

Modified Transurethral Technique for the Management of Distal Ureter During Laparoscopic Assisted Nephroureterectomy

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INTRODUCTION Laparoscopic assisted nephroureterectomy is a well established technique for managing the upper urinary tract urothelial cancer. However, management of the distal ureter remains a controversial issue. We describe a modified method of cystoscopic loop ligation and detachment of the distal ureter.

TECHNICAL CONSIDERATION We performed transperitoneal laparoscopic assisted nephroureterectomy in 13 patients. The lower end of the ureter was managed perurethrally using our modified technique. We circumscribed the ureteric orifice with a bladder cuff using a Collins knife. We ligated the ureteric stump via cystoscope to avoid urine spillage from the upper tract. We achieved the complete excision of the distal ureter with a bladder cuff in all cases with our modified technique.

CONCLUSIONS Our modified technique appears to be a simple, less invasive, and oncologically safe method to manage the distal ureter perurethrally. UROLOGY 71: 740–743, 2008. © 2008 Elsevier Inc.

Upper tract urothelial carcinoma accounts for less than 5% of all urothelial tumors. Open radical nephroureterectomy with excision of the ipsilateral ureteric orifice and a bladder cuff remains the standard therapy for managing patients with upper tract urothelial carcinoma. Laparoscopic nephroureterectomy has emerged as a less invasive alternative to open surgery. Since the first description of laparoscopic nephroureterectomy in 1991,¹ there have been several reports on this procedure. The technique of managing distal ureter remains a controversial issue and various methods have been described in the literature.^{2–5} There is no consensus as to the best approach for dealing with the distal ureter. We describe a modified method of cystoscopic loop ligation and detachment of the distal ureter that is technically less demanding while still upholding traditional oncological principles.

MATERIAL AND METHODS

Since March 2005 and December 2006, we have treated 13 consecutive patients for upper tract urothelial carcinoma with transperitoneal laparoscopic nephroureterectomy with our modified distal ureter technique. We performed retrospective data collection and included patients demographic, operative details, and outcomes.

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Cystoscopic Ligation and Release of Distal Ureter

After induction of general anesthesia, the patient is placed in the lithotomy position. Cystourethroscopy is performed with a 21-Fr cystoscope with a 30° lens and 1.5% glycine irrigation. The bladder is inspected for any concurrent tumor. The presence of any active bladder tumor disease is a contraindication of this technique. A 24-Fr resectoscope mounted with a Collins knife is used to score the ureteric orifice circumferentially while maintaining a 1-cm bladder cuff. The dissection is carried circumferentially through the partial detrusor muscle. Care is taken not to detach the ureter or expose the perivesical fat at this stage to avoid extravasation of the irrigation fluid. The ureteric orifice thus circumscribed stand out like a mushroom.

An 8-Fr ureteral dilator (Cook Urological, Inc., Bloomington, Ind) cut to 34 cm is passed through the 23-Fr cystoscope up to the tip. A preformed 0 PDS II endoloop (Ethicon, Sommerville, NJ) is fed into the ureteral dilator in a retrograde fashion (Fig. 1A). Loop size is reduced to about 3 cm and is held snugly against the ureteral dilator tip to allow maneuverability during the cystoscopic ligation. Ureteral dilator with loop is pulled back into the cystoscope sheath so that loop is just visible (Fig. 1B). The surgical assistant can perform this preparation during the ureteric dissection. Lately, we have started using the Albarran deflecting bridge, which has greatly facilitated the loop application.

The Cystoscope loaded with the endoloop is then passed into the bladder. The endoloop is advanced over the mushroom-shaped ureteric stump, which is then ligated by pushing the knot with the ureteric dilator (Fig. 2A–C). The Albarran bridge is particularly helpful by deflecting the ureteral dilator and thus keeping the loop in place while the noose is tightened. Once the loop is secured ensuring complete ureteral ligation, the ureteric stump is further dissected until the perivesical fat is reached. The ureter is thus detached from the bladder. There is some extravasation of the

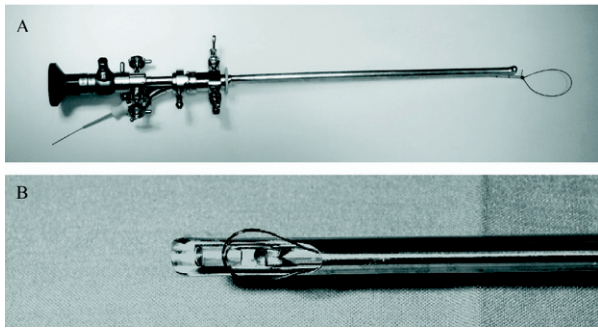


Figure 1. (A) Cystoscope with Albarran deflecting bridge loaded with a ureteric dilator and endoloop. (B) Close-up view of the distal end of the cystoscope with loop.

