

Original Article

## Double-Nippled Ureteroneocystostomy: A Novel Surgical Technique in the Management of the Obstructed Dilated Ureter

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### ABSTRACT

**Objective:** To present the outcome of double-nippled ureteroneocystostomy as a novel technique in the treatment of the dilated obstructed distal ureter.

**Patients and Methods:** The technique was performed in 55 patients with lower ureteric stricture. The lowest segment of the dilated obstructed ureter is transected and passed through the bladder dome for ureterovesical implantation. The distal 3 cm is folded twice like a sleeve to fashion a double-nippled valve. Evaluation of the appearance and function of the ureter and ipsilateral renal function was done by laboratory, imaging and endoscopic studies at 3, 6 and 12 months following surgery, then annually.

**Results:** Functional and morphological improvement was observed in 80% of the cases. Imaging and endoscopic verification of the valve stability and ipsilateral renal unit status, integrity and patency were confirmed in all patients but two (3.6%) who developed grade 2 vesico-ureteric reflux.

**Conclusion:** Double-nippled ureteroneocystostomy is a safe and efficient surgical modality for the management of the dilated ureter due to bilharzial stricture.

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**Keywords :** Ureteric stricture, bilharzial ureter, double-nippled, ureteroneocystostomy

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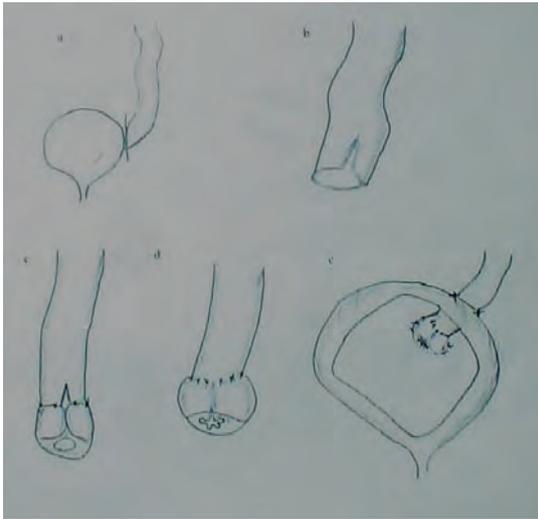
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## INTRODUCTION

Ureteroneocystostomy is frequently performed to manage distal ureteral obstruction or vesico-ureteric reflux (VUR). Several surgical procedures have been described. Those of Politano-Leadbetter<sup>1</sup>, Paquin<sup>2</sup>, Lich<sup>3</sup> and Gregoire<sup>4</sup> are probably the most popular with a reported 90% to 99% success rate. In severely dilated ureters remodeling of the distal segment must be primarily done through either tailoring or plication which carries the risk of post-operative complications, e.g. stenosis in 4% to 11% and VUR in 3% to 9% of cases<sup>5,6</sup>. The split nipple is a simple pro-

cedure, but according to Clark and Hosmane it is associated with VUR in 20% - 50% and stenosis in 8% of cases<sup>7</sup>. In Egypt, many of the obstructed dilated ureters are associated with urinary bilharziasis. Therefore they are unsuitable for surgical techniques using submucosal tunneling<sup>8</sup>. Double-nippled ureteroneocystostomy was created for the treatment of severely dilated ureters to overcome the high incidence of stenosis or VUR after simple split nipple<sup>7</sup> or ureteric remodeling techniques<sup>5,6</sup>.



**Fig. 1:** Diagram showing the technique of fashioning the double-nippled valve and its vesical implantation

The objective of this study is to present the outcome of double-nippled valve ureteroneocystostomy as a novel technique in dilated obstructed distal ureters.

## **PATIENTS AND METHODS**

In a prospective study performed at the Urology Department, Al-Azhar University, Cairo, between 2000 and 2008 double nippled ureteroneocystostomy was performed in 55 patients with hydronephrosis due to an obstructed distal ureter. The patient cohort consisted of 24 females and 31 males with a mean age of  $41 \pm 2$  (range 1.3 – 64) years.

