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BRIEF REPORT

Waleed K. Al Khudair
Mostafa K. Mansi

Rehabilitation of long-term defunctionalized bladder for renal transplantation

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W.K. Al Khudair (✉) · M.K. Mansi
Section of Urology &
Kidney Transplantation,
Department of Surgery,
King Fahad National Guard Hospital,
P.O. Box 22490, Riyadh 11426,
Saudi Arabia
Fax: + 966 1 252 0121

Abstract Some kidney transplant candidates have urinary diversion due to lower urinary tract dysfunction. Careful assessment of the native defunctionalized bladder before kidney transplantation may reveal a usable bladder in a substantial number of these patients. However, most of these bladders need some kind of rehabilitation. An assessment of the continence mechanism is also crucial. We report on successful kidney transplantation into a native bladder, defunctionalized for 9 years, after it had been carefully evaluated and rehabilitated.

Key words Kidney transplantation, bladder rehabilitation · Bladder rehabilitation

Introduction

End-stage renal disease can be the result of lower urinary tract abnormalities in a significant number of candidates for kidney transplantation. Most of these patients are young and will have had urinary diversion for several years when they present for pre-transplant evaluation. Although renal transplantation into an ileal or sigmoid conduit is feasible, the progressive deterioration of graft function and patient dissatisfaction with skin stoma make this approach less than optimal [3, 4, 7]. The use of the native bladder in such patients, if possible, should not be overlooked. It has been demonstrated that some bladders that have been defunctionalized for decades may retain the ability to recover their function at undiversion [5]. Recently, renal transplantation into the native nonaugmented bladder of patients with a history of posterior urethral valves showed favorable long-term outcomes with graft function comparable to that in the general transplant population [10].

We report our experience with the evaluation and management of a patient with supravesical urinary diversion for 9 years who underwent renal transplantation into the native long-term defunctionalized bladder after successful bladder rehabilitation.

Case report

A 17-year-old male patient with chronic renal failure who had been on hemodialysis for 9 years and who had supravesical urinary diversion was referred to our hospital for renal transplantation. At the age of 6 years, he was examined for recurrent episodes of urinary tract infection and was diagnosed as having neuropathic bladder dysfunction with bilateral grade IV vesico-ureteric reflux. At that time he underwent bilateral ureterovesical reimplantation, and 1 year later he underwent left-to-right transureteroureterostomy and right cutaneous ureterostomy for recurring urinary tract infections. His kidney function continued to deteriorate, and within a year he started hemodialysis. The patient and his parents repeatedly refused renal transplantation to an ileal conduit at various other centers. They insisted on doing away with the abdominal skin stoma and even refused the idea of renal

transplantation into a continent reservoir with a catheterizable skin stoma.

Careful voiding history before supravesical diversion revealed that the patient was continent and dry. The pretransplant bladder evaluation consisted of urethrocystoscopy, voiding cystourethrography, urodynamics (cystometry, uroflowmetry and postvoid residual), and demonstration of continence. Urodynamic studies showed a markedly decreased bladder capacity of 80 ml with uninhibited detrusor contractions and poor compliance, a peak flow rate of 7 ml/s, and 20-ml residual volume. Urethrocystoscopy revealed a mild degree of bladder wall trabeculations with no evidence of stones, tumors, or posterior urethral valves. Voiding cystourethrography showed no gross abnormalities in bladder configuration and confirmed markedly decreased bladder capacity. Continence was demonstrated by filling the bladder with normal saline through an in-and-out urethral catheter until the desired maximum capacity. The patient was then asked to hold the bladder contents as long as he could, ambulate, walk upstairs, and perform Valsalva's maneuver. The patient was taught to perform clean intermittent self-catheterization (CISC) and was advised to fill the bladder at home twice weekly until maximum capacity was reached with increasing volumes of normal saline. He was given anticholinergics (oxybutynin 5 mg orally 3 times daily) during the bladder cycling period. The patient kept a diary of the volume of normal saline with which the bladder could be filled each time as well as the residual volume after voiding, and he was followed up every 4 weeks to assess the progress in bladder cycling.