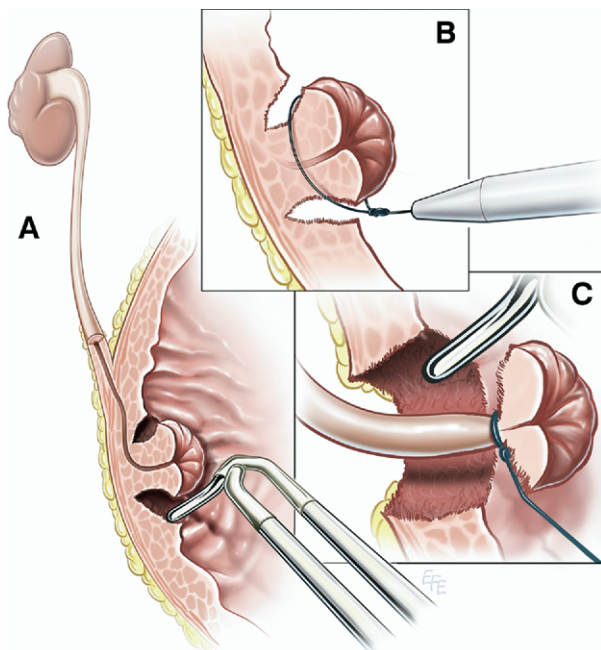


Figure 2. Technique of cystoscopic loop ligation and detachment of the distal ureter. (A) Ureteric orifice with 1 cm of bladder cuff is scored circumferentially and dissected through the partial detrusor thickness using a Collins knife. (B) Mushroom-shaped ureteric stump is ligated with PDS endoloop. (C) Ureteric stump is further dissected and detached from the bladder.

irrigation fluid at this stage of dissection, which is minimized by avoiding overdistension of the bladder. The extra length of PDS II suture outside the urethra is cut and the bladder is drained with an 18-F Foley catheter.

Nephrectomy and Proximal Ureteral Release

The patient is repositioned in the semiflank position with the table flexed and the kidney rest raised. The patient is carefully secured to the table properly so that the table can be rotated at a later stage for the distal ureter dissection. The laparoscopic procedure is performed typically using 5 ports. Pneumoperitoneum is achieved by the open Hassan technique at Mc Burney's point. Transperitoneal laparoscopic nephrectomy is performed using the standard technique while leaving the ureter intact. The ureter is dissected to the level of the pelvic brim.

Specimen Retrieval and Bladder Closure

Once the laparoscopic dissection is complete, the operating table is rotated to make the patient as flat as possible. A small Gibson-type extraperitoneal incision is made in the ipsilateral groin, incorporating the McBurney's port incision to retrieve the en bloc specimen. The distal ureter is easily detached from the bladder with minimal dissection owing to the prior cystoscopic release. With the loop secured at the lower end of the ureter, we are able to confirm the complete ureteric dissection. The bladder defect is then closed under direct vision in two layers. The wound is closed with a closed drainage system left in place.

RESULTS

There were 8 male and 5 female patients. Age ranged from 45 to 88 years (mean, 68.3 years). Tumor was in the proximal ureter/renal pelvis in 8 patients, in the middle ureter in 3 patients, and in the distal ureter in 2 patients. We achieved cystoscopic ligation of the distal ureter in all cases. Total mean operating time was 230 minutes (range, 180 to 290 minutes). Mean surgical time for the cystoscopic portion was 27.69 minutes (range, 12 to 50 minutes). Irrigation fluid extravasation was minimal during the cystoscopic procedure and none of the patients developed intraoperative or postoperative hyponatremia. Mean blood loss was 303.8 mL; however, cystoscopic dissection was associated with minimal blood loss. No patient required a blood transfusion. The drain was usually removed on postoperative day 2.

Complications occurred in two patients. One patient developed acute myocardial infarction on postoperative day 4 and died. One patient developed non-ST elevation myocardial infarction in postoperative period.

