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Native pyeloureterostomy after kidney transplantation: experience in 48 cases

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Abstract Necrosis and stenosis of the ureter are severe complications after kidney transplantation and occur with mean incidence of 2,9–13,4%. Several surgical techniques like simple nephrostomy or complex urinary tract reconstruction have been applied for repair. In this study, our experience with native pyeloureterostomy (NPUS) using the native ureter is presented. Between March 1978 and June 1996, 2592 kidney transplantations were performed in our institution. In 48 patients (1,9%), secondary urinary tract reconstruction by NPUS was necessary. These patients were evaluated retrospectively by review of the case notes. At the time of operation the mean age was 45 ± 14 years. Indications for NPUS were distal ureteral stenosis ($n = 29$), necrosis ($n = 17$), bleeding ($n = 1$) or iatrogenic lesion of the ureter ($n = 1$). The mean time period between transplantation and urinary tract reconstruction was 20 ± 23 days (range: 1–90 days) for necrosis and 404 ± 637 days (range:

14–2385 days) for stenosis. A pyeloureterostomy was technically feasible in all patients using the recipient's ipsilateral ureter. In 40 out of 48 patients the graft developed a normal function postoperatively (follow up: 39 ± 48 months). A graft nephrectomy was necessary only in one patient, because of complete pyelonecrosis 6 days after NPUS. Two grafts were lost due to acute rejection. Data of five patients were not available > 15 years after successful reconstruction. We can conclude that NPUS is a safe and simple rescue technique for the treatment of distal ureteral complications after kidney transplantation. Therefore, this technique should be the therapy of choice when secondary reconstruction by re-ureteroneocystostomy is not possible.

Key words Kidney transplantation · Ureteral complications · Pyeloureterostomy

Abbreviations NPUS · Native Pyeloureterostomy

Introduction

Kidney transplantation is a well standardized method of treating patients with end-stage renal failure. Anastomosis of the donor ureter to the recipient's bladder (ureteroneocystostomy), employing either an internal or external approach, is the method of choice for ureteral reconstruction. Ureteral complications after renal transplantation have been reported in 2,9–13,4% of renal transplants [12, 15, 21, 22, 29]. Early complications

(< 3 months after transplantation) are mainly urine fistula or ureter necrosis. Late ureteral problems (> 3 months after transplantation) are mostly results of ischemic alterations of the ureter. Poor harvesting techniques and gradual ischemia resulting from chronic rejection of the ureter vascular endothelium are common reasons for pathological changes. Both events result in long segmented ureteral stenosis and consecutive obstruction. Especially in grafted patients under immunosuppressive therapy, early complications may induce wound

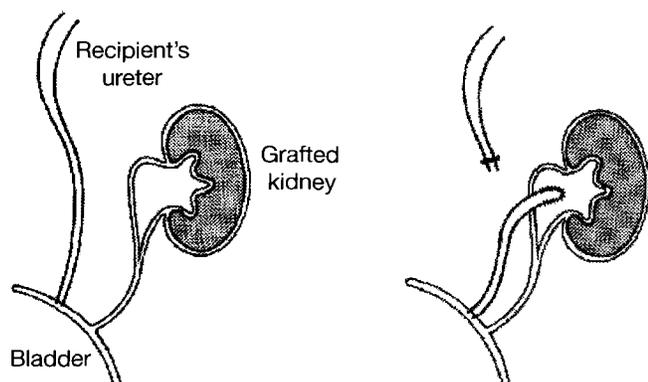


Fig. 1 Surgical technique of secondary pyeloureterostomy

infection, septicemia and death. Immediate surgical intervention is recommended to save graft and patient. If the reimplantation of the donor ureter is not feasible due to insufficient length or stenosis of the distal ureter, different techniques can be used. We are reporting our experience with 48 native pyeloureterostomies (NPUS) done by using the recipient's ureter for reconstruction of the urinary tract. This single center retrospective analysis gives an overview of indications and results of this procedure.

Materials and methods

Data analyzed

Between March 1978 and June 1996, 2592 kidney transplantations were performed at the Medizinische Hochschule Hannover, Germany. All patients underwent extravesical tunnelled ureteroneocystostomy Lich-Gregoir [18] at the time of grafting. Following transplantation, 48 patients (33 male, 15 female; 1.85% of all renal transplant patients) underwent NPUS to treat either obstruction or necrosis of donor ureter and/or renal pelvis. Posttransplant data were collected retrospectively. Median follow up after transplantation was 33 (5–177) months, 30 (3–147) months after NPUS.