After informed consent was obtained, the patients were evaluated by clinical assessment, urinalysis, culture including bacterial colony count and antibiotic sensitivity tests, serum creatinine, abdomino-pelvic ultrasound, intravenous urography (IVU) and voiding cystourethrography (VCU). Renal isotope scan, abdomino-pelvic CT and MR urography (MRU) were performed in 11, 5 and 3 patients, respectively, to confirm obstruction of the ureter.

### **Technique (Fig. 1, 2)**

Via a midline suprapubic extraperitoneal approach, the dilated distal ureter is explored,

then ligated above the obstruction and separated from the lower strictured segment. A 3 cm longitudinal incision is made on the anterior wall of the distal ureter to sufficiently spatulate it. One third of this spatulated segment is turned back on itself like a sleeve and secured by 4-corner 5/0 vicryl sutures to create the first nipple. Then it is again turned on itself to create the second nipple, giving the final shape of the double-nippled valve. The second nipple is secured with 6 sutures using 5/0 vicryl. A full-thickness bladder incision is performed at the dome to allow direct ureterovesical anastomosis without kinking. Ureterovesical anastomosis of the double-nippled valve is achieved by mucosa-to-mucosa anastomosis using 5/0 vicryl interrupted sutures. The distal ureter is fixed to the outer wall of the bladder with two anchoring 4/0 vicryl sutures. A ureteral double-loop stent is introduced up to the kidney without resistance and kept indwelling for 4-weeks.

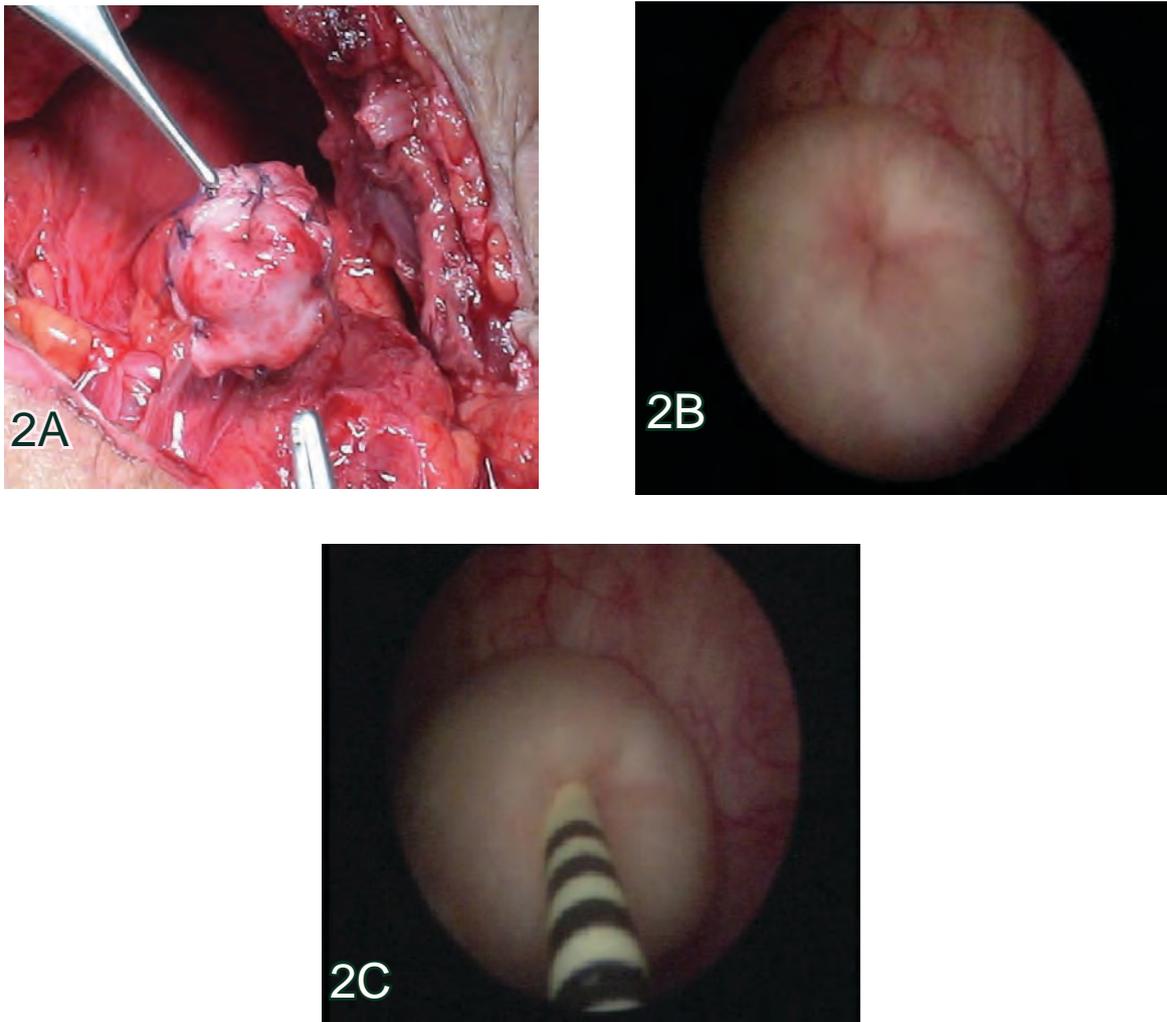
### **Post-operative assessment and follow-up**

