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ORIGINAL ARTICLE

Percutaneous Catheter Dilatation of Benign Ureteroenteric Anastomotic Strictures Followed or not by Retrograde Transconduit Placement of a Catheter: Long Term Results

Kaskarelis J, Palafouta E, Koukoulaki M, Athanasiou H, Roulias A, Pittaras G, Stefanakis S, Malovrouvas S

Unit of Interventional Radiology, Department of Radiology, Evangelismos General Hospital, Athens, Greece

ABSTRACT

BACKGROUND We report our experience on multiple balloon dilatations for benign ureteroenteric anastomotic strictures after total cystectomy and urinal deviation by ileal conduit, followed or not by retrograde placement of a permanent catheter through the stoma of the ileal conduit.

PATIENTS AND METHODS Patients were classified in two groups: Group A included patients treated only by multiple balloon dilatations and Group B patients in whom multiple dilatations were followed by retrograde insertion of a permanent catheter through the stoma of the ileal conduit, which then had to be replaced regularly. Records of survival and patency rates were recorded.

RESULTS Twenty patients with 24 benign ureteroenteric anastomotic strictures were referred to the radiology department. Long-term results were available in only 15 patients, who were finally included in the study. In Group A long term follow-up was achieved in five patients. Mean primary patency time of stenoses (interval between initial dilatation and recurrence) was 33.2 months. This time-period proved to be the same as the survival time of Group A patients, since all five patients eventually succumbed to the underlying disease or other reasons. In Group B, 6 patients are still alive and 4 patients eventually succumbed to the underlying disease or other reasons. Mean primary patency time of stenoses was 38.1 months.

CONCLUSIONS Balloon dilatations of benign ureteroenteric anastomotic strictures, due to radical cystectomy and urinal deviation by ileal conduit, were technically successful in all cases. Patency rate was comparable in the two study groups. However, regular catheter replacement through the ileal conduit is well tolerated and gives a sense of security to both patient and physician.

KEY WORDS: *Ureter interventional procedures, Ureter stenosis, Ureter obstruction, Ureteroenteric anastomotic strictures, Percutaneous dilatation*

Address for correspondence:
Kaskarelis John,
Ipsilantou Street 45-47,
Athens, 106 76, Greece,
e-mail: kaskarelis1@yahoo.com

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INTRODUCTION

Benign ureteral strictures are most frequently iatrogenic, following pelvic surgery or non-operative management of ureteral lesions. Less common causes are radiation therapy, retroperitoneal fibrosis and congenital abnormalities. Ureteroenteric

anastomotic strictures due to total cystectomy and urinary diversion by ileal conduit or ureterosigmoidostomy are ureteral strictures with special features [1,2]. These strictures are predisposed to numerous complications, including recurrent urinary infection, sepsis, stone formation and progressive loss of renal function that is often clinically silent. Ureteral narrowing or occlusion is a complication that occurs in 4-8% of ureteroenteric anastomosies [1]. Several therapeutic approaches have been proposed for urodynamically significant stenosis of ureteroenteric anastomosies such as surgical incision, endoureterotomy, ureteral stenting and multiple balloon dilatations with or without placement of a catheter [3,4].

Percutaneous transrenal catheter dilatation of benign ureteral strictures was first reported in the '80s [5]. The results were encouraging and constituted the basis for further research [6,7].

In this paper we reviewed our experience with multiple, repetitive balloon dilatations of 24 benign ureteroenteric anastomotic strictures in 20 patients with total cystectomy and urinary diversion by ileal conduit. In some of these cases a permanent catheter was inserted in a retrograde fashion through the stoma of the ileal conduit.

