

Review Article

THE ENDOSCOPIC APPROACH TO THE DISTAL URETER IN NEPHROURETERECTOMY FOR UPPER URINARY TRACT TUMOR

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ABSTRACT

Purpose: We reviewed the current status of the endoscopic distal ureteral approach to nephroureterectomy for transitional upper urinary tract cancer.

Material and Methods: We reviewed the English, French and Spanish literature using a PubMed and MEDLINE search, and compared the stripping and pluck techniques. Statistical analysis was done using Fisher's exact test. Individual case reports are discussed but they were not included in the statistical analysis.

Results: The mean rate of bladder carcinoma recurrence after ureteral resection and detachment is 19.3% for the stripping and 24% for the pluck technique. This difference is not statistically significant. In 3.1% of cases invasive bladder cancer has been noted but only after distal ureteral resection using the pluck technique.

Conclusions: The endoscopic approach to the distal ureter during nephroureterectomy is feasible. Bladder cancer recurrence was similar after each technique. However, isolated case reports illustrate the need for cautious selection of surgical candidates.

KEY WORDS: carcinoma, transitional cell; neoplasm recurrence, local; bladder; urinary tract; nephrectomy

The primary diagnosis of upper urinary transitional cell carcinoma accounts for less than 5% of all urothelial tumors.¹ A history of bladder carcinoma is present in 20% to 30% of patients and contralateral tumor can present synchronically in up to 2.5%.^{2–6} Upper urinary transitional cell carcinoma is more common in patients treated for bladder carcinoma, probably as a result of iterative bladder resection and vesicoureteral reflux.^{7–9}

Nephroureterectomy is the gold standard when an upper urinary tract tumor is not suitable for conservative treatment by endoscopic technique or conservative open surgery.^{10–14} The specimen removed must include the complete ureter with a bladder cuff of tissue surrounding the ureteral orifice. The rationale for excising all upper urothelial tissue on the affected side is the high rate of tumoral recurrence in the remaining ureteral stump after nephrectomy only is performed.^{2,4,5,15,16} Although tumor grade and stage are the most important determinants of long-term outcome,^{2–5,12,17–21} others factors such as multiplicity^{22–24} and the type of operation can negatively influence survival.^{2,22,25}

Two incisions are usually needed for nephroureterectomy, including a lumbar or subcostal incision and a pararectal or Gibson's incision to approach the kidney and distal ureter-bladder cuff, respectively. However, an extended abdominal incision can also provide an adequate surgical field. When nephroureterectomy is indicated, a less invasive approach can be used, namely the endoscopic distal ureteral approach, at the beginning of intervention before nephrectomy or at the end of the procedure after nephrectomy, ureteral identification and ligation. Renewed interest in the endoscopic approach to the distal ureter was stimulated by the introduction of laparoscopic nephroureterectomy in clinical practice.^{26–29} We reviewed the vari-

ous methods of approaching the distal ureter via endoscopy during nephroureterectomy and evaluated their feasibility and results in terms of bladder tumor recurrence.

MATERIALS AND METHODS

A bibliographic PubMed and MEDLINE search was performed for this review. Our report is based on the available English, Spanish and French literature, excluding abstract presentations.

Description of techniques. The most common techniques are basically ureteral stripping and the pluck technique, that is intussusception and resection of the intramural and perivesical ureter. Many modifications of the stripping technique have been reported to improve the technique by decreasing the rate of unsuccessful ureteral extractions.

Ureteral Stripping: The initial description of the technique is attributed to McDonald.^{30,31} Basically the ureter is catheterized at the beginning of the procedure and ligated posterior during the open flank approach. The kidney, proximal and mid ureter are removed via an open loin incision and the catheter is secured to the distal ureter. In the endoscopic approach the patient is then repositioned for ureteral intussusception and pull-through of the ureter through the urethra. After the introduction of a resectoscope ureteral detachment is performed by applying external tension to the catheter and resecting or circumcising the bladder wall.^{32,33} With the aim of improving excision many variants have been described, for example traction on the adventitia through the loin incision by Allis clamps or stitches at the beginning of intussusception,^{34–36} use of a venous stripper or balloon catheter to secure the ureter,^{37,38} double ligation of the ureter over a kinked ureteral catheter³⁹ and longitudinal discharge ureterectomy distal to ureteral ligation.⁴⁰

The Pluck Technique or Ureteral Endoscopic De-Insertion:

This technique consists of resection of the ureteral meatus and surrounding tissue. A conventional resection loop is used and resection is extended along the transmural ureteral trajectory, perforating the bladder wall until perivesical fat is visible and the ureter is completely detached from the bladder. The ureteral lumen and surrounding tissue are carefully and broadly coagulated to seal the ureter and prevent urinary spillage during the remainder of the procedure. After endoscopy is complete the patient is repositioned and nephroureterectomy is performed via a flank incision.³⁰ Dissection of the pelvic ureter is done under direct vision until the iliac vessels are visualized. Gentle traction is then applied, helped by blunt digital dissection. Traction enables extraction of the complete ureter in all cases.⁴¹ Examination of the specimen and recognition of the coagulated tip ensure complete excision of the urothelium.