All patients were scheduled for regular visits every 3 months during the first year, every 6 months during the second year, and then annually. The mean follow-up was  $21.3 \pm 7.2$  (range 12 to 56) months. Assessment of ipsilateral renal function and integrity and the double-nippled valve stability and competence was performed by laboratory, imaging and endoscopic investigation. Cystoscopy with retrieval of the ureteral stent was performed after 4 weeks. When there was no urinary tract infection, VCU and IVU were performed after 6 and 12 months, respectively. A post-operative renal isotope scan was done in 10 patients, while 15 patients were subjected to cystoscopy to evaluate the double-nippled valve after one year.

Student's t-test and Chi-square tests were used for statistical analysis with significance defined as  $p < 0.05$ . Values are expressed as mean  $\pm$  standard deviation.

## **RESULTS**

Double-nippled ureteroneocystostomy was performed in 55 patients with dila-



**Fig. 2:** A) Operative view of the double-nippled valve.  
 B) Endoscopic view of the same case after one year showing the stable double-nippled valve  
 C) Endoscopic view of the same case after one year to confirm valve patency by passage of a 6 Fr ureteric catheter

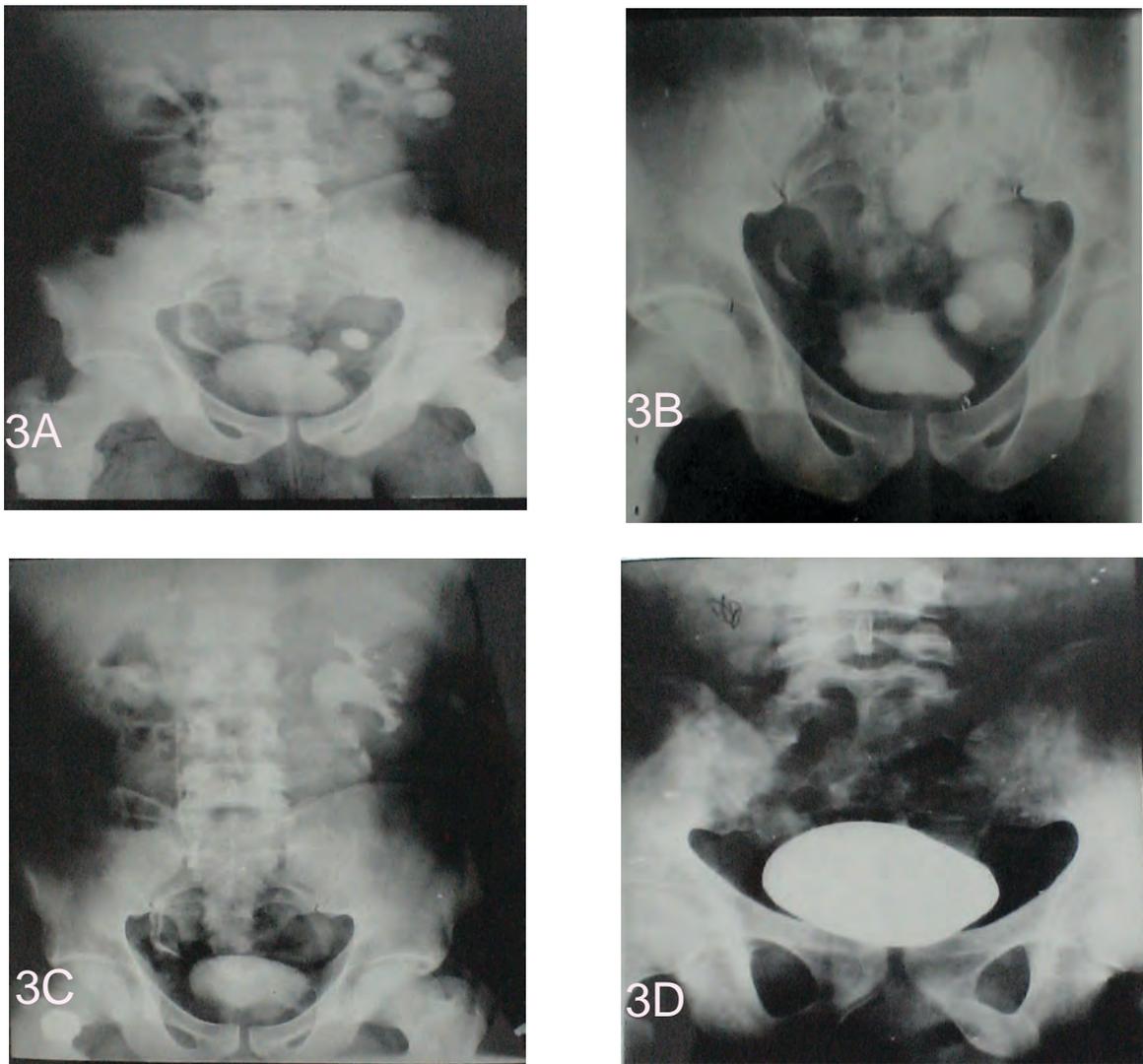
ted obstructed distal ureters. Pre-operative mean serum creatinine was  $1.1 \pm 0.5$  (range 0.5 – 4.3) mg/dL. No significant improvement was detected in serum creatinine after surgery with a post-operative mean value of  $1.0 \pm 0.3$  (range 0.5 – 3.7) mg/dL.

