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BRIEF REPORT

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Treatment of transplant ureteral stenosis with Acucise endoureterotomy

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Abstract Treatment of ureteral stenosis has been attempted in many patients with transplanted kidneys. Treatment with the Acucise catheter system is a new approach for such patients. Published results of the approach in eight patients promise safety, effectiveness, and low perioperative morbidity. We report two cases of transplant ureteral stenosis treated with Acucise. One patient with stenosis of the pyeloureteral junction was treated successfully and has been free of recurrence for 9 months. The other patient had long-distance stenosis of the lower portion of the transplant ureter. Acucise incision was successful, but the patient had to undergo ureteroneocystostomy because of a ureteroperitoneal fistula. We use these cases to illustrate the disadvantages of endourological ureteral surgery as a standard therapeutic approach after renal transplantation. We suggest that Acucise is reliable when used in patients with uncomplicated short-distance ureteral stenosis; however, patients with long-distance stenosis or stenosis caused by heavily scarred periureteral tissue will not profit from it because of a higher complication rate.

Key words Ureteral stenosis, Acucise endoureterotomy · Acucise endoureterotomy, ureteral stenosis · Endoureterotomy, ureteral stenosis

Introduction

Ureteral stenosis is the most frequent urological complication of kidney transplantation. It appears in 2%–10% of all renal transplant recipients [1, 3, 9]. Without prompt diagnosis and adequate therapy, it leads to renal failure and graft loss. Although different approaches to endourological ureteral dilation are available, open surgical ureteroneocystostomy remains the standard therapy for distal stenoses.

In 1993, Chandhoke et al. presented a promising new endoscopic technique for the treatment of native ureteral stenosis. They used a combination of dilation and cutting of ureteral tissue in one step in the Acucise catheter system (Applied Medical Systems, Laguna Hill, Calif., USA) [2]. To date, only eight cases have been reported of patients with ureteral stenosis after renal transplantation who were treated with Acucise endoureterotomy [4, 12]. We report here our experience with two patients and give an overview of the state of the art of this system for use in renal transplant recipients.

Methods and patients

Acucise endoureterotomy

Before Acucise endoureterotomywas performed, confirmatory retrograde pyelography was done. In contrast with other groups, we did not stent the ureter before manipulation [6]. Under radiologic guidance, we inserted a nonconducting Terumo guide wire (Fig. 1A). We passed the Acucise catheter over the guide wire and to the stricture. By using a side-arm adapter, we documented the stricture with a retrograde application of contrast medium. The cutting wire was placed in such a way as to save the vessels on the

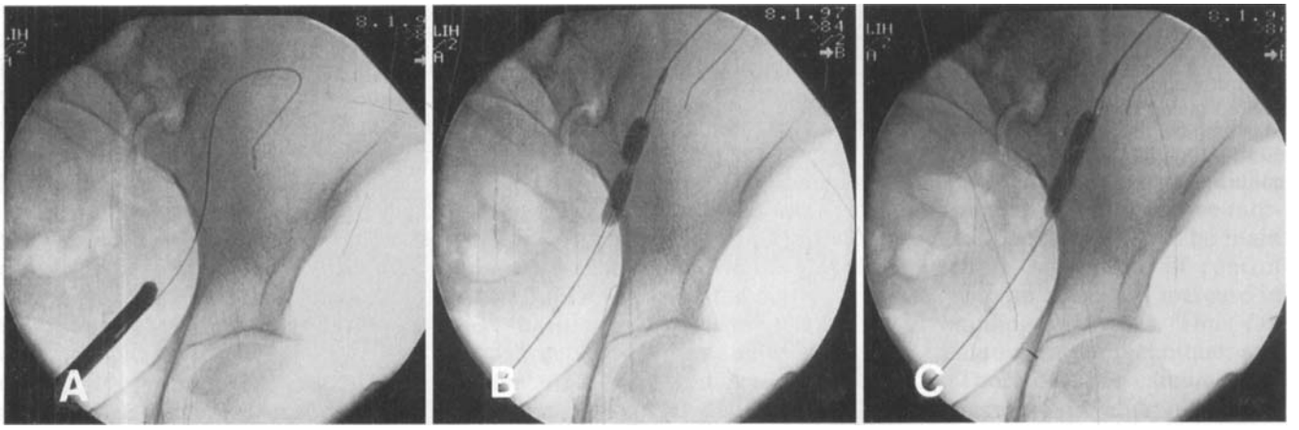

Fig. 1 The Acucise technique: **A** cystoscopic insertion of a guide wire in the transplant ureter under fluoroscopic control; **B** insufflation of 2 cc of contrast medium into the balloon; **C** incision of ureteral stenosis with the cutting wire

opposite side. Then, we placed 2 cc of diluted contrast medium in the balloon and activated the cutting wire with 75 W until we could document the cutting effect under radiological control (2–5 s). We immediately retracted the Acucise device and inserted a 9 Fr double-J (DJ) stent over the Terumo wire. The Terumo wire was then removed. A transurethral catheter was inserted and left in place for 24 h; the DJ stent remained in place for 10 days.