In 1972 Abercrombie described a variant of this technique that involves resecting the ureteral roof with a catheter in situ.⁴² Others perform nephrectomy first with early distal ureteral ligation. Thus, endoscopic resection occurs at the end of the procedure.⁴³

The most important modification of this technique is circumcision of the ureteral orifice by a hook electrode with early coagulation of the ureteral orifice before initiating the endoscopic procedure. Meatal circumcision is continued until perivesical fat is visualized, indicating that the ureter is freed of all perivesical attachments. After the procedure is complete nephroureterectomy is performed via a flank incision in the usual manner. As in the original technique, the coagulated ureteral orifice enables specimen identification.^{44,45} Recently a modification of this technique was described with early trans-bladder ligation of the distal ureteral tip during laparoscopic nephroureterectomy.²⁹

Bibliographic material. Although the technique was described almost 5 decades ago, only a small number of procedures have been reported. An even smaller number of series with long-term followup have been published. These studies mainly consist of descriptions of technique modifications or postoperative recurrence. There are no prospective comparative studies comparing open and endoscopic ureteral removal that assessed significant differences. In some series the 2 approaches were compared retrospectively³² or within the same interval.³⁶

Information on bladder recurrence is available in 14 series, of which slightly different stripping methods were used in 5^{32,33,35,36,46} and 9 involved the pluck technique or a variation.^{28,41,43-45,47-50} Survival data are available only occasionally. Followup is not available in 4 studies.^{28,32,35,43} The site of primary upper urinary transitional cell carcinoma is not available in 1 series,⁴¹ while information on primary tumor grade and stage is available in only 2 of the stripping^{32,46} and 6 of the pluck^{41,43,45,47-49} technique. Data on complications are available in 7 series of the pluck and in 8 of the stripping technique.^{28,29,32,33,35,36,39-47,49} There are 3 isolated case reports of invasive bladder recurrence⁵¹⁻⁵³ and an extensive series involving the pluck technique.²⁷

Statistical methods. Due to the variety of techniques and reports lacking important information performing statistical analysis is difficult. For comparing bladder recurrence in the 2 techniques only tumor cases were considered and Fisher's exact test was used with $p < 0.05$ considered significant. The lack of information in unpublished series and the weak evidence based value of the isolated case reports precluded their inclusion in statistical analysis. For calculating the complication rate tumor cases and the other series were included as well as series mentioning only a description of the technique. Only series specifically mentioning the rate and characteristics of complications were included in analysis.

RESULTS

Characteristics of primary upper urinary tract tumors. The characteristics of primary upper urinary tumors are described in 8 series (table 1). The primary tumor was invasive in 16.6% of cases treated with the stripping and in 48.6% treated with the pluck procedure. In the series of Clayman et al high grade tumors were managed by intramural ureter resection or by unroofing without ureteral detachment.³³

Bladder recurrence. Of patients who underwent the stripping and pluck procedure 62 and 129 were followed, respectively (table 2). The recurrence rate varied depending on the specific approach to the distal ureter, namely 19.3% in stripping and 24% in pluck series, which was not significant (Fisher's exact test $p = 0.581$). With a 95% confidence interval the odds ratio for bladder recurrence was 1.29-fold higher for the pluck than for the stripping technique but again this value was not significant.

To date 9 bladder recurrences have been described at the resection site, including 5 corresponding to superficial bladder tumors and 4 (3.1%) involving invasive bladder recurrence. These recurrences developed after the pluck technique. As indicated, 3 additional invasive bladder recurrences were reported as isolated cases.⁵¹⁻⁵³ All except 1 invasive tumor were diagnosed within year 1 after primary treatment (table 3). Interestingly no pelvic or trigonal invasive or superficial bladder recurrence has been described after the stripping procedure.

Complications. Table 4 lists the complications of the 2 procedures. The pluck technique or resection of the distal ureter has a low complication rate and according to the reports of various groups it is feasible in all cases.^{41,45,49} The 2.7% immediate postoperative complication rate involves extravasation, which was due at least in 1 case to inadvertent intraperitoneal perforation during the endoscopic procedure.^{29,41,45}

The 10% complication rate of the stripping technique is usually due to the ureteral catheter hindering endoscopic ureteral extraction. Catheter breakage, the impossibility of urethral progression and even anchorage of the pelvic ureter have led to an open conversion rate of between 9.5% and 12.5%.^{35,36,39,40,46} A urethral stricture was noted in a male patient after difficult extraction.⁴⁶

General considerations. Mean hospital stay after endoscopic ureteral treatment varies widely between 4.6 and 11 days.^{32,36,43,45,49} The mean duration of bladder catheterization is 3 to 8 days.^{33,39,40,43,48} Only 1 series mentioned a prolonged bladder catheterization duration of 14 days. Patients who undergo the laparoscopic procedure are often discharged home within 24 hours.²⁹

Mean endoscopic operative time is short at 22 minutes for the pluck⁴⁹ and less than 45 minutes for the stripping³⁶ technique. A modification of the pluck technique requires about 90 minutes.²⁹ Total intervention time varies between 156 and 205 minutes, including 1 laparoscopic series.^{28,33,36,46}

TABLE 1. Characteristics of primary upper urinary transitional cell carcinoma

References	No. Noninvasive	No. Invasive
Stripping procedure		
Clayman et al ³³	16	2*
Jacobsen et al ⁴⁶	14	4
Pluck procedure		
Hetherington et al ⁴⁷	2	3
Abercrombie et al ⁴⁸	10	6
Palou et al ⁴¹	12	18
Sawa et al ⁴³	2	3
Kural et al ⁴⁹	2	4
Polo Peris et al ⁴⁵	10	6

* High grade, high stage tumors treated with intramural resection without ureteral detachment.

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