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Transplanting patients with abnormal lower urinary tracts

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Abstract Since 1977, 23 patients with bladder or bladder outlet dysfunction leading to renal failure have received 28 kidney transplants in our institution. Three patients were provided with an ileal conduit, but the remainder were transplanted using their own bladder following urodynamic assessment and bladder reconstruction. Graft and patient survival were good when compared to a group of patients with normal lower urinary tracts, actuarial graft survival at 5 years being 70% for both groups and patient survival being 82% and 90%, respectively. Patients who develop renal failure from detrusor/sphincter dysfunction can be transplanted successfully once the cause of the renal failure has been identified and corrected.

Key words Bladder dysfunction, kidney transplantation · Kidney transplantation, bladder dysfunction · Urinary tract, kidney transplantation

Introduction

Patients with chronic renal failure due to detrusor/sphincter dysfunction present a problem when being considered for renal transplantation because the abnormal lower urinary tract – usually poor compliance early in filling [10] – will inevitably affect the newly transplanted kidney. Traditionally, the approach has been to fashion a conduit of ileum or colon and to drain the transplant urine into this. This arrangement, however, leaves the patient with a permanent stoma and the long-term problems of conduit drainage [4, 5]. More recently, with the development of urodynamic investigations, bladder function may be more accurately assessed [7] and any pathological process corrected before (or occasionally after) transplantation is carried out [2, 3]. Transplantation in patients with abnormal lower urinary tracts is safe and effective under these circumstances [1, 9].

In this paper we report our 15-year experience with renal transplantation in patients whose renal failure was primarily due to bladder or bladder outlet dysfunction.

Patients and methods

All patients known to have had bladder or bladder neck dysfunction and who had undergone transplantation in our institution between 1977 and 1992 were reviewed. Attention was focused on the original disease, corrective surgery, current graft function and immunosuppressive therapy. Pre-transplant urodynamic studies were performed and appropriate reconstruction carried out on all patients presenting after 1979.

The most common finding on urodynamic studies causing renal failure was poor compliance early in filling (Fig. 1), something that will virtually always cause impaired renal function if left untreated and that results from long-standing detrusor sphincter dyssynergia [10]. Up until 1984, it was standard practice to perform substitution cystoplasty using the right colon, and this remains the largest group since follow-up of patients at risk, particularly the neuropath (mainly spina befida), was much less careful than it is now and the dangers of poor compliance on urodynamics were not understood. Voiding is usually by self-intermittent catheterisation, for although the artificial urinary sphincter (AUS) has been used in three patients, its use is generally avoided due to the potential risk of infection in the immunocompromised patient. Bladder neck incision and selective sphincterotomy will sometimes achieve voluntary voiding and maintain continence. More recently, "clam" enterocystoplasty has been favoured [8].

Although it is standard practice in patients without renal failure to split the bladder from side to side, in those to be transplanted or who

Table 1 Urological procedures performed on the 23 patients with abnormal bladders. (*BNI* bladder neck incision, *SIC* Self-intermittent catheterisation, *AUS* Artificial urinary sphincter)

Bladder reconstruction		Patients
Caecocystoplasty	+ AUS	3
	+ SIC	4
Clam cystoplasty + SIC		3[a]
Ileal conduit		3
Own bladder ± BNI ± SIC		8
Ileocystoplasty		1
Uretero-ileo-colostomy		1
Modified Mitrofanoff procedure		1

[a] One clam cystoplasty to a previous caecocystoplasty

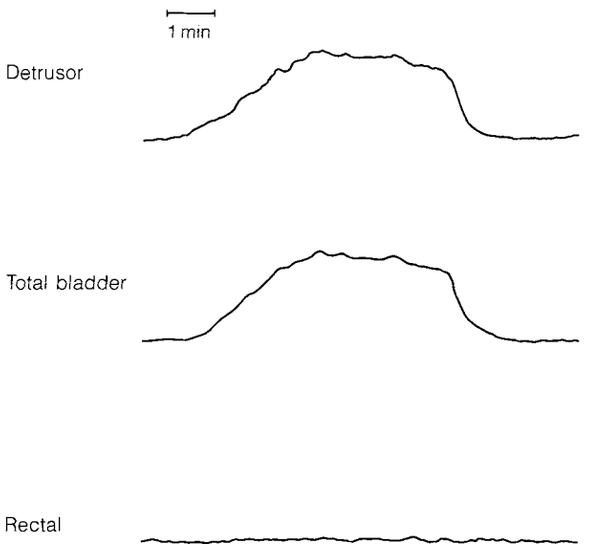

Fig. 1 Urodynamic tracing showing high pressure (> 30 cm) water non-compliant urinary bladder that will inevitably lead to renal failure. Filling rate: 100 ml/min; pressure: 0–100 cm H_2O

