Ureteral complications in renal transplantation with more than one donor ureter

Axel Haferkamp, Joachim Dörsam, Klaus Möhring, Manfred Wiesel and Gerd Staehler

Department of Urology, University of Heidelberg, Heidelberg, Germany

Abstract

Background. The purpose of this study was to evaluate the ureteral complications of renal transplant recipients with more than one donor ureter.

Methods. Between 1967 and 1997, 19 patients (median age 34 years, range 6–62 years) received renal transplants from donors with more than one ureter. There were 18 donor organs with two ureters, and one patient underwent en bloc renal transplantation with four donor ureters. In nine patients, the ureters were implanted separately at the bladder dome according to the extravesical technique of Witzel, Sampson, Lich and Röhl. In 10 patients, we performed a modification of this extravesical technique according to Nghiem with a side-to-side anastomosis of the ureters before completing the ureteroneocystostomy.

Results. After a median follow-up of 55 months (range 2–218 months), no graft loss due to ureteral complications was noted. One patient died due to myocardial infarction, seven patients returned to dialysis without ureteral complications. There were two patients (one patient after side-to-side ureteral anastomosis, one patient with separate implantation of the two ureters) with ureteral obstruction of one donor ureter. Both patients underwent open surgical revision with temporarly placement of internal ureteral stents.

Conclusions. The presence of multiple ureters from donor kidneys is associated with a higher complication rate in our patient population compared with donor kidneys with one ureter. There was no difference in the long-term outcome between the two implantation techniques used.

Key words: renal transplantation; ureter; ureteroneocystostomy

Introduction

The shortage of donor organs has led transplant surgeons to use all compatible organs harvested, particularly those of young donors and those with anatomical variants such as double ureters [1]. Kidneys from young donors are often used for en bloc renal transplantation. Although there is some evidence that kidneys removed from infants and children are sufficiently mature to support life and that such kidneys will even undergo hypertrophy within adult recipients, most transplant groups are hesitant to use single kidneys removed from paediatric donors for adult recipients. Techniques have therefore been devised for en bloc excision of both kidneys from paediatric donors and double transplantation into adult recipients or larger children [2–4].

Duplication of the ureter is the most common congenital malformation of the upper urinary tract and is therefore seen in renal transplantation, too. It occurred with a frequency of 0.6% in 51 880 autopsy cases reviewed by Campbell [5] and in 1% of 800 kidneys examined by Pollak and colleagues [6].

Ureteral complications represent a significant source of morbidity associated with renal transplantation. The majority of these complications are associated with the ureteroneocystostomy. They consist of ureteral junction obstruction, leakage, ureteral necrosis and ureteral stricture [7,8]. Several ureteral reimplantation procedures have been used to create a ureteroneocystostomy in renal transplantation, for which a quick, safe and reliable technique is highly desirable. Two different techniques are used commonly today in donor organs with single ureters: the transvesical technique originated by Leadbetter—Politano [9] and the extravesical technique following Witzel [10], Sampson [11], Lich [12] and Röhl [13].

Although the presence of more than one ureter of the donor kidney increases the technical difficulties in transplantation, this can hardly be considered a contra-indication to transplantation. Despite the rareness of renal transplantation with more than one donor ureter, different ureteral reimplantation techniques have been described [14–17].

The aim of our study was to evaluate the ureteral complications of renal transplant recipients with more than one donor ureter who underwent two different extravesical ureteroneocystostomy procedures.
Materials and methods

Between 1967 and 1997, we performed 1470 renal transplants. Nineteen of these patients received renal transplants from donors with more than one ureter, including 15 transplantations with double donor ureters and four en bloc renal transplantations. One patient received an en bloc paediatric allograft with four ureters. The patients consisted of nine females and 10 males with a median age of 34 years and a range from 6 to 62 years.

In nine patients, the ureters were implanted separately at the bladder dome according to the extravesical technique of Witzel, Sampson, Lich and Röhl [10–13]. After the bladder was filled with 100 ml of 0.1% cephalosporin solution and the in dwelling Foley catheter was clamped, a 3 cm myotomy was made with the cautery on the anterolateral surface of the bladder. This incision was continued through the seromuscular layer until mucosa bulged through. The muscular edges were undermined, freeing them up for future closure. A 1 cm incision was made in the mucosa at the distal aspect of the incision. The donor ureter was stented with a 7 French internal ureteral stent (B. Braun, Melsungen, Germany) and spatulated. The full thickness of the ureter was anastomosed to the bladder mucosa in a running fashion with 5-zero polypropylene sutures, creating a watertight closure. To avoid ureteral slide, the distal stitch was taken to the edge of both the mucosa and fibres of the detrusor muscle. The seromuscular layer was closed over the ureter with interrupted 4-zero polydioxanone sutures, creating a submucosal tunnel ~3 cm long. The second donor ureter was anastomosed using the same technique with the second myotomy 3 cm laterally (Figure 1).

In 10 patients, we performed a modification of the extravesical ureteroneocystostomy described above. To the best of our knowledge, this modification was first published by Nghiem in 1991 [14]. After bladder filling and clamping of the Foley catheter, both ureters were spatulated posteriorly, inserted with 7 French internal ureteral stents (B. Braun, Melsungen, Germany) and anastomosed together with 5-zero polypropylene sutures, creating a single tunnel. Afterwards, the extravesical procedure following Witzel, Sampson, Lich and Röhl was performed, implanting the end of the single tunnel to the bladder mucosa. (Figure 2). Using this modification, only one myotomy of the seromuscular layer is necessary.

