Endoscopic Treatment of Benign Ureteral Strictures

Bannakij Lojanapiwat, Surithorn Soonthopun and Supot Wudhikarn, Division of-Urology, Department of Surgery, Chiangmai University, Chiangmai, Thailand.

BACKGROUND: The traditional choice of procedure for treatment of ureteral stricture is open surgical repair. Advances in endourology have provided the urological surgeon with an alternative to open surgery for the treatment of benign ureteral stricture.

METHODS: Twenty-seven benign ureteral strictures in 24 patients were treated by the endourological method. Twelve endoureterotomies were performed using a cold knife via a 9.5Fr Storz ureteroscope and 15 high pressure balloon dilations were performed. The ureters were stented with 7 Fr double-J stents for 6 weeks.

RESULTS: The success rate was 9/12 (75%) in the endoureterotomy group and 9/15 (60%) in the balloon dilation group after follow-up for more than 6 months.

CONCLUSIONS: Endoscopic treatment of ureteral strictures appeared to be a safe and reasonably effective modality for the treatment of ureteral strictures, especially for the short type that are non-ischaemic in origin and not associated with radiation therapy. Endourological treatment of ureteral strictures is the procedure of choice for initial management of benign ureteral strictures and has high success rates and fewer complications. (Asian J Surg 2002;25(2):130–3)

INTRODUCTION

In 1979, Gruntzig and Kompe introduced balloon catheters for the treatment of coronary obstruction. The balloon dilation technique, used for angioplasty, was extended and popularized for the treatment of ureteral strictures. In 1983, Banner et al reported 27 ureteral strictures treated with balloon dilation. Also in 1983, Wickham first reported the endoscopic treatment of ureteral obstruction at the ureteropelvic junction. The Wickham technique was extended for endoscopic treatment of strictures along the entire length of the ureter with an indwelling stent (endoureterotomy) using the principle of Davis-tube intubation.

PATIENTS AND METHODS

Patients

Twenty-seven benign ureteral strictures in 24 patients (12 men and 12 women) were treated by the endourological method. Two groups were studied. In group I, the ureteral strictures were treated with endoureterotomies (n = 12) using a cold knife via a 9.5 Fr Storz ureteroscope (Karl Storz, Culver City, California, USA). In group II, the strictures were treated with high-pressure balloon dilation (n = 15).

In the 12 patients in Group I who presented with 12 of 27 strictures, the mean age was 51 years (range, 36–78 years). The causes of these strictures were previous ureterolithotomy (two patients), previous ureteroscopy (two patients), previous passing of stones (four patients), previous radiation treatment (one patient) and the coexistence of ureteric calculi (three patients) (Table 1). The diagnosis of strictures was made after the occurrence of flank pain (six patients), after investigation of urinary tract infection (two patients), after routine follow-up after ureteroscopy (two patients)
and after investigation of azotemia (two patients). The location of strictures was the upper ureter (one patient), the middle ureter (two patients) and the lower ureter (nine patients).

Twelve patients in Group II presented with 15 of 27 strictures (three had bilateral strictures). The mean age was 48 years (range, 32–70 years). The causes of these strictures were previous ureterolithotomy (six patients), previous passing of stones (five patients) and previous radiation therapy (one patient). The diagnosis of stricture was made after investigation of urinary tract infection (three patients) and after the occurrence of flank pain (nine patients). There were 6 upper ureteral strictures, 1 middle, and 8 lower ureteral.

**METHODS**

All strictures were approached in a retrograde manner after anaesthesia.

**Group I**

Ureteroscopy was performed. The stricture was identified and the safety guide wire put in place. The depth of the incision in the strictures was through the full thickness of the ureter until the periureteral fat was visualized. The incision was extended for 1 cm above and below the strictered area.

The orientation of the incision depended on the site of the stricture. For the distal and middle ureter, below the iliac vessel, the incision was made anteromedially. For the upper and middle ureter, above the iliac vessels, posterolateral incisions were made.

**Group II**

Cystoscopy was performed. Under fluoroscopic control, the guide wire was passed retrogradely through the stricture, and a balloon catheter (Microvasive, Boston Scientific) was inserted. The balloon was then inflated to a maximum diameter of 1 cm for 10 minutes and immediate success was defined as the absence of the “waisting” at the stricture site.

All of the strictures of both groups were drained postoperatively with 7 Fr indwelling double-J ureteral stents. The stents were removed 6 weeks postoperatively.

**RESULTS**

The mean procedural time in group I was 65 minutes (range, 40–100 minutes). The median length of hospital stay was 1.6 days (range, 1–4 days) (Table 2). Bleeding was the only post-operative complication (1 patient) which subsided within 3 days postoperatively. The mean duration of procedure in group II was 40 minutes (range, 25–60 minutes). All the patients stayed in the hospital for 1 day. No complications were seen. All the patients were monitored for more than 6 months. The mean follow-up time for group I was 15.3 months (range, 14–18 months) and mean follow-up time for group II was 9.7 months (range, 7–18 months).

