Urological Complications in Renal Transplantation

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Urological Complications in Renal Transplantation*

Riad N. Farah, MD,* Richard Klugo, MD,* Thomas Mertz, MD,* and Joseph C. Cerny, MD*

There were 116 renal transplants performed on 108 patients over a five-year period at Henry Ford Hospital with three major urological complications. The rate of 2.6% compares favorably with that reported in other series. Careful preoperative urological evaluation together with technically precise ureteroneocystostomy are factors that minimize the incidence of urological complications.

Graft survival after renal transplantation depends upon the vascular and urinary anastomosis as well as control of graft rejection. Numerous factors contribute to good results in transplantation, among which are immediate function of the homograft, high degree of histocompatibility, the avoidance of excessive immunosuppression, and minimal wound and urological complications.

There have been several reports of urological complications following renal transplantation (See Table). Complication rates as high as 25.7% have been reported with ureteropyelostomy, while the rates for ureteroneocystostomy range from 15% to less than 1%. In our review of 116 renal transplants we found three urological complications (2.6%). This rate compares favorably with that reported in earlier series and underscores the importance of the urologist in the work-up and management of the transplant recipient.

Materials and Methods

From 1972 to 1977, 116 renal transplant operations were performed on 108 patients at Henry Ford Hospital. Six patients received two kidneys, and one patient received three. There were 102 cadaver and 14 living-related donor transplants. Ninety-six of the 108 patients in this series had a preoperative urological evaluation. Each had a careful urological history, physical examination, cystoscopy, cystometry, delayed cystography, bilateral retrograde pyelography, and if indicated, voiding or retrograde urethrograms.

In all cases ureteroneocystostomy was used for the primary urinary anastomosis following the modified Leadbetter-Politans technique (Figure 1). In males, the ureter is brought deep to the spermatic cord, and in all patients redundant ureter is excised. A 2-3 cm submucosal tunnel is created, and patency of the anastomosis is insured by retrograde passage of an 8 FR catheter. The cystostomy is closed in a three-layer, watertight fashion (Figure 2).
Ureteroneocystostomy using modified Leadbetter-Politano Technique. A. Establishing entrance site of transplanted ureter. B. and C. Developing submucosal tunnel and placing traction suture to pull ureter from outside bladder through tunnel in one motion. D. Ureter is then spatulated and anchored in place with 4-0 absorbable suture. E. Puncture wound at top of the tunnel is closed.
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Postoperative management requires bladder drainage through a 22 FR urethral foley catheter for 3-5 days after transplantation. Strict attention is paid to catheter care and patency.

Results

In 96 patients, 25 urinary tract abnormalities were discovered prior to transplantation. These were neurogenic bladder (10), obstructive prostatic hyperplasia (4), urethral stricture (3), polycystic renal disease (3), branch renal calculi (2), renal hypertension (2), and a renal mass found to be a benign cyst (1). Pretransplant treatment in this group of patients consisted of transurethral prostatectomies in four patients, urethral stricture dilatation to 24 FR in three patients, and bilateral nephrectomy in those with polycystic renal disease, branched renal calculi, and renal hypertension.

Major urological complications occurred in three cases (2.6%) after renal transplantation, all related to renal pelvic and ureteral dilatation and deteriorating renal function. Two of three patients had had a normal pretransplant urological evaluation. At surgical exploration in each case the collecting systems were drained by ureteral catheters or internal stents, but renal function did not improve. All three cases eventually had transplant nephrectomy. No deaths were related to these urological complications.

Fig. 2
Three-layer bladder closure using 4-0 absorbable suture for the mucosa (A) followed by an inverting layer (B) and (C). Reinforcing sutures (D) of 0 or 2-0 suture approximate perivesical tissue in order to bury deeper layers.

POSTOPERATIVE COMPLICATIONS OF URETERONEOCYSTOSTOMY AS THE PRIMARY URINARY ANASTOMOSIS IN RENAL TRANSPLANTATION

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*Includes extravasation, fistula, obstruction, ureteral slough.
†Occurring as a direct result related to urologic complications.
Case Reports

Case 1
A 37-year-old man received a cadaver kidney in November, 1974 and was treated for several rejection episodes until March, 1977, when he became azotemic and had a pyelogram consistent with ureteral dilatation. A retrograde pyelogram (Figure 3) demonstrated no ureteral obstruction, but the kidney was explored, and ureterolysis, ureteroneocystostomy, and renal biopsy were performed. The biopsy indicated chronic rejection. The ureter was stented, but postoperatively renal function continued to deteriorate. The ureteral stent was removed on the 14th postoperative day, and the patient developed a urinary fistula. Nephrectomy was performed, and the specimen demonstrated chronic rejection and ureteral necrosis.