Statistical analysis

Statistical significance between groups was determined with the Levine \times s test for equality of variances ($P = 0.05$).

Surgical technique

The native ureter was identified through an intraperitoneal approach. The recipient's ureter was mobilized carefully, leaving its blood supply intact. The ureter was divided at a length to allow anastomosis to the pelvis of the grafted kidney without tension. Proximal native ureter was ligated. The ureter was incized longitudinally over 1.5–2 cm, and a corresponding incision was cut into the graft pelvis. Pyeloureterostomy was done using a continuous suture line (Fig. 1), in most cases side-to-end, rarely end-to-end.

Drainage of the operation site was obligate. Until 1990, a nephrostomy catheter was inserted and an ureteral splint was placed into the recipient's ureter. After removal of the ureteral splint 2–3 weeks later, anastomosis was controlled by antegrade pyelography. After 1990, only a 7 French 16 cm double pigtail catheter was inserted intraoperatively and removed via cystoscopy approximately 3 weeks after the operation.

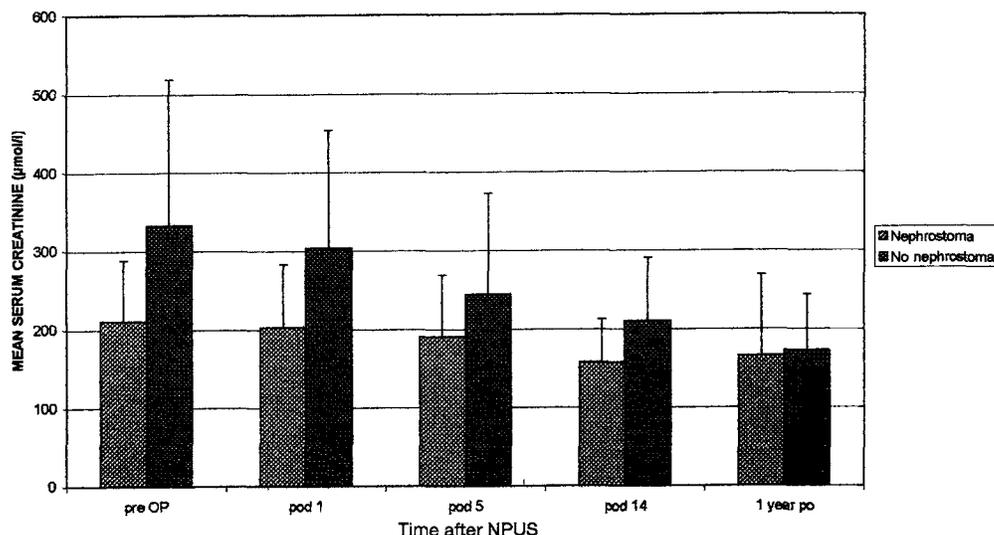
Results

The mean age of the patients at time of NPUS was 45 ± 14 years. Indications for operation were ureteral stenosis ($n = 29$), necrosis ($n = 17$), ureteral bleeding ($n = 1$), or iatrogenic injury of the donor ureter ($n = 1$). The mean time between transplantation and NPUS was 20 ± 23 days for necrosis and 404 ± 637 days for stenosis.

In cases of ureteral necrosis, various symptoms were present. All patients with ureteral necrosis were treated as soon as the diagnosis was established. In one patient a percutaneous nephrostomy was installed preoperatively. Leading symptoms for ureteral stenosis were development of obstruction after transplantation and increasing serum-creatinine. Twenty patients with ureteral stenosis first underwent percutaneous nephrostomy to relieve obstruction, and then NPUS was performed. Nine patients were treated by NPUS immediately after ureteral obstruction was diagnosed. Serum creatinine levels were the same one year after NPUS in both groups (Fig. 2).

One urine phlegmona with consecutive septicemia was treated by repeated wound lavage. After definitive closure of the abdominal cavity, this patient died of cardiac complications with good graft function. In one case, iatrogenic injury of the ureter during transplantation lead to pyelonecrosis with urine fistula and consecutive graft nephrectomy. Leakage of pyeloureteral anastomosis in four patients was treated in two cases with reoperation and revision of the anastomosis. One patient had a pigtail dislocation into the urinary bladder, so that a new pigtail had to be inserted. One urine fistula after removal of the pigtail was treated successfully by another retrogradely inserted pigtail for 5 weeks.