Three renal transplant recipients with double donor ureters were operated on unstented because they were operated on before 1985 when we started to use internal ureteral stents to protect the ureteroneocystostomy.

The operations were performed by 10 different transplant surgeons. Since renal transplantations with more than one donor ureter occurred so rarely, it was the surgeons’ choice as to which technique was used.

After transplantation, the patients’ renal function was followed by transplant sonography, renal scintigraphy, creatinine clearance, and serum creatinine and urea.

Results

The patients had a median follow-up of 55 months, with a range of 2–218 months. One patient died due to myocardial infarction with a functioning graft 2 months after renal transplantation. Seven patients returned to dialysis: one graft was lost because of recurrent acute vascular rejection after a follow-up of 11 months, and two because of chronic rejection after a median follow-up of 73 months. Three patients developed transplant glomerulonephritis after a median follow-up of 57 months. In one patient, the immunosuppressive therapy had to be stopped and the graft was lost because of a severe cytomegalovirus infection after a follow-up of 3 months.

None of these eight patients developed ureteral complications after renal transplantation, neither did the three patients who were operated on unstented before 1985.

During the follow-up, we had no graft loss due to ureteral complications, nor to ureteral necrosis or urinary leakage.

Two patients developed ureteral stenosis of one donor ureter after renal transplantation. These obstructions were verified by pyelocaliectasis in the transplant sonography, obstruction signs in the renal scintigraphy and by increasing serum creatinine and urea. One patient had an ureteroneocystostomy following the modified extravesical technique of Nghiem; one patient had separate implantations of both ureters following the extravesical technique of Witzel, Sampson Lich and Röhl. The patient with the extravesical modification of Nghiem had a donor kidney with the anatomical variant of two donor ureters; the patient with the ureteroneocystostomy following Witzel, Sampson, Lich and Röhl had an en bloc infant kidney trans-
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had two additional arteries; one patient had one additional vein.

Discussion

Renal transplantations of donor organs with more than one ureter are rare, since anatomical variants such as double ureters only occur in ~1% of donor kidneys [5,6], and en bloc paediatric renal transplantations are also rare and are not performed in all transplantation centres. Despite the rarity of these renal transplantations, several ureteral reimplantation procedures for two donor ureters have been described. Following the literature, most authors report separate ureteroneocystostomies of both ureters using the transvesical technique of Politano—Leadbetter [2,15] or the extravesical technique of Witzel, Sampson, Lich and Röhl [2,18]. Modifications of both techniques using a single common tunnel for both ureters are also described [1,14]. To the best of our knowledge, the only report of a modification of the extravesical technique using a single tunnel to avoid a second myotomy is described by Nghiem [14]. Controversy still exists in the literature of renal transplantation with single donor ureters as to which ureteroneocystostomy procedure, the transvesical or the extravesical, has a lower complication rate [8,19]. We do not have experience or results with the transvesical technique since we only performed extravesical techniques.

Merkel and colleagues [18] and Nghiem [15] who performed single ureteral reimplantations using the extravesical procedure in en bloc paediatric renal transplantations reported the development of leakage in 20 and 9%, respectively. They only found urinary leakage, but no obstruction. Our complication rate was similar at 11.1%, but this only involves one patient with obstruction; no urinary leakage occurred. We believe that the complication rate for obstruction in patients with double ureterstremoval.

The overall ureteral complication rate of transplant recipients with more than one donor ureter was 10.5%, for the separate implantation technique it was 11.1% and for the modified technique it was 10.0%. There was no difference in the complication rates between both operation techniques.

Seven of our 19 patients were evaluated postoperatively for vesico-ureteral reflux. The reason for a voiding cystography to evaluate reflux was urinary infection or dysuria. Two patients were found to have vesico-ureteral reflux, one with side-to-side implantation and one with separate ureteral implantation. Since no infection recurred after short-term antibiotic therapy, no further therapeutic option was necessary. All other patients had no infections or symptoms of dysuria and therefore have not been evaluated by voiding cystography.

Four of our 15 patients with anatomical ureteral variants also had anatomical variants of their renal vessels. Three of them had one additional artery, one
can only be compared with that of the original technical report of Nghiem [14]. He performed 20 ureteroneocystostomies using his modified technique and had no ureteral complications in the short-term follow-up. In our series, we found an ureteral obstruction of one of the two donor ureters because of an angulation of this ureter at first entry into the bladder wall after internal ureteral stent removal. We believe that the position of the myotomy for the common tunnel in this modified extravesical technique has to be localized very carefully to avoid ureteral angulation and subsequent obstruction after internal ureteral stent removal.

According to Nghiem [14], the advantages of the single tunnel ureteroneocystostomy are: minimal vesical section, avoidance of a second myotomy incision and a second ureteral reimplantation, shorter operating time and the possibility of using short ureters.

**Conclusion**

The presence of multiple ureters from donor kidneys is associated with a higher complication rate in our patient population compared with donor kidneys with one ureter. We found no difference between the extravesical ureteroneocystostomy procedure following Witzel, Sampson, Lich and Röhl and the modified extravesical ureteroneocystostomy procedure following Nghiem. Because of the avoidance of a second myotomy incision, the shorter operating time, the minimal vesical dissection and the possibility of using short ureters we prefer the modified technique of Nghiem.

**References**

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Received for publication: 31.8.98
Accepted in revised form: 27.1.99