Fig. 3. Case 1
IVP (left) demonstrates pyelocaliectasis with poor visualization of the ureter. Retrograde pyelogram (right) outlines ureter and renal pelvis.

Case 2
A 27-year-old woman received a cadaver kidney in January, 1976 and did well until July, 1977 when her serum creatinine levels rose from 1.4 to 3.3 mg/dl. Ultrasound of the renal graft (Figure 4) was consistent with dilatation of the renal pelvis and calyceal system. Attempts at retrograde pyelography were unsuccessful due to stenosis at the ureteral vesical junction. A transvesical ureteral meatotomy was performed, and the ureter was left intubated. There was no intraoperative evidence of hydronephrosis, and renal function did not improve with the ureteral stent in place. The stent was removed two weeks later. A percutaneous renal biopsy later demonstrated chronic rejection. The kidney was subsequently removed.
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Case 3

A 25-year-old man received a cadaver renal allograft in July, 1972. The pretransplant evaluation demonstrated a sensory paralytic bladder. The graft functioned, and over a one-year period the patient was treated for three rejection episodes until August, 1973 when his serum creatinine reached 7.4mg%, and IVP demonstrated hydronephrosis (Figure 5). Exploration of the kidney was performed. Through a pyelotomy incision an 8 FR ureteral catheter passed easily through the ureter into the urinary bladder and was left as an internal stent. Renal biopsy performed at exploration indicated chronic rejection. Postoperatively, renal function did not improve with creatinine levels steady between 7 and 8 mg/dl. The ureteral stent was removed on the 15th postoperative day. The patient resumed hemodialysis 27 months later and had a nephrectomy and a second transplant in March, 1976.

Discussion

Urological complications far outnumber other surgical complications associated with renal transplantation. Up to 12% of all transplanted kidneys do not perform adequately because of urological problems involving the transplanted kidney and ureter. Ureteral obstruction due to kinking, torsion, ureteral necrosis or fibrosis, and stricture at the anastomosis are the most frequently seen complications. Obstruction due to adjacent abscess, lymphocele, and spermatic cord compression are less common. Vascular insufficiency and ureteral necrosis are the most common causes of ureteral fistula. Bladder dehiscence and vesical fistulas can be prevented if care is taken during surgery to avoid previous bladder incisions and perform a watertight bladder closure. Other complications included calyceal renal fistula, spontaneous renal rupture, scrotal hydrocele, testicular atrophy, epididymitis, and scrotal edema.

A very important factor in reducing the incidence of bladder leaks and fistulas is the preoperative assessment of bladder function. Elimination of bladder outlet obstruction or the recognition and treatment of neurogenic bladders that cause high intravesical pressure will help avoid these complications. Likewise, sensory paralytic bladders that are prone to overdistention should be placed on timed voiding schedules.
to insure integrity of the ureteroneocystostomy and bladder closure. Catheter patency must be maintained in the immediate postoperative period to avoid undue stress on the cystostomy closure and to prevent bladder dehiscence.\(^6\)

Problems with the transplanted ureter can be reduced by careful harvesting and technical precision at the urinary anastomosis. In ureteral harvesting it is essential that maximal ureteral length and blood supply be preserved in order to avoid a "too short" ureter and the need to change to a less reliable method of urinary anastomosis. An extensive review of ureteropyelostomy and ureteroneocystostomy by Barker et al.\(^2\) demonstrates a higher incidence of complications, graft loss, and patient death with ureteropyelostomy as the primary urinary anastomosis.

The complications encountered in this series involved deteriorating renal function and the urological finding of ureteral dilatation or hydroureteronephrosis. In each case surgery to relieve obstruction did not result in improved renal function. Graft rejection was the primary cause of azotemia in these patients, which raises the question of the functional significance of the hydroureteronephrosis. The delay in development of hydroureteronephrosis suggests that it was caused by ureteral rejection and fibrosis as opposed to initial technical errors during transplantation. Histopathologically, the renal pelvis and ureters demonstrate both acute and chronic inflammatory changes consistent with and similar to rejecting renal cortical tissue.

References