Patient 1

In May 1995, a 54-year-old woman with chronic renal failure due to chronic pyelonephritis received a renal transplant in her left iliac fossa. Ureterocystostomy was performed following the extravesical technique. After 12 months, she presented with an increase in serum creatinine. Sonography showed medium hydronephrosis, and retrograde pyelography confirmed stenosis of the pyeloureteral junction. Dilation was unsuccessful, and open surgical pyeloureterostomy with the native ureter was performed in October 1996. The postoperative course was uneventful. However, after removal of the ureteral stent that had been placed during surgery, hydronephrosis reappeared and serum creatinine increased. Ureteral stenting for 8 weeks had no effect on the stenosis, and a new operative revision was indicated. In January 1997, the ureteral stenosis was incised with the Acucise catheter system. The postoperative course was again uneventful. No significant hematuria was observed. Serum creatinine decreased to the baseline value and remained stable after removal of the stent. Ultrasonography of the transplant kidney showed a substantial decrease in hydronephrosis. The patient's course has been routine for 9 months.

Patient 2

In October 1996, a 26-year-old man with chronic renal failure due to chronic glomerulonephritis received a kidney from a living relative. Ureterocystostomy was performed following the extravesical technique. At first, the postoperative course was without complications. After the removal of the DJ catheter that had been inserted during surgery, serum creatinine increased; sonography showed hydronephrosis of the transplanted kidney. Retrograde pyelography showed severe distal ureteral stenosis, probably caused by necrosis of the distal ureter. Because of a complicated urinary infection, the planned operative treatment was delayed. In the meantime, the transplanted kidney was diverted by percutaneous nephrostomy. In January 1997, the stenosis was dilated using the Acucise catheter system. However, retrograde insertion of the Acucise catheter failed, and antegrade insertion via the nephrostomy was performed. The Acucise catheter could barely pass the stenosis, so controlled placement of the cutting wire was impossible. Dilation of the stenosis was successful, and a 7 Fr DJ catheter was inserted and left in place for 4 weeks. The postoperative course was uneventful. After removal of the ureteral catheter, retrograde pyelography showed a fistula between the ureter and the peritoneum. A new operative revision was indicated and pyeloureterostomy was performed in March 1997 with the patient's native ureter. The patient has had a complete convalescence and satisfactory transplant function for 6 months.

Discussion

Urological complications produce substantial morbidity after renal transplantation and can cause acute or chronic failure of transplant function and graft loss. The most frequent complications are ureteral obstruction, urine leakage, hematuria, and necrosis of the distal ureter. Stenosis of the pyeloureteral junction or the vesicoureteral anastomosis occurs in 2%–10% of cases [1, 3, 9]. Prompt diagnosis and effective therapy are mandatory if the risk of graft loss is to be reduced.

Ureteral stenosis soon after transplantation commonly results from ischemia of the distal transplant ureter caused by restricted vascularization. This leads to fibrosis of the ureteral intima. But vascularization of the upper or middle part of the ureter can also be affected by severe denudation of the transplant ureter during preparation for the operation. Periureteral fibrosis in the area of surgical dissection is the reason stenosis occurs in patients with long-term graft function [6] and late ureteral obstruction. The technique used for vesicoureteral anastomosis is closely related to the inci-

