

# Simplified laparoscopic technique for the treatment of long distal ureteral stenosis

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## Abstract

Laparoscopic interventions with the application of vesico-psoas hitch and Boari flap methods for the reconstruction of pronounced ureter defects require considerable physical skill and competence. This case series aims to present our experience in the treatment of long, distal ureteral stenoses via simplified laparoscopic ureteroneocystostomy in 3 male patients in whom the stenoses ranged from 5 cm to 6 cm. Prior to each laparoscopic intervention, intravenous urography and pyelography via a nephrostomy tube were performed. The mean operation time was 157 min (120–180 min), and blood loss averaged 33 ml (20–50 ml). No intra-operative or post-operative complications were recorded. The post-operative hospital stay was  $\leq 6$  days. Follow-up imaging examinations revealed normal kidney-urinary bladder urine flow in all cases. In conclusion, we consider that simplified ureteral replantation facilitates laparoscopic treatment of long, distal ureteral stenoses.

**Key words:** laparoscopy, ureter, replantation.

## Introduction

Ureterocystoneostomy is the widely accepted treatment method for distal ureteral strictures [1]. Apart from simple anastomoses, the classical open method is useful for performing complex techniques such as vesico-psoas hitch, Boari flap, supplementing the ureteral defect with part of an intestine, or even renal autotransplantation [2]. For achieving comparable functional outcomes in the less invasive laparoscopic surgical method, the application of these techniques requires advanced skills and competence in reconstructive interventions, in particular, for intracavitary sutures [3]. However, gaining experience in reconstructive laparoscopy is fairly difficult due to the limited number of patients who qualify for such pro-

cedures. Simplifying the laparoscopic technique may contribute to popularisation of this method in the treatment of ureteral stenoses.

To present our experience in the treatment of long, distal ureteral segment stenoses via the application of simplified laparoscopic ureteral replantation.

## Case report

### Patients

Three male patients underwent laparoscopic surgical correction of distal left ureteral stenosis with symptomatic hydronephrosis. The demographic and clinical characteristics of the patients are set out in Table I. In 2 of these patients, ureteral stenosis was

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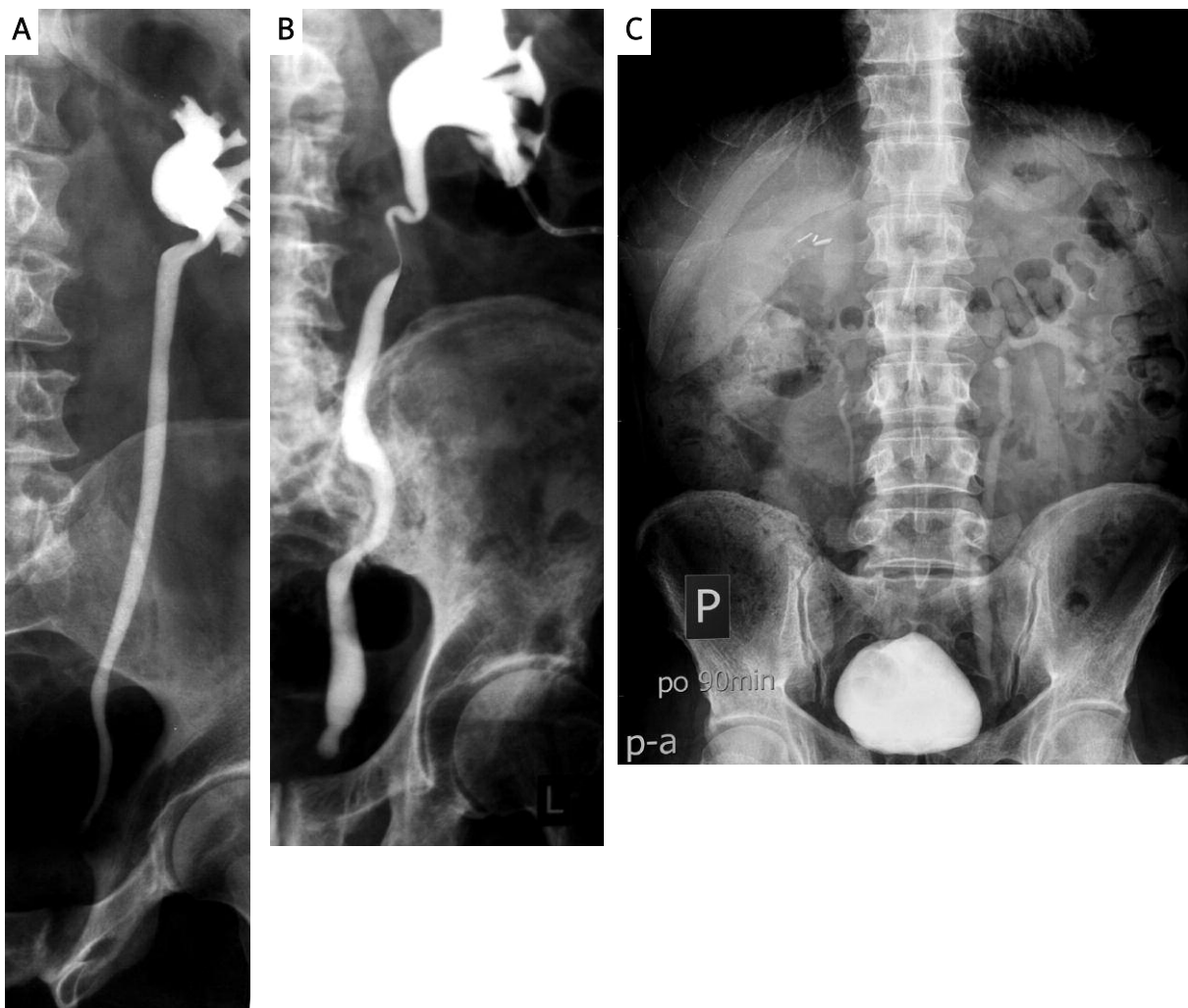
**Table I.** Patient characteristics