PATIENTS AND METHODS

Twenty-four ureteroenteric anastomotic strictures were dilated with balloon catheters in twenty adult patients (16 males and 4 females) from 1991 to 2002. A review of the clinical and radiological records of each of these patients was performed. All patients had undergone total cystectomy and urinary diversion by ileal conduit for either bladder (n=18) or uterine cervical (n=2) carcinoma. The ureter was diverted to an isolated segment of terminal ileum and a colon conduit was created. Patients with strictures due to progressive neoplasia were excluded. When referred to our department, patients' age ranged from 48 to 78 years (mean age 63.9 years). The mean interval between surgery and treatment of stenosis was 15.2 months (range 3-71 months). The stricture became apparent because of either hydronephrosis or renal impairment, when stenoses were bilateral.

Treatment of uretroenteric anastomotic strictures consisted of multiple dilatations either without (Group A) or with (Group B) placement of a permanent catheter through the stoma of the ileal conduit. Primary success rate of the procedure was 100%.

TECHNICAL ASPECTS OF INTERVENTIONAL PROCEDURES

In all cases the interventional procedure was preceded by ultrasonography or/and CT scanning or/and intravenous urography in order to verify or exclude hydronephrosis and study the area for anatomic abnormalities. Evaluation of coagulation parameters was also performed. Coagulation tests included prothrombin time (PT) and International Normalized Ratio (INR), activated partial thromboplastin time (aPTT), fibrinogen level and platelet count. Abnormal results (PT more than 4 sec above the control level or INR greater than 1, 4 and platelet count less than 150,000/ml) were corrected when necessary with platelet or fresh frozen plasma transfusion or IV vitamin K.

All patients received antibiotic prophylaxis, usually a third generation cephalosporin with or without gentamycin, 1 hour prior to the procedure and for 48 hours after the procedure.

Interventional procedures were performed under sonographic and/or fluoroscopic guidance. Ultrasound guidance was preferred initially for selection of the best route to the collecting system for a percutaneous nephrostomy. Injection of local anaesthetic (2% lidocaine) was given as deeply as possible. Access to the pelvicalyceal system (usually middle or lower calyx) was tried using a modified Seldinger technique under fluoroscopic guidance.

Our technique included the following steps:

a) A Chiba needle (Cook, William Cook Europe, Bjaeverskov, Denmark) was advanced and directed toward the appropriate calyx percutaneously. After removing some urine, contrast media was injected in order to perform an antegrade urography and consequently localize the stricture (Figure 1 & Figure 2).
b) A Cope mandrill wire 0.018 inches (Cook, William Cook Europe, Bjaeverskov, Denmark) was then introduced into the needle, as a guide wire for the placement of an introduction set.
c) A hydrophilic guide wire (Terumo medical corp.) was passed with appropriate manipulations through the stenosis and was looped in the ileal conduit. A multipurpose catheter was advanced over the guide wire up to the stoma of the ileal conduit and was extended outside.
d) The hydrophilic guide wire was then replaced with a stiff guide wire (usually an Amplatz guide wire), which was extended from the site of nephrostomy to the ileal stoma (Figure 3a). Afterwards the balloon catheter was advanced over the guide wire in a retrograde fashion- through the stoma of the ileal conduit-up to the site of the stenosis.
e) The high-pressure balloon (>10 atm) was inflated by diluted contrast agent to its maximum volume for 2 to 3 minutes. At the end of the first dilatation the width of the balloon was 5-6mm or eventually 7-8mm (Figure 3b).
f) The balloon was then removed and an 8Fr catheter [tubes :ULTcatheters (Cook, William Cook Europe, Bjaeverskov, Denmark); Flexima catheters (Medi-tech, Inc., Boston Scientific Corporation, Watertown, MA, USA); Nephrocatheters (Uresil LP, Skokie, IL., USA)] was inserted in a retrograde fashion (Figure 4).
g) The 8Fr catheter was maintained in place for a two-month

FIGURE 1. 62-year- old woman with clinical and radiological signs of hydronephrosis on the left side. 8 months ago the patient underwent surgical maneuvers (radical cystectomy and formation of an ileal conduit diversion) because of uterine cervical carcinoma; kidney incision with percutaneous urography to confirm and localize the ureteral stricture. The ureter is totally obstructed.