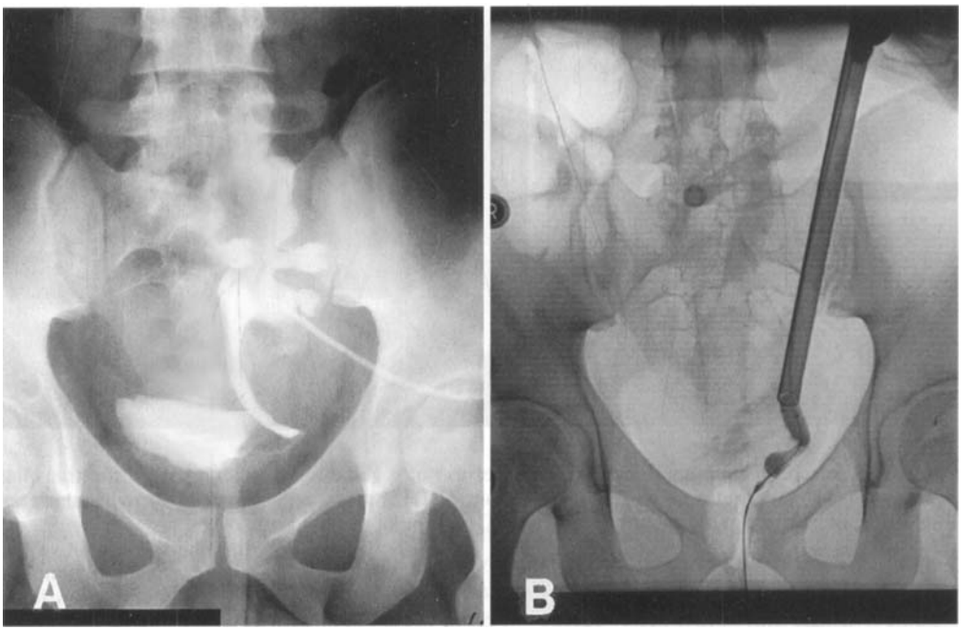

Fig. 2 **A** Antegrade pyelography showing a long-distance distal ureteral stenosis after renal transplantation. **B** The stenosis makes it barely impossible to insert the Acucise urethrotome, neither in retrograde nor in antegrade direction

dence of ureteral stenosis. The incidence is decreased by using extravesical techniques for ureteroneocystostomy, as opposed to techniques that require intraoperative opening of the bladder [1].

Standard therapy for stenosis of the transplant ureter is open surgical ureteroneocystostomy or pyeloureterostomy with the patient's native ureter. These methods are associated with a high incidence of early perioperative complications, from wound infections and urinary tract infections to septic shock syndrome.

Endoscopic surgery involving the ureter in patients who have not received transplants has improved in recent years, and the techniques used offer a promising alternative for the treatment of ureteral complications after renal transplantation [7]. Various endourological approaches to ureteral stenosis are possible. The simplest is percutaneous antegrade or retrograde balloon dilation of the ureter and postoperative stenting. Peregrin et al. reported successful dilation in 96% of 23 patients, but long-term success in only 50% [9]. Similar results have been reported by others [5, 8, 10, 11]. The main disadvantage of this method is the uncontrolled destruction of ureteral and periureteral tissue by the dilation.

Another endourological technique was reported by Conrad et al. [3]. They performed percutaneous antegrade or retrograde cold-knife incision in 11 patients who had transplant ureteral stenosis. During a mean observation time of 26 months, recurrence of the stenosis was observed in only one patient. The long-term success rate was 82%. The most frequent problem was prolonged, severe, postoperative bleeding, which in one case led to removal of the transplanted kidney. In our opinion, that problem is caused by the impossibility of using coagulation or alternatives to produce sufficient hemostasis with the technique.

Recently, an innovative technique of endourological therapy for stenosis of the ureter was introduced. Use of the Acucise catheter allows the surgeon to dilate and cut the region of interest in one step under flouroscopic control [2]. The Acucise catheter combines an electrocautery cutting wire with a balloon catheter. Its use permits controlled incision and dilation of the stenosis and sufficient hemostasis with electrocoagulation. An overall long-term success rate of 73% has been obtained in the treatment of stenosis of the native ureter.

Youssef et al. reported the first experience with the technique in three patients who had transplant ureteral obstruction. The operations were successful in all of the patients, but no follow-up data were reported [12]. Erturk et al. reported on five patients whose transplant ureteral stenosis was treated with the Acucise technique [4]. The intervention was successful in all five and there were no perioperative complications. However, one patient suffered chronic rejection and eventually lost his graft despite further successful dilation of the transplant ureter. Mean follow-up was 9 months.

We treated stenosis of the transplant ureter in two patients with the Acucise catheter technique. In patient 1, we used the retrograde technique to treat stenosis of the pyeloureteral junction; stenosis was relieved without any complications and there has been no recurrence after 9 months. In patient 2, retrograde insertion of the Acucise catheter failed, although the guide wire was

successfully inserted through the obstructed section of the distal ureter. The stenosis was then dilated, at first in an antegrade direction via a percutaneous nephrostomy. After the postoperative removal of the ureteral stent, antegrade pyelography showed a ureteroperitoneal fistula, so open surgical ureteroneocystostomy had to be performed.

The two cases illustrate the problems associated with the Acucise technique. Only a ureteral stenosis that readily allows passage of at least a 7 Fr catheter can be treated. Furthermore, elasticity of the cut and dilated ureteral tissue are necessary. If the tissue lacks elasticity, dilation will be insufficient and the wire will cut too deeply. The structures surrounding the ureter are also affected by the procedure. This is especially important in the case of a scarred stenosis over a longer distance, such as after ischemia of the lower end of the transplant ureter, as in patient 2.

In conclusion, the Acucise technique is useful for treating ureteral stenosis after renal transplantation. However, as is true of other methods described previously, its success rate depends on careful patient selection. It can avoid open surgical intervention in patients whose disease has caused increased perioperative morbidity, and hospitalization can be shortened. The main disadvantage of the technique is the lack of control over the cutting of tissue, with an attendant increase in the risk of injuring surrounding structures. Thus far, few patients have been treated with the technique, and follow-up data are sparse. Therefore, one cannot make any definitive statements regarding its value; further investigation is required.

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