The results of follow-up studies of the ipsilateral renal unit one year after surgery (Fig. 3) compared to the pre-operative data are shown in Table 1.

Only 2 renal units developed grade 2 VUR after double-nippled ureteroneocystos-

tomy. Improvement in renal morphology and concentration and excretion of contrast was noted in 80% of the renal units ( $p < 0.05$ ). The mean glomerular filtration rate (GFR) of the ipsilateral unit was significantly improved from  $21 \pm 3$  ml/min pre-operatively to  $33 \pm 6$  ml/min 12 months after the intervention ( $p < 0.05$ ).

Cystoscopy was performed in all patients 6 weeks after the operation to retrieve the ureteric stent. Preservation of the double-nippled configuration was confirmed endoscopically 12 months after surgery in all evaluated pa-



**Fig. 3.** Pre-operative and 12 months post-operative radiologic evaluation of double-nippled ureteroneocystostomy. A) IVU showing severely dilated left collecting system with hydrocalyces and two stones in the lower ureter. B) Delayed IVU showing the markedly dilated and tortuous lower left ureter with two stones above the stricture that was confirmed during surgery. C) IVU of the same case, 12 months after double-nippled ureteroneocystostomy showing normal calyceal morphology and excretion of contrast. D) VCU with no vesico-ureteric reflux.

tients (n=15) with easy passage of a ureteric catheter.