Patient	Age [years]	BMI*	Past abdominal cavity surgeries	Primary stage of bladder carcinoma	Length of stenosis [cm]
1	41	30	None	pTaNoMo G I	6
2	73	23	Appendectomy	pT1NoMo G II	6
3	46	24	Cholecystectomy	No cancer	5

\*BMI – body mass index

a result of fibrosis following transurethral resection of non-invasive bladder carcinoma. In the remaining patient, cicatrization occurred following ureteroscopic lithotripsy. The diagnosis of ureteral stenosis was confirmed by urography and pyelography, performed

after implantation of the nephrostomy tube (Photo 1). The lengths of the stenoses were 6 cm, 6 cm, and 5 cm. The 2 patients with an oncological history underwent mapping biopsies of the bladder, which revealed no neoplastic process recurrence.

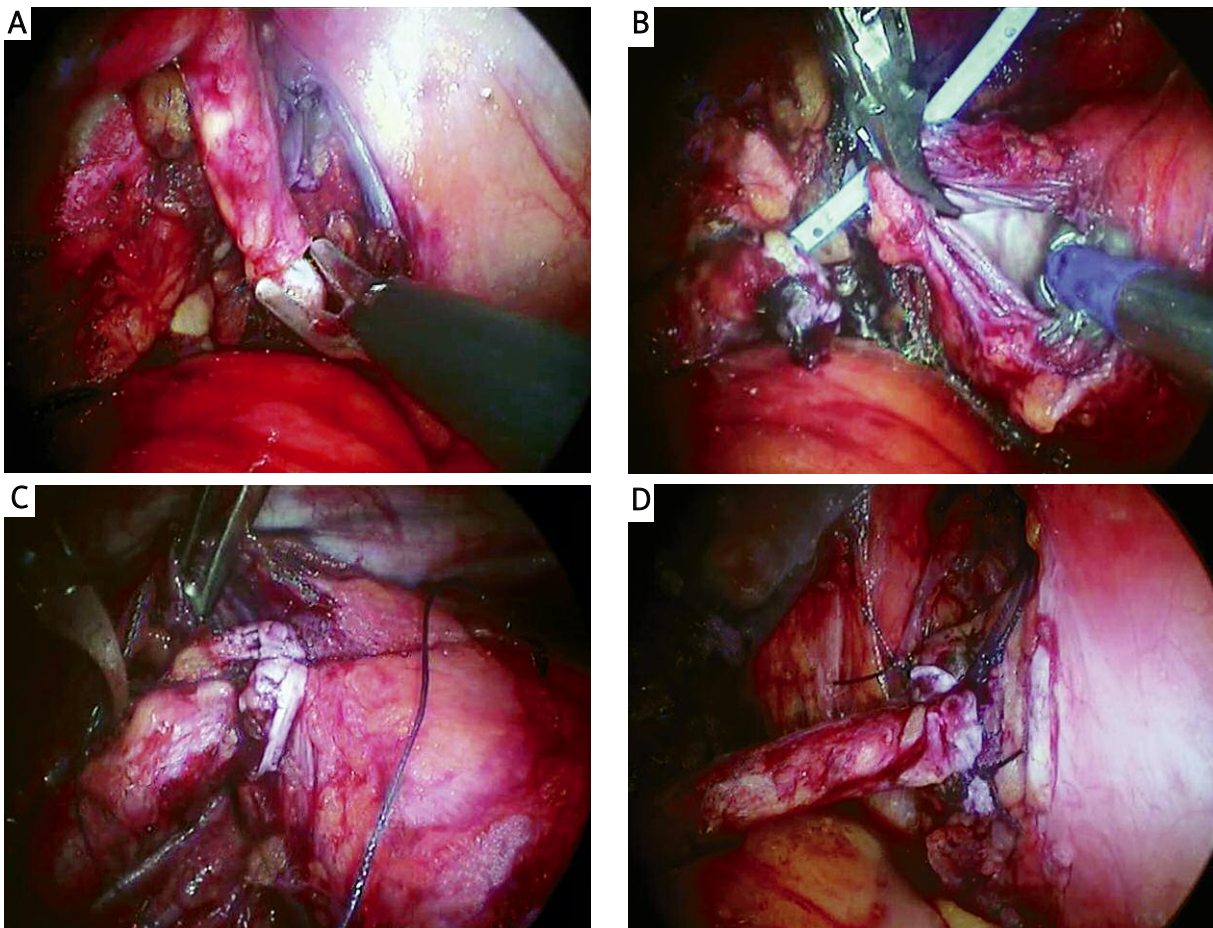


**Photo 1.** Pre-operative pyelography in patients 1 (A), 2 (B), and urography in patient 3 (C)

## Surgical technique

All operations were performed via the trans-peritoneal approach. Following the induction of general anaesthesia and intubation, we performed a cystoscopy. A Foley 18 F catheter was left in the bladder following the examination. The patient was placed in a Trendelenburg position, with the operation site elevated at a 45° angle. A 10-mm camera port was introduced near the umbilicus. Upon CO<sub>2</sub> insufflation up to 12 mm Hg, 3 trocars were placed in the peritoneal cavity as follows: a 10-mm trocar in between the umbilicus and the pubic symphysis, and two 5-mm trocars in between the umbilicus and the anterior superior iliac spine, placed 4–5 cm apart. The parietal peritoneum was dissected along Toldt's line; the large intestine was freed and the iliac vessels near the ureter were

exposed. Following ureter identification and its mobilisation to the level of the bladder, the stenosed portion was excised and sent for histopathological examination. A 2-cm long portion of the proximal end of the excised ureter was spatulated; then, a double-J 6 F catheter was introduced through one of the ports into the peritoneal cavity and ureteral lumen. Subsequently, the urinary bladder was filled with 250 ml of saline solution, the covering peritoneum was incised, and the bladder was exposed by blunt dissection after immobilising the sides and the retropubic Retzius space. Filling the bladder with saline facilitated the identification of an optimal location for ureteral implantation as there was no tension or bends in the bladder surface. Next, the detrusor muscle was incised for 2 cm with a diathermic knife. The bladder mucosa was cut with scissors without the use of diathermy.