FIGURE 2. 76-year-old man with clinical and radiological signs of hydronephrosis on the right side. 24 months ago the patient underwent surgical maneuvers (radical cystectomy and formation of an ileal conduit diversion) because of bladder neoplasm; visualization of the ureteroenteric stenosis by antegrade urography. The ureter is not totally obstructed.

period. Then a second dilatation with a balloon-catheter of 8-10mm was performed and a 10Fr catheter was introduced.

h) Two months later a third dilatation was performed with a balloon of 10-12mm and a 12Fr or 14Fr catheter was introduced. The length of these catheters is 25-35 cm. The optional catheter for each patient depends on his/her height. The end of the catheter in the neocyst is easily found under fluoroscopic guidance.

The procedure was considered successful if there was no further evidence of obstruction on urodynamic and/or urographic studies and simultaneously kidney function parameters returned to normal levels.

RESULTS

Seventy two multiple balloon dilatations of ureteroenteric strictures with or without placement of a permanent catheter were performed in 20 patients during this study period. For five patients (5 strictures) there was lack of follow-up information after the last (third) dilatation and removal of the catheter (Table 1). The remaining 15 patients were divided into two groups according to the different treatment regime.

Group A included patients treated only by multiple balloon dilatations. In Group A follow-up was possible in five patients with five strictures. The catheter was removed ten days after the last dilatation in all patients. Kidney function parameters remained within normal limits. These patients died with patent anastomoses during a follow-up period of an average of 33.2 months (range, 12-66 months). All these deaths were caused by underlying disease or other reasons. In other words, the survival time was the same as the mean time of follow-up (Table 2).

Group B included patients in whom multiple dilatations were followed by retrograde insertion of a permanent catheter through the stoma of the ileal conduit, which then had to be replaced regularly. Ten patients with 14 strictures were included in Group B. After the last dilatation a permanent catheter was inserted and was changed on an outpatient basis every three months (Figure 5). Patients of Group B remained in hospital for a few hours after the scheduled catheter replacement in order for their vital signs to be evaluated. Four patients from this group succumbed eventually either to the underlying

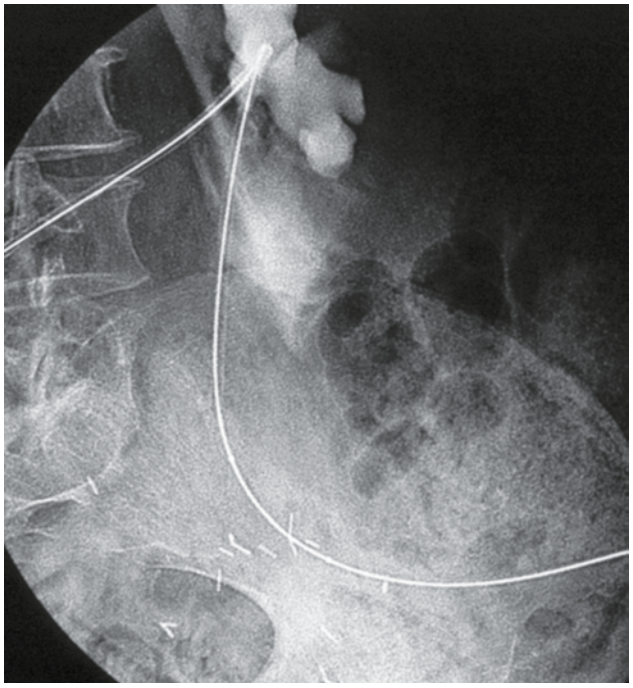

FIGURE 3A. 68-year-old man with clinical and radiological signs of hydronephrosis on the right side. 23 months ago the patient underwent surgical maneuvers (radical cystectomy and formation of an ileal conduit diversion) because of bladder neoplasm; a guide wire extended from the site of the kidney incision outside of the ileal stoma.