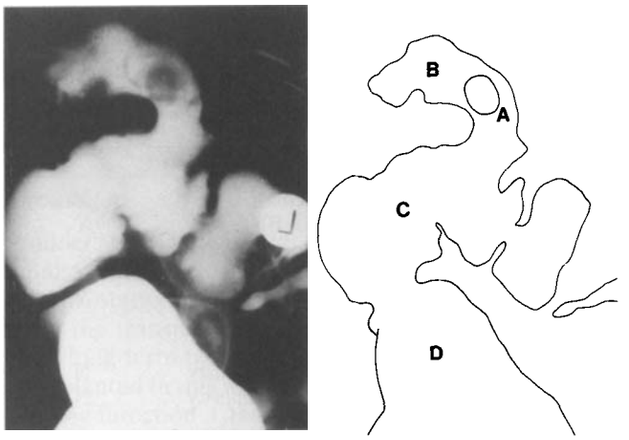

Fig. 2 Barium enema showing uretero-ileo-sigmoidostomy of patient EY (*A* ureteric nipple, *B* ileal tail, *C* sigmoid colon, *D* rectum

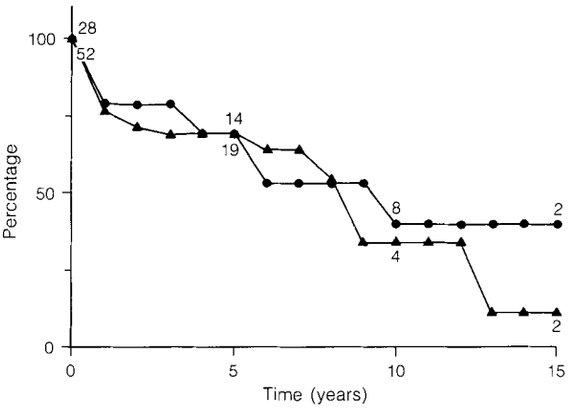

Fig. 3 Actuarial patient survival of patients transplanted with abnormal bladders (–●–) compared to a cohort of patients with normal bladders (–▲–) transplanted at the same time up to 15 years

have already received a graft, it is mandatory to divide the bladder from front to back, either to facilitate subsequent transplantation or to avoid compromising an established graft. Occasionally, if the bladder is absent or unusuable, a pouch of large bowel is constructed and a continent stoma established, our favoured technique being the appendiceal Mitrofanoff [6]. An ileal conduit would never be used now since some form of reconstruction can always be achieved.

Renal transplantation was performed using the standard technique of anastomosing the renal artery and vein to the external iliac artery and vein, respectively, in either the right or the left iliac fossa. The transplant ureter was anastomosed to the patient's intact or reconstructed bladder or to an ileal conduit.

Prior to 1982, immunosuppression consisted of azathioprine and prednisolone, but since 1982 cyclosporin has been used alone or with azathioprine and prednisolone (triple therapy). Transplant function and survival were compared to those in patients with normal bladders. The latter were selected on the basis of having been transplanted immediately before or after the patients with abnormal bladders.

Results

During the 15 year from 1977 to 1992, 23 patients with abnormal bladders received 28 kidney transplants. There were 18 males and 5 females with a mean age of 25 (range 4–60) years. Initial immunosuppression was with cyclosporin in 21 transplants and with azathioprine and steroids in 7. The urological procedures performed prior to transplantation are given in Table 1. Two patients had "clam" cystoplasties performed post-transplantation when it was found that pre-transplant urodynamic assessment had failed to fully elucidate the bladder problem.

Table 2 gives details of the 23 patients, including the causes of bladder dysfunction, current bladder status, current creatinine and immunosuppressive therapy. Of the 28 transplants, 17 are functioning 1 month to 15 years

Table 2 Clinical details of the patients under study. (*BNI* bladder neck incision, *SIC* self-intermittent catheterisation, *Aza* azathioprine, *Pred* Prednisolone, *CyA* cyclosporin, *HD* haemodialysis