<table>
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<tr>
<th>Table 1. Characteristics of patients</th>
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<td>Group I</td>
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<tr>
<td>Patients (No.)</td>
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<td>Age (range)</td>
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<td>Gender ratio (M:F)</td>
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<td>Cause of stricture</td>
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<tr>
<td>Previous ureterolithotomy</td>
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<td>Previous ureteroscopy</td>
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<td>Previous passing of stone</td>
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<td>Previous radiation treatment</td>
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<td>Co-existence of UC</td>
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UC = ureteric calculi.

Success was defined as symptomatic improvement and radiographic resolution of obstruction by intravenous pyelogram or retrograde pyelogram at 1, 3 and 6 months postoperatively, then every 6 months. (Figure I A, B). The long term success rate was 75% (9/12 strictures) in group I, and 60% (9/15 strictures) in group II.

The mean length of stricture in patients who had a recurrence (1.5 cm, range 0.5–3 cm) was longer than in those who had no recurrence (0.8 cm, range 0.5–3 cm). Both patients, who had received previous radiation therapy, had a recurrence after treatment.

<table>
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<th>Table 2. Results and complications of treatments</th>
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<td>Group I</td>
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<tr>
<td>Hospital stay (days)</td>
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<td>Complications</td>
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DISCUSSION

The traditional choice of procedure for treatment of ureteral stricture is open surgical repair, including ureteroneocystostomy with or without a psoas hitch, Boari’s flap, primary ureteroureterostomy, transureteroureterostomy, renal descensus, ileal substitution, autotransplantation and nephrectomy.

Recent attention has focused on the endourology for the management of ureteral strictures. Endourological techniques ranging from balloon dilation to endoincision with electrocautery, cold knife and laser have been increasingly used in recent years for the treatment of ureteral strictures.

The choice for selecting an antegrade or a retrograde approach to manage a ureteral stricture depends on the nature of the stricture and the surgeon’s preference. In 1984, Lang and associates described the percutaneous antegrade management of stricture by the introduction of a ureteral stent. Transurethral dilation of ureteral strictures with a ureteral catheter or balloon, introduced via the cystoscope or ureteroscope, is an accepted approach to retrograde management of lower ureteral strictures. Endoscopic ureteral balloon dilation is safe, offers shorter hospitalization and more rapid rehabilitation. In 1983, Wickham reported the endoscopic treatment of ureteral obstruction at the ureteropelvic junction by using a cold knife urethrotome to incise the ureteropelvic junction via a percutaneous nephrostomy tract. David reported successful clinical results in the treatment of ureteral obstruction with incision and stenting of the ureter. If a guide wire can be passed, endoscopic dilation or endoureterotomy and a stent should be used as the initial treatment of a ureteral stricture. The retrograde approach...
is the choice for endoureterotomy for most patients with ureteral strictures because of decreased morbidity, hospitalization and currently available ureteroscopic equipment. The site of the incision depends on the site of stricture. The distal ureter below the iliac vessels is incised medially, strictures above the iliac vessel are incised anteriorly and the upper and middle ureters are incised laterally. Endoureterostomy (endoscopic intraureteral incision) can be performed with a cold knife or electrocautery or laser (Nd YAG, Holmium YAG).\(^5\)\(^-\)\(^9,\)\(^11\) Cold knife incision has the advantage over electrocautery and laser endoureterotomy of avoiding thermal injury to the ureter and surrounding tissues.

The outcome of balloon dilation and endoureterotomy can be stratified according to several parameters such as stricture length, stricture location, renal function, stricture aetiology, method of treatment and also the stent duration. Previous reports of the success of balloon dilation range from 45% to 100% with an overall success rate of 51% and ranged from 62%–95% for endoureterotomy treatment.\(^5\)\(^-\)\(^9,\)\(^12\)\(^-\)\(^14\) Ureteral strictures associated with ischaemia (after radiation) or cancer respond poorly to endoscopic treatment. The success rate also depends on the characteristics of the strictures. Success is more likely with short strictures (≤ 2 cm) and the treatment result of the strictures in the distal ureter is better than that in the middle ureter (78% vs 25%).\(^7\) Recent reports have suggested that ipsilateral kidney function is an important predictor of success. No patient whose renal function was less than 25% of normal had a successful outcome following endoureterotomy. David et al reported that complete muscular regrowth occurs and peristalsis resumes within 6 weeks after ureterotomy.\(^4\) However, we elected to leave the stent in place for this period. The use of a 14 Fr stent provided no advantage over the use of a smaller, more easily positioned 7 Fr stent, and, therefore, we used the 7 Fr in our patients.\(^15\) Twenty-one percent of ureteral strictures may be symptomless. All treatment should be followed by routine imaging studies (intravenous pyelogram, renal scan, retrograde pyelography, ultrasound) to rule out the presence of new asymptomatic hydronephrosis due to ureteral stricture formation.\(^8\)

**Conclusions**

Endoscopic treatment of ureteral strictures appears to be a safe and reasonably effective modality for the treatment of ureteral strictures, especially for short strictures that are nonischaemic in origin and not associated with radiation therapy. Endourological treatment of ureteral strictures is the procedure of choice for initial management of benign ureteral strictures, affording high success rates and fewer complications.

**References**