FIGURE 3B. Same patient with figure 3a; Balloon dilatation of the stricture in retrograde fashion. The high-pressure balloon (14 atm) had a width of 8mm and was inflated with diluted contrast material to its maximal volume.

disease or other reasons, while kidney function parameters were normal. Six patients are still alive. The average duration of ureter patency in this group was 38.1 months (19-91 months), which is also the average time of follow-up in this group (Table 3).

In every case the stenoses were less than 4cm long and the ureter was totally obstructed in all but two cases. The stenoses were on the right side in 18 cases and on the left side in 6 cases.

No significant complications from the ureteral balloon dilatations and/or retrograde insertion of a nephrostomy catheter were observed in either group. No specific medication was administered except from antibiotic when necessary. Results in terms of patency and renal function were not different between Group A and B.

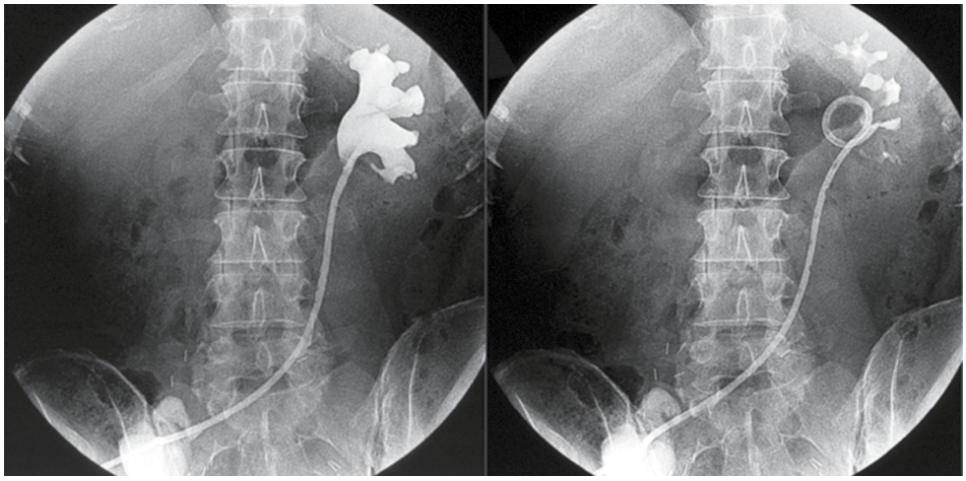

FIGURE 4. 55-year-old man with clinical and radiological signs of hydronephrosis on the left side. 71 months ago the patient underwent surgical maneuvers (radical cystectomy and formation of an ileal conduit diversion) because of bladder neoplasm; placement of an 8 French pigtail catheter in retrograde fashion, through the ileal stoma.

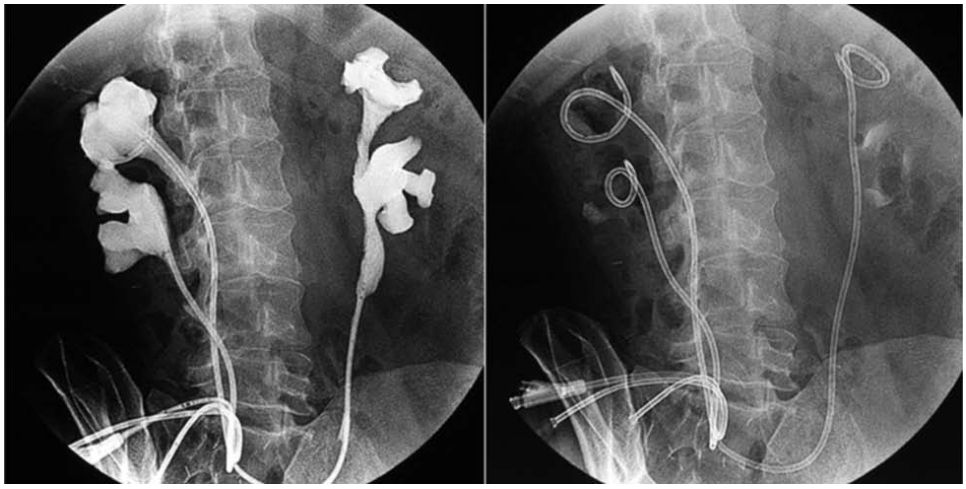

FIGURE 5. 58-year-old man with clinical and radiological signs of hydronephrosis on both sides. 63 months ago the patient underwent surgical maneuvers (radical cystectomy and formation of an ileal conduit diversion) because of bladder neoplasm; placement of three 8 French pigtail catheter in retrograde fashion, through the ileal stoma. The collecting system of the right kidney is duplicated.