The foley catheter was routinely removed on postoperative day 7. We did not routinely perform a cystogram. No patient developed evidence or complication of a urinary leak. Mean hospital stay was 7.3 days (range, 4 to 20 days) which is common in our health care system, as patients are hesitant to leave the hospital with an indwelling foley catheter; as a result, most discharge followed successful catheter removal and voiding trial. Table 1 shows oncological results. Surveillance cystoscopy results were available for the 11 patients and bladder recurrence occurred in 5 patients (45%). Two of the patients were found to have bladder tumor recurrence in the ipsilateral hemibladder close to the ureteral scar/orifice. There was no recurrent tumor at the ureteral scar/orifice or in the perivesical space. No patient had port site metastasis. One patient with high grade and invasive pathology (T3G3) developed metastatic disease and died 20 months after the procedure.

COMMENT

The distal ureter can be managed in several ways during laparoscopic assisted nephroureterectomy. The

Table 1. Oncological results

Total	13
Positive surgical margin	
Distal ureter	0
Outer	0
Recurrence	
Bladder	5
Local	0
Distant	1
Mean (range) follow-up (months)	15.3 (6–24)
Histopathology	
pTa	7
pT1	1
pT2	3
pT3	2
G1	4
G2	3
G3	6

open technique via transvesical or extravesical approach is still considered the most oncologically sound method. The extravesical approach is a blind method and may not result in complete excision of the distal ureter and bladder cuff. Further, the open technique may be difficult in the patients with morbid obesity or with previous history of pelvic surgery and radiotherapy. Open radical nephroureterectomy, when performed through a single incision, has been associated with a 50% residual ureteric stump rate,⁶ with recurrence in the stump occurring in 30% to 64% of cases.^{7,8}

Various endoscopic distal ureteral management techniques have been described as a less invasive alternative to the standard open method. The pluck technique² involves transurethral resection of the intramural ureter down to the perivesical fat, facilitating subsequent plucking of the distal ureter during laparoscopic procedure. Urine extravasation from the detached ureter may contaminate the perivesical space with malignant cells. Cases of tumor recurrence in the perivesical space have been reported with this technique.^{9,10} Blind pulling of the distal ureter may avulse the ureter, leaving behind the distal ureteric segment.

Gill *et al.* described transvesical laparoscopic detachment and ligation of the distal ureter using two transvesical ports.⁴ Their method is technically demanding and time consuming. Mean surgical time for the cystoscopic procedure was 90 minutes (range, 60 to 110 minutes) in a series of 8 patients. Our technique is a modification of the Gill method, with several advantages. Our approach duplicates the oncological principal of the standard open technique. The distal ureter is ligated before it is detached from the bladder, thus preventing the spillage of upper tract urine into perivesical space. This technique is truly cystoscopic without the need for any transvesical ports. Cystoscopic dissection is comparatively less time consuming and requires a minimal learning curve. Our mean

cystoscopic dissection time was 27.7 minutes. The ureteric stump should be dissected carefully particularly in the upper half of dissection circle to avoid inadvertent transaction of the ureter. The bladder is closed primarily through the abdominal wound, thus minimizing urine extravasation and related complications. Our technique is not suitable in the patients with previous resection of the ureteric orifice.

In the intussusception technique by McDonald, the ligated ureter is stripped, or intussuscepted, through the urethra with the aid of a ureteric catheter, after endoscopic incision of the bladder cuff.³ The ureter is transected in this method; hence, it is contraindicated for ureteric tumors. It requires extensive transurethral manipulation and does not guarantee adequate excision of the intramural ureter and bladder cuff. The technical inconveniences with stripping accounts for approximately 10% of the conversions to open surgery.¹¹ Comparatively, our method is technically simple and was successful in all cases with complete excision of the intramural ureter and bladder cuff. Shalhav *et al.*⁵ described laparoscopic stapling of the distal ureter and bladder cuff. Positive margins were frequently associated with the laparoscopic stapling approach.¹² Distal margins were clear in all patients in our series.

Oncological outcomes appear satisfactory in the short term in this small series. Long-term follow-up data are not yet available. However, the intramural ureter and bladder cuff were completely excised in all patients and distal and outer surgical margins were clear in all patients. There have been no recurrences at the ureteral scar or in the perivesical space.

In conclusion, our technique of cystoscopic loop ligation and detachment ensured complete en bloc excision of the distal ureter with a bladder cuff. This technique is less invasive and can be performed with a minimal learning curve. Short-term oncological outcomes are satisfactory in this small series. We think our method is a viable option for the management of the distal ureter during laparoscopic nephroureterectomy.

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