Three months after bladder rehabilitation, cystometry demonstrated a bladder capacity of 320 ml with a maximum intravesical pressure capacity of 26 cm H_2O, improved bladder compliance, and disappearance of the unstable contractions. The peak flow rate improved to 19 ml/s on uroflowmetry with no residual. The patient then underwent bilateral native nephrectomy and closure of the skin stoma. Eight weeks later, a cadaver kidney was transplanted into the left iliac fossa in the standard fashion, and the transplant ureter was implanted into the bladder via an extravesical ureteroneocystostomy. A double J stent was placed in the transplanted kidney at transplantation and removed after 10 days.

The patient had prolonged bladder drainage for 2 weeks via a urethral Foley catheter with no surgical complications. Post-transplantation, the patient was kept on standard immunosuppression (cyclosporin, azathioprine, and steroids) and was given prolonged antibiotic prophylaxis with norfloxacin for 4 weeks. Voiding cystourethrography and urodynamic studies were performed 3 months post-transplantation, and urodynamic studies were repeated at 6, 12, and 18 months to assess bladder function. No anticholinergics were given after transplantation and the patient continued to be continent with zero residual urine volume after voiding. Bladder capacity increased from 320 ml before transplantation to 470 ml 18 months postoperatively. The patient has a stable, functioning graft 18 months post-transplantation with an unchanged serum creatinine of 170 mmol/l. There have been no episodes of urinary tract infection since transplantation.

Discussion

Severe lower urinary tract dysfunction and major anatomic abnormalities were considered absolute contraindications to kidney transplantation until Kelly and associates reported the feasibility of transplantation into an intestinal cutaneous conduit in 1966 [6]. However, recipients of such transplants are known to be at increased risk for complications of recurrent urinary tract infections, inferior graft survival, calculus formation, and such conduit-specific complications as urinary leakage, urinary fistula, and stoma problems, in addition to patient dissatisfaction with the skin stoma and the appliance [3, 4, 7]. It became increasingly evident that the use of intestinal conduits for transplantation should be minimized and only used when there was no bladder, and that every possible effort should be made to utilize the native bladder when present [8].

Clinical studies demonstrated that prolonged defunctionalization of a normal bladder does not limit its ability to recover function and that congenitally obstructed bladders can regain normal or near-normal capacity when undiverted [5]. Such recovery has been attributed to errors in the original diagnosis, complete control of chronic bladder infection, premature diagnosis of the illness, and further growth and development of the bladder in young children. Prolonged defunctionalization may cause bladder contraction, which should improve with restoration of urinary flow unless chronic inflammation has caused severe bladder wall fibrosis that prevents bladder recovery. In such cases, patients are best treated by bladder augmentation prior to transplantation [9].

Many patients with pre-existing supravesical urinary diversion who are candidates for renal transplantation may have a usable bladder despite prolonged defunctionalization. However, these bladders need careful pretransplant evaluation by voiding cysto-urethrography, cystoscopy, urodynamics and residual urine determination [8]. Bladder rehabilitation by cycling with increasing fluid volumes remains the best way to assess and artificially stimulate bladder recovery. An equally important reason for bladder cycling is to demonstrate continence and to assess the efficiency of the continence mechanism. The majority of patients with a prolonged defunctionalized bladder have detrusor instability on urodynamic studies, and bladder cycling will help to distinguish those with urgency incontinence from those who have true sphincteric incompetence [9]. Bladder cycling is also useful in identifying patients who are continent but who fail to empty their bladder completely. Such patients can have successful transplantation with clean intermittent self catheterization [1, 2].

Serrano and associates [11] performed bladder cycling by continuous bladder irrigation for 3–5 days through a suprapubic catheter in three patients and through an in-and-out urethral catheter in another two patients. They started the irrigation at 50 ml/h and increased the volume every few hours to reach approximately 100 ml/h. We used a different regimen that allowed a gradual increase in bladder capacity by having the patient himself fill the bladder twice a week through a urethral catheter over a 3-month period. Although our

regimen takes a longer time, we think it offers a better chance for maximum recovery of the bladder capacity. Furthermore, it makes the patient familiar with the self-catheterization technique in case he needs it after transplantation to completely empty the bladder when there is a large residual urine volume.

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