Patient	Age	Bladder status	Bilateral nephrectomy	Renal transplant	Current creatinine (μmol/l)	Immunosuppression	Continence
Neurogenic bladder							
SP	21	Ileal conduit	Y	1978	174	Aza/Pred	–
ID	31	Own + BNI	Y	1980	118	Aza/Pred	Y
JF	21	Caecocystoplasty	Y	1981	435	Aza/Pred	Y
SW	18	Own + SIC	Y	1982	102	Aza/Pred	Y
DH	18	Caecocystoplasty	Y	1982(1)	–	Reject at 10 years	–
		and artificial		1992(2)	86	CyA/Aza/Pred	Y
		sphincter + SIC					
KW	23	Caecocystoplasty	N	1985	HD	Chronic rejection	N
CY	21	Caecocystoplasty	N	1986(1)	–	Rejection	–
		+ SIC		1991(2)	123	CyA/Aza/Pred	Y
LL	28	Own + SIC	N	1987	133	CyA/Pred	Y
TH	17	Caecocystoplasty	N	1988	HD	Chronic rejection	
		Artificial sphincter				Non-compliance	
		+ SIC				(Died 1992)	
DT	15	Clam cystoplasty	N	1988	174	CyA/Aza/Pred	Y
CO'N	26	Caecocystoplasty	N	1989	89	CyA	Y
		Artificial sphincter					
		+ SIC					
TT	43	Caecocystoplasty	N	1991	129	CyA/Aza/Pred	Y
LE	27	Modified Metropenoft	N	1991	210	CyA/Aza/Pred	Y
Renal TB							
BC	48	Ileocystoplasty	N	1987	177	Aza/Pred	Y
EY	41	Uretero-ileo-colostomy	Y	1980	81	Aza/Pred	Y
NLE	60	Own	N	1985	Died with functioning graft in 1986		
Urethral valves							
HD	26	Own + psoas	Y	1987	235	CyA/Pred	Y
		Hitch					
JE	4	Own	N	1984(1)	–	Renal vein thrombosis	–
				1985(2)	328	Aza/Pred	Y
GS	9	Ext urethral	Y	1988(1)	–	Chronic rejection	–
		sphincterotomy		1993(2)	HD	Renal vein thrombosis	
MH	25	Own + BNI	Y	1985(1)	–	Rejected	
				1988(2)	192	CyA/Aza	Y
Prune belly syndrome							
JD	12	Own	Y	1978	98	Aza/Pred	Y
KM	30	Ileal conduit	N	1992	HD	Renal vein thrombosis	–
Ectopia vesicae							
DP	17	Ileal conduit	N	1978	Died in 1980		

later. Five grafts have been rejected and three others have been lost due to early renal vein thrombosis. Three patients have died. One had a well-functioning graft, one with an ileal conduit developed chronic pyelonephritis and became undialysable, and one with a caecocystoplasty and artificial sphincter became non-compliant and, after rejecting his graft, died on dialysis from heart failure. All but one of the patients with an intact or modified bladder are continent. This one patient with troublesome nocturnal enuresis has improved following a "clam" procedure to his caecocystoplasty. Three patients successfully use Brantley-Scott artificial sphincters and five patients perform self-intermittent catheterisation to empty their bladders.

Patient EY is an interesting case. His original disease was tuberculosis, which required a right nephrectomy and an ileocystoplasty. He then underwent a caecocystoplasty and excision of the ileocystoplasty. The left ureter was implanted into the ileal tail of the caecocystoplasty. Later, when the function of the left kidney deteriorated, the ileal tail ws detached from the caecum and converted to an ileal conduit. Prior to his transplant, a left nephrectomy was

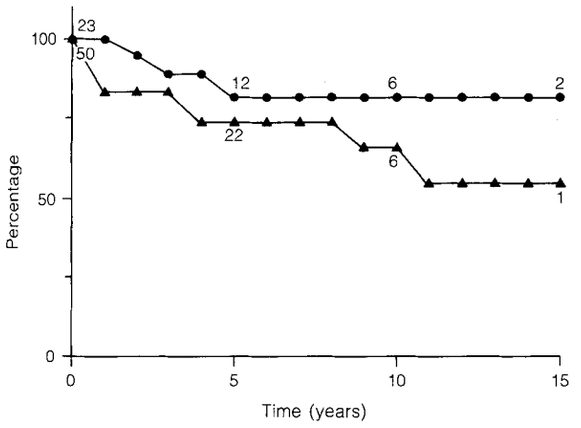

Fig. 4 Actuarial graft survival of patients transplanted with abnormal bladders (–●–) compared to a cohort of patients with normal bladders (–▲–) transplanted at the same time up to 15 years

performed and the ileal conduit reattached to the caecocystoplasty. Following his renal transplant, he passed all his urine per rectum since, mistakenly, the ileal tail to which the transplanted ureter had been joined had been reanastomosed to the sigmoid colon rather than to the caecocystoplasty. Nonetheless, the patient remains well with this anatomical configuration 14 years later (Fig. 2) and had excellent renal functin (creatinine 81 μmol/l).

Actuarial patient and graft survival are shown in Figs. 3 and 4. Patients with abnormal bladders have been compared with a group of patients with normal bladders transplanted at around the same time. Survival times were very similar, with 70% of the grafts in both groups being functional at 5 years.

Discussion

Bladder and bladder outlet dysfunction sufficient to cause renal failure is clearly not a contraindication to renal transplantation. In the past, the usual approach was to drain the transplant into an ileal conduit. This can give good long-term results, but one of the three patients we transplanted in this way lost graft function and died of ascending infection. Clearly, it is preferable for patients to be able to void per urethra and to avoid the well-known problems associated with a stoma and its collecting device.

With currently available techniques, most patients with bladder or bladder outlet dysfunction can undergo bladder reconstruction or have outlet problems corrected. Some patients may subsequently need to perform self-intermittent catheterisation, but this does not seem to cause problems in immunosuppressed patients.

We would, therefore, recommend that any patient who develops chronic renal failure as a result of bladder dysfunction undergo full urodynamic evaluation whilst on dialysis treatment. Appropriate surgery can then be undertaken that will allow renal transplantation to be successfully carried out.

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