TABLE 1. Patients lost to follow up

Sex	Age	Number of strictures per patient	Underlying disease	Radiation	Time elapsed from surgery to dilatation (months)
M	71	1	Bladder neoplasm	No	3
M	67	1	Bladder neoplasm	No	5
F	60	1	Uterine cervical carcinoma	Yes	11
M	48	1	Bladder neoplasm	No	7
M	75	1	Bladder neoplasm	No	9

TABLE 2. Multiple dilatations without placement of a permanent catheter through the stoma of the ileal conduit (Group A)

Sex	Age	Number of strictures per patient	Underlying disease	Radiation	Time elapsed from surgery to dilatation (months)	Follow up (months)	Outcome/end of study
M	56	1	Bladder neoplasm	No	3	12	Died with normal kidney function parameters
M	75	1	Bladder neoplasm	No	12	42	Died with normal kidney function parameters
M	78	1	Bladder neoplasm	No	47	66	Died with normal kidney function parameters
M	76	1	Bladder neoplasm	No	24	30	Died with normal kidney function parameters
F	62	1	Uterine cervical carcinoma	Yes	8	16	Died with normal kidney function parameters

DISCUSSION

The onset of ureterointestinal strictures following urinary diversion occurs in 4-8% of cases and may lead to gradual loss of renal function. Traditionally, the treatment of choice is open ureteral reimplantation [1-4]. However, surgical revision carries a high risk of postoperative morbidity because

TABLE 3. Multiple dilatations with placement of a permanent catheter through the stoma of the ileal conduit (Group B)

Sex	Age	Number of strictures per patient	Underlying disease	Radiation	Time elapsed from surgery to dilatation (months)	Follow up (months)	Outcome/end of study
M	57	1	Bladder neoplasm	No	5	42	Died with normal kidney function parameters
M	50	2	Bladder neoplasm	No	12	91	Still alive
M	55	2	Bladder neoplasm	No	71	37	Died with normal kidney function parameters
M	58	1	Bladder neoplasm	No	6	63	Still alive
F	63	1	Bladder neoplasm	No	19	30	Died with normal kidney function parameters
M	60	1	Bladder neoplasm	No	15	29	Died with normal kidney function parameters
M	72	1	Bladder neoplasm	No	8	29	Still alive
M	68	1	Bladder neoplasm	No	23	21	Still alive
M	66	2	Bladder neoplasm	No	9	20	Still alive
F	59	2	Bladder neoplasm	No	7	19	Still alive

of fibrotic adhensions after previous surgery or impaired tissue healing due to radiation therapy or surgically induced ischemia [1,2].

During the last years nonsurgical techniques, for the treatment of these strictures, have gained increasing interest. Alternative techniques to open surgery have been proposed: nephrostomy, drainage, endourologic incision, percutaneous high-pressure balloon dilatation, permanent ureteral metallic stents and percutaneous incision of strictures with cutting balloon catheter. Unfortunately all of the previous therapeutic approaches have disadvantages.

Endoureterotomy of strictures in uroenteric anastomose has evolved over the past decade. The stenoses are incised with a 5F electrode, followed by balloon dilatation until full expansion of the stenosis. The success rate of endoureterotomy is 73., 51 and 32% at 1, 2 and 3 years, respectively [8,9].