**Photo 2.** Laparoscopic reimplantation of the left ureter: **A** – excising the stenotic urethral segment; **B** – opening of the urinary bladder; **C** – vesico-ureteral suture; **D** – final effect following the application of four vesico-ureteral sutures

The Foley catheter was closed to prevent CO<sub>2</sub> outflow from the peritoneal cavity. After opening the bladder, the free end of the double-J catheter was placed into the bladder and a tension-free ureteral reimplantation was performed. Single, absorbable Vicryl 3-0 sutures were applied to the whole ureteral and bladder wall, and intracavitary binding was performed. The procedure was concluded with an evaluation of the tightness of the bladder by filling it with 200 ml of saline solution, drainage, and skin suture (Photo 2).

## Results

Basic data regarding the course of operations are presented in Table II. The post-operative hospital stay was 5 days in 2 of the patients, and 6 days in 1 case. The nephrostomy tube was removed on post-operative day 2; the peritoneal drain, on post-operative day 3; Foley's catheter, at post-operative week 2; and the double-J catheter, after 4 weeks post-operatively. The efficacy of the treatment was assessed based on clinical examination, ultrasound examination, and intravenous urography performed 1 or 2 days after the removal of the ureteral double-J catheter. In each case, the urinary kidney-bladder flow was appropriate (Photo 3). Cystoscopy performed after 3 and 12 months post-operatively revealed the natural appearance of the bladder after surgery and the implanted ureteral ostium. No recurrent urinary bladder carcinoma was noted.

## Discussion

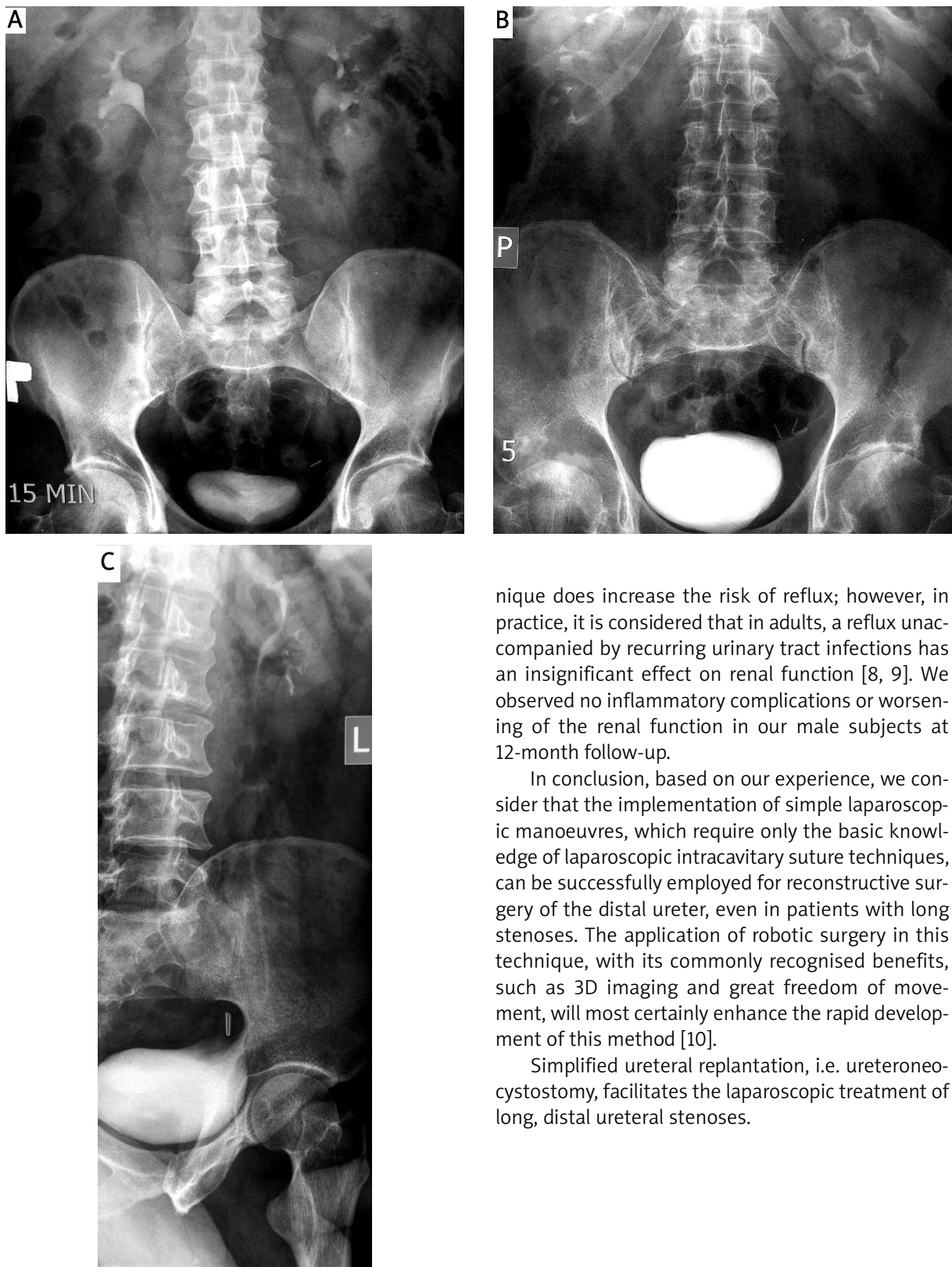
Ureteral replantation is a procedure performed most often in children with vesico-ureteral reflux. Indications for such surgery in adults are much less common, being usually required for iatrogenic ureteral damage, with stenosis or fistula. The open surgical technique is commonly used for such ureteral repair. Laparoscopic ureter replantation was first reported by Reddy and Evans in 1994 [4]. Subsequent

