal allograft. However, some concerns have been raised that bladder augmentation in these patients may increase the risk of complications, predominantly urinary tract infections (UTI), urological complications, and then allograft dysfunction and loss. Studies evaluating RT outcome in relation to AC in children [10–12] have had contradictory results, and current knowledge is based on studies with a limited number of patients with a wide variety of lower urinary tract abnormalities. Therefore, the aim of this study is to compare RT outcome (urological complications, UTIs, graft function, and patient and graft survival) between transplanted PUV children with an AC and those without it.

Materials and methods

Of 369 kidney transplants performed in 309 children (aged ≤ 18 years) in our department between 1985 and 2012, 36 were patients who were classified as having renal failure secondary to PUV. Of these 36 PUV children, 12 underwent an AC before transplant (AC group) and 24 did not have their bladder augmented (control group). Both groups were transplanted during the same time period (1990–2012). A voiding cystourethrography and urodynamic studies were performed in all PUV patients when they entered into ESRD. All patients had at least one kidney that produced enough urine for a valid urodynamic study. Evaluations included a cystometrogram or flow pressure study, electromyography, uroflowmetry, and measurement of post-voiding residual urine.

Children with overactive bladder were treated with anticholinergic medications, and those with myogenic

failure and significant post-voiding residual urine ($\geq 15\%$ of full bladder volume) were on clean intermittent catheterization (CIC).

In PUV patients with a poorly compliant bladder our criteria for augmenting the bladder before transplant was that, despite anticholinergic therapy, the urodynamic study showed a linear increase of detrusor pressure during filling with a detrusor pressure >20 cm of water at an estimated bladder capacity of $<60\%$.

Bladder augmentation was made with ureter in 10 patients and with sigmoid colon in two; in all of them it was performed prior to transplantation (mean age 7.7 years, range 2.5–18.0 years). In the 10 patients augmented with ureter, the average bladder volume increased from 98 ml (range 52–160 ml) to 298 ml (range 195–366 ml), and the average detrusor pressure decreased from 25 cm of water (range 20–35 cm) to 9 cm of water (range 7–11 cm).

In the two patients augmented with intestine; in one bladder volume increased from 114 to 560 and detrusor pressure decreased from 45 to 7 cm of water and in the other, bladder volume increased from 167 ml to 605 ml and detrusor pressure decreased from 60 to 9 cm of water, respectively. The mean time from bladder augmentation to RT was 1.4 years (range 0.4–4.5 years).

After the AC, two patients with a ureter augmentation did not need CIC to empty their bladders and 10 did. Of these 10 CIC patients, four had the CIC through the urethra and six through a continent catheterizable stoma made with either appendix (two patients) or with ureter (four patients) Of the four patients with a ureter stoma, two were augmented with intestine and the other two with ureter (bilateral nephrectomy, using one ureter to make the catheterizable stoma and the other to augment the bladder).

In the AC group, the ureter of the graft was implanted into the native bladder in all cases following the Lich–Gregoir technique.

In the control group (patients transplanted without an AC), two had CIC through continent catheterizable stoma, made with appendix in one and with ureter in the other.

UTI was defined by clinical symptoms, including pyrexia, loin pain, or deterioration of graft function associated with a positive urine culture.

Glomerular filtration rate (GFR) was calculated using the Schwartz formula [13]

Data including age at transplant, allograft source, urological complications, incidence of UTI, graft function and survival, and patient survival were compared between the AC group and the control group.

The immunosuppressive regime was similar in both groups (because all of these patients were transplanted in the same time period) and consisted of anti-lymphocytic

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