Poulakis et al described the incision of uroenteric anastomose with "cold-knife" [10]. Placement of permanent ureteral metallic stents in uroenteric anastomoses has evolved over the past five years [11]. Palaseak et al reported that ureteroenteric anastomoses had remained patent in all 7 patients at a mean follow-up of 22.4 months after placement of permanent metallic stent [12]. A cutting balloon catheter has been used for incising stenotic uroenteric anastomoses [13,14]. However, regardless of the type of cutting balloon and the guidance (fluoroscopic guidance, endoscopy or both of them) there is always a risk of injury to the vital surrounding structures, such as the nearby blood vessels or intestine [15,16].

Shapiro et al had reported on 37 patients with ureteroenteric strictures, who were treated with balloon dilatations. They were able to follow-up these patients for more than 1 year, some as long as 6 years. While the procedure was technically successful in all cases, many patients developed recurrent strictures by 6 months and the majority by 1 year. Only 6 dilatations have been successful at 1 year. Half of those deemed to be "long-term" successes have required repeat dilatation and stenting over the ensuing 6 years [6].

Chang et al treated seven patients with eight ureteroileal strictures [23]. Although treatment of four strictures was successful, only three of these have been followed up for more than 1 year.

Kramolowsky et al treated ten ureteroileal strictures with semirigid fascial dilators, balloon dilatation, or a combination of balloon dilatation and percutaneous intraureteral electrosurgery [24]. In 5 patients in whom dilatation was performed with semirigid fascial dilators or balloon dilatation, there was early recurrence of their strictures. Even including the group treated with a combination of balloon dilatation and percutaneous intraureteral incision of the stricture, success was limited to two of ten strictures.

The long-term overall success rates of percutaneous dilatations of ureteral strictures with a balloon catheter varies markedly in the literature, ranging from 5-67% [5-7,17-19]. Those patients with ureteroenteric anastomotic strictures

constitute a small percentage of the total population with strictures. In our series (24 strictures in 20 patients) balloon dilatation was successful in all cases. Multiple dilatations of benign ureteroenteric anastomotic strictures were also successful on a long-term basis in all (15 cases) where follow-up was possible (five patients were lost during follow-up). Studies on treatment approaches, such as open surgery, have reported less encouraging results [17,18]. On the other hand, balloon dilatation is recommended by many authors, as a technique useful in managing such complications in order to avoid open surgery [19-22].

Our method of balloon dilatation differs from those previously described. Previous reports involve only multiple dilatations. Accordingly the technique by which a catheter is kept in place and is changed every two months has not been described before in the literature. We believe that by placing internal drainage catheters of progressively increased diameter, we use the catheter as a scaffold which favors and corroborates a stable nonstenotic form of healing. Furthermore, we keep the balloon inflated for a longer duration of time (2-3min) than previously reported. Other studies recommend that pressure should be maintained for 45-60 sec or until no waste is seen fluoroscopically at the site of the stricture [5,8,9].

Results in terms of patency and renal function were not different between Group A and B, but we noticed that regular replacement of the catheter gave a sense of security either to the patient or to the physician. It also gave us the chance to reevaluate the patients on a regular basis. Since the procedure took place on outpatient basis, cost is low and time of hospitalization is not more that a few hours. Due to the technique of changing the catheter in a retrograde fashion through the stoma of the ileal conduit, a percutaneous incision of the kidney was necessary only the first time a dilatation was performed. On subsequent replacements no medication was needed, except from prophylactic antibiotics, when necessary.

CONCLUSIONS

Balloon dilatations of benign ureteroenteric anastomotic strictures were technically successful in all cases in our study. The results of our technique are better than those of other nonsurgical techniques (endourologic incision, permanent ureteral metallic stents, percutaneous incision of strictures with cutting balloon catheter etc) and the procedure is simpler and has a low morbidity rate. Patency rate was comparable in the two study groups (with and without permanent retrograde catheter placement: 38.1 months and 33.2 months respectively). However, regular replacement through the ileal conduit is well tolerated by the patient and gives a sense of security to both the patient and the physician.

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