## DISCUSSION

Ureteric stricture has been described in 24.7% of patients with pathologic urinary bilharziasis; in 66% the stricture affects the lower ureter<sup>9</sup>. Ureteroneocystostomy is the standard treatment modality in these cases after exclusion of malignancy. Several pro-

cedures consisting of intra- or extravesical approaches are commonly used<sup>1-5,10</sup>.

In most non-bilharzial cases, ureteroneocystostomy with submucosal tunneling yields good results with an efficient antireflux mechanism and without obstruction<sup>11</sup>. However, for a successful submucosal technique a tunnel of 4 to 5 times the diameter of the ureter must be created<sup>12</sup>. Sufficient ureteric length is not available in cases with severely

**Table 1:** .Pre- and postoperative IVU and VCU of the ipsilateral renal unit

Imaging	Preoperative		12 months after surgery	
	N	%	N	%
IVU: Hydroureteronephrosis	47	85.5%	45	81.8%
Marked	29	61.7%	9	20.0 %
Moderate	14	29.8%	16	35.6%
Mild	4	8.5%	12	26.7%
None	0	0%	8	17.7%
VCU: Vesico-ureteric reflux	55	100%	55	100.0 %
None	55	100%	53	96.4 %
Grade-2	0	0%	2	3.6%

dilated ureters or when the mucosa is adherent to the muscle layer as seen in urinary bilharziasis, which is considered a good reason for using the double-nippled technique

In severely dilated ureters remodeling of the distal segment must be primarily done through either tailoring or plication which carries the risk of post-operative complications. In our study, no tailoring was performed, thus preserving the blood supply and integrity of the distal ureter. For cases of ureteric stricture with bilharziasis other surgical techniques are needed<sup>8</sup>. Bazeed evaluated different surgical procedures for the treatment of bilharzial lower ureteric strictures and found that 9% of cases were suitable for an antireflux tunnel technique<sup>13</sup>. In another study on 30 bilharzial lower ureteric strictures Bazeed et al. reported VUR in 30% of cases after partial flap ureteroneocystostomy<sup>14</sup>.

Therefore double-nippled ureteroneocystostomy was created to overcome the problems associated with re-implantation of ureters with severe dilatation due to obstruction or bilharziasis. This technique offers 3

advantages: no post-operative obstruction, easy identification and catheterization of the double-nippled ureteric orifice during endoscopy, and a low VUR rate. In the present study post-operative VUR (grade 2) occurred in 3.6% of cases, while none of the patients developed obstruction. The antireflux mechanism is created by the use of ureteric wall to bulk the nipple after double-folding the ureteric wall.

Shokeir treated 21 patients with dilated obstructed ureters using a novel extravescical seromuscular ureteroneocystostomy with improvement in 16 cases (76.2%) and stabilization of renal function in 5 (23.8%). Moreover, he found no case of VUR during the follow-up period<sup>15</sup>.

These results are similar to our study where functional and morphologic improvement was documented in 80% of the affected renal units, while stabilization was noted in the remaining ones.

Several endoscopic and laparoscopic treatment modalities were introduced in the last

decade with satisfactory results<sup>16-18</sup>. The success rate ranges from 45% to 86% of patients rendered free of obstruction after endoscopic treatment<sup>16</sup>. Fugita et al. used laparoscopy to perform the Boari-flap technique in the management of lower ureteric strictures and confirmed that no case had post-operative obstruction, while all patients experienced grade 1 VUR<sup>19</sup>. In the coming months a preliminary study of double-nippled ureteroneocystostomy using a laparoscopic approach will be carried out to extend the application of the double-nippled technique.

In conclusion, double-nippled ureteroneocystostomy provides an antireflux patent valve without impediment of the urinary flow from the kidney. In our experience this procedure is easy and effective with functional and morphological stabilization or improvement of the ipsilateral renal unit.

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