related publications have presented short series of patients, the largest of which ( $n = 45$ ) was presented by Seideman *et al.* [1]. Previous papers have highlighted the low invasiveness of laparoscopic treatment in comparison with open surgery, comparable functional outcomes, and the low risk of subsequent complications along with the necessity of wide experience with the laparoscopic technique [1-5]. The last element of surgical skill significantly affects the small size of the cohorts presented in the studies. Performing complex anastomoses with the use of the Boari flap and vesico-psoas hitch is reportedly most difficult, with an average operative time of 247 min, as reported by Gözen *et al.* [5]. Operations carried out without the employment of the above techniques were significantly shorter as they lasted, on average, 156 min [5]. The Boari flap facilitates tension-free anastomosis in the case of larger ureteral defects [6]. Despite the presence of large ureteral deficiencies in our present patients, we avoided the Boari flap method, each time performing high dissection towards the hilum of the kidney, which served the purpose of creating an adequate anastomosis. Another important aspect was the careful mobilisation of the bladder walls. We did not record any elevated tension in the anastomosis, fibrosis with restenosis, or lack of tightness in our cases, all of which are reported to occur frequently [5].

Creating an anti-reflux mechanism is one of the components of the ureteral replantation procedure. The technical aspects of such laparoscopic surgery have been well described by Rassweiler *et al.* [2] and Simmons *et al.* [7]. The most commonly used method is the Lich-Gregoir technique, which requires some experience in laparoscopic treatment, similarly to the previously mentioned procedures. However, a significant ureteral defect prevents the application of anti-reflux methods. Therefore, we performed simple ureteroneocystostomy in our patients, all of whom had significant ureteral defects. Potentially, this tech-

**Table II.** Perioperative data

Patient	Operation duration [min]	Blood loss [ml]	Number of ureteroneocystostomy sutures	Intra- and postoperative complications
1	170	30	6	None recorded
2	120	20	4	None recorded
3	180	50	6	None recorded



**Photo 3.** Intravenous post-operative urography in patients 1 (A), 2 (B), and 3 (C)

nique does increase the risk of reflux; however, in practice, it is considered that in adults, a reflux unaccompanied by recurring urinary tract infections has an insignificant effect on renal function [8, 9]. We observed no inflammatory complications or worsening of the renal function in our male subjects at 12-month follow-up.

In conclusion, based on our experience, we consider that the implementation of simple laparoscopic manoeuvres, which require only the basic knowledge of laparoscopic intracavitary suture techniques, can be successfully employed for reconstructive surgery of the distal ureter, even in patients with long stenoses. The application of robotic surgery in this technique, with its commonly recognised benefits, such as 3D imaging and great freedom of movement, will most certainly enhance the rapid development of this method [10].

Simplified ureteral replantation, i.e. ureteroneocystostomy, facilitates the laparoscopic treatment of long, distal ureteral stenoses.

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