Stenosis of the native ureter occurred in two patients. Once, the distally obstructed ureter could be shortened and a native ureteroneocystostomy was performed via standard techniques. One patient with native ureteral stenosis had to be treated with a permanent percutaneous nephrostomy. Graft nephrectomy was necessary in three patients within 3 months after NPUS because of severe rejection, pyelonecrosis or arterial embolus. Five patients died during the observation period due to reasons not related to the surgical intervention, four of them with good graft function. By the end of June 1996, 28 of 48 patients after NPUS still had a good graft function.

Fig. 2 Serum creatinine levels

Discussion

Reconstruction of the urinary tract after renal transplantation is possible by several procedures. A transvesical (internal) or an external ureteroneocystostomy are the most common surgical procedures [29, 32]. The complication rate for this technique was reported to range from 2.9–9% [4, 9, 10, 25] and can lead to infection, urine fistula and, last but not least, to graft loss. The main causes of ureteral problems are poor graft harvesting techniques with destruction of a lower pole artery, stripping of the ureter or surgical problems at the time of implantation. Unfortunately, the incidence of ureteral complications is more or less stable over the years, although this fact is well known and explant surgeons do their best to improve their explant procedures. High dose steroid therapy [30] and chronic rejection [13] are mentioned as further risk factors. Primary ureteral stenting can be a helpful tool, although ureteral problems can also occur in stented patients [7]. If graft dysfunction after transplantation occurs and graft rejection can be excluded the diagnosis can usually be matched by ultrasound and nuclear isotope scanning [5, 24].

A main complication in the early phase after kidney transplantation is a leakage of the ureterocystostomy. Although non-operative procedures have been described [3], open surgical revision seems to be the most satisfying intervention. In most cases the problem can be solved by redoing or repairing the anastomosis.

Ureteral stenosis of the distal ureter is a frequent late complication in renal transplant patients and increases with the time after grafting [15]. In the first line percutaneous or endoscopic dilation is recommended, success rates are up to 85% [2, 11, 14, 19, 23, 31].

In cases where long segmented stenosis or necrosis of the distal ureter or other conditions require surgical re-

construction of the graft ureter, we prefer native pyelo-ureterostomy (NPUS) using the ipsilateral recipient's ureter to treat ureteral stenosis or necrosis in renal transplant patients. NPUS is a common rescue technique [6, 8, 17, 26, 28]. In ureteral stenosis, the dilated pelvis of the grafted kidney is usually very accessible and minimal mobilisation of the native ureter is sufficient to approximate those two structures for anastomosis. Nevertheless, a ureter-neocystostomy is possible if the stenotic segment is short and the blood supply of the distal graft ureter is intact. In some cases, e.g. if the native ureter is not available due to prior ipsilateral nephrectomy, the Boari flap or psoas hitch procedure can be alternatives to manage very short transplant ureters. A good option to treat complete necrotic ureter and pelvis is to use a vascularized small-bowel patch and the ipsilateral native ureter [33]. Like others, whose data were published recently, [27] the complication rate after NPUS in our clinic was also very low, although we prefer continuous – instead of interrupted suture lines which are described in the original Anderson-Hynes pyeloureterostomy. Because this technique preserves the normal ureteric orifice, retrograde catheterization is possible and a pigtail catheter can be inserted if necessary. For this reason, a reoperation could be avoided in two of our four patients with leakage, by retrograde stenting. Stenosis of native ureter was a rare problem and can be excluded by retrograde ureteropyelography in suspected cases. The role of preoperatively inserted nephrostomy has been discussed controversially [12, 16, 17]. Our data show no significant difference of serum creatinine after one year follow-up between both groups (nephrostomy versus no nephrostomy preoperatively), and we conclude that a nephrostomy can be avoided. The benefit of native nephrectomy performed during secondary ureteropyelostomy is not clear [10]. Our results and [1, 7, 9, 20] long-term follow-

up observations concerning the native kidney after ligation of the proximal native ureter have shown that ligation of the native proximal ureter is not related to increased morbidity [1].

In summary, NPUS is a safe and efficient method of handling ureteral complications after renal transplanta-

tion. The incidence of urinary complications was appropriately low, and we have performed this technique with good results. Although newer endoscopic techniques are improving, [27] we still prefer NPUS to handle ureteral complications safely and definitively after renal transplantation.

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