Endourololgic Management of Transitional Cell Carcinoma in the Upper Urinary Tract

Surgical approach: endoscopic management of upper tract transitional cell carcinoma (TCC) originally reserved for patients with solitary kidney, bilateral disease, renal insufficiency, or high surgical risk; however, endoscopic approach reasonable in patients with low-grade, early disease and normal renal function; for low-volume ureteral or renal disease, consider retrograde ureteroscopic approach; can use antegrade percutaneous approach for bulky renal disease or large, proximal ureteral tumor

Ureteroscopic biopsy: biopsy finding important for managing patients endoscopically, but small working channel prohibits use of large instruments; can use alligator forceps such as Piranha, or flat wire basket or grasper for larger biopsies; however, difficult to biopsy tumors in lower pole; flexible nitinol baskets and graspers pass through working channel without damaging flexible ureteroscope

Diagnosis: visual diagnosis — inadequate for distinguishing benign from malignant lesions; among 40 patients, subsequent biopsy revealed that initial visual diagnosis inaccurate in 30%; make therapeutic decisions based on biopsy; narrow band imaging (NBI) — available with digital ureteroscope (eg, Olympus); may reveal lesions difficult to see with white light; NBI used primarily in bladder; 126 patients with low-grade TCC of bladder followed for 3 yr with white light cystoscopy, then for 3 yr with NBI; patients who underwent NBI had lower risk for recurrence and fewer tumors at recurrence, suggesting that NBI increases visibility of tumors; however, unclear whether carcinoma in situ visible with NBI, so additional studies needed

Treatment: to treat lesion ureteroscopically, debulk with basket or cold cut forceps, then ablate base of lesion with holmium laser using low power settings (0.6 J at 6 Hz); to avoid injuring ureter, keep tip of laser off wall of ureter; when laser 1 to 2 mm away, coagulative effect maximized and depth of penetration of ≈0.5 mm; can use holmium laser to cut away pedunculated lesions and to treat stones or tumors in anticoagulated patients and those with uncorrected bleeding diatheses; avoid circumferential ablation with laser, which can cause ureteral stricture; avoid cutting guide wire with laser

Tumor seeding: seeding theoretical risk, but not supported by evidence; keep pressures low and use ureteral access sheath with flexible ureteroscope; induce diuresis by giving intravenous furosemide (Lasix) when safety wire placed; keep collecting system as empty as possible; using ureteral access sheath allows continuous decompression of collecting system and reduces intrarenal pressure

Percutaneous approach: used for large tumors in upper tract; insert 30F nephroscopy sheath and manage lesion with resectoscope; biopsy lesion, debulk, and fulgurate base; leave nephrostomy tube in place, perform adjunctive treatment, and restage tumor in 3 mo; upper tract seeding rarely reported with percutaneous approach; epithelium thinner in renal pelvis than in bladder; cut through wall to perinephric fat to ensure tumor completely resected; percutaneous resection in renal pelvis otherwise similar to transurethral resection of bladder tumor (TURBT); can use roller ball to fulgurate base of collecting system, but do not touch guide wire with resectoscope or roller ball

Outcomes: early data on endoscopic management of urothelial TCC indicate better outcomes for grade 1 than grade 2 lesions; size, grade, and multifocality of tumor influence outcome; grade and stage best prognostic indicators

Adjunctive therapy: agents — for upper tract include topical bacillus Calmette-Guérin (BCG) and mitomycin C (MMC); use of interferon-α reported; challenges — no large, randomized, prospective trials have studied adjunctive therapy for TCC in upper tract; in bladder, intravesical MMC decreases recurrence of Ta and T1 tumors after TURBT, and effective seeding theoretical risk, but not supported by evidence; any identified conflicts were resolved to ensure that the planning committee to disclose relevant financial relationships within the past 12 months that might create any personal conflicts of interest. Any identified conflicts were resolved to ensure that the educational activity promotes quality in health care and not a proprietary business or commercial interest. For this program, members of the faculty and planning committee reported no conflicts of interest. In his lectures, Dr. Preminger presents information related to the off-label or investigational use of a therapy, product, or device.
intrarenal pressure observed during hour of topical therapy, but pressure decreases rapidly after washout; peak pressure of 75 cm H₂O, less than required to cause pyelovenous backflow; histologic findings from animal study showed no qualitative differences in inflammation, edema, necrosis, or dilation after injecting MMC into proximal ureter and collecting system

Retrospective comparison: no level 1 evidence supports endoscopic management of TCC in upper tract; retrospective comparison based on hypotheses that nephron-sparing surgery (NSS) using endoscopic management might result in more recurrences in bladder or upper tract than radical nephroureterectomy; that conservative management of upper tract recurrences feasible, and that tumor grade and stage predict outcome; among 312 patients, ≤100 had NSS and others had radical nephroureterectomy; cumulative incidence of recurrence in upper tract significantly higher in patients undergoing NSS; incidence of recurrence in bladder and of metastasis similar in both groups; conclusion — patients treated with NSS for upper tract TCC have increased risk for local upper tract recurrence; however, with careful selection, conservative management of patients with recurrences possible using nephron-sparing approach; no increase in bladder tumors or metastases in patients treated with NSS; stage and grade most important predictors of outcomes

Surveillance: follow patients every 3 mo for 2 yr, then every 6 mo for 3 yr, then annually if no disease present; follow with ureteroscopy and contralateral imaging of upper tract; patients undergoing endoscopic management of upper tract TCC must understand need for close surveillance; caveats — be wary of diagnostic errors; stage never certain because adequate biopsies “almost impossible” to obtain; incomplete resection or incomplete ablation often problematic

Questions and Answers

Rate of recurrence at 3 mo: percutaneous approach reserved for bulky disease; usually little or no disease found at 3 mo after percutaneous resection; disease discovered at 3 mo usually represents tumor missed at time of original intervention rather than recurrence; consider using BCG or gemcitabine from above

Using larger fiber for bulky tumor: using 200-μ instead of 500-μ fiber results in loss of flow through working channel and decreases deflection of flexible ureteroscope; 200-μ fiber works well for tumors and improves visualization; with percutaneous approach used for bulky tumors, resectoscope works better; however, if patient has, eg, large lesion in renal pelvis and small lesion in lower pole calyx, can use flexible cystoscope and 200-μ or 500-μ fiber

Advances in the Management of Ureteral Calculi

Historical perspective: significant changes in last 30 to 40 yr in management of stones in ureter; shock wave lithotripsy less common and endoscopic techniques used more frequently; modern urology equipped with better instruments, improved adjunctive devices (eg, nitinol baskets and graspers and access sheaths), and improved fragmentation devices such as holmium laser

Outcomes with ureteroscopy: compare favorably with percutaneous approach; 93% stone-free rate achievable with endoscopic management of large stones, but mean of 2.3 procedures required per patient; in meta-analysis, stone-free rate 96% for stones measuring 2 to 3 cm and 85% for stones >3 cm

Ureteroscopes: new, flexible, digital ureteroscopes can access all locations in collecting system and ureter; digital ureteroscopy provides enhanced images and improves stone-free rate; NBI improves ability to treat stones; prospective study — compared digital with fiber-optic ureteroscopy; digital ureteroscopy associated with shorter operative times and greater volume of stone removed per minute; digital scope more durable than flexible ureteroscope

Baskets: flexible nitinol baskets and graspers used routinely; significant loss of deflection occurs when placing holmium laser fiber through flexible 7.5F ureteroscope; loss of deflection more important problem in kidney than in ureter; loss of deflection minimal when using small nitinol basket; can place 1.3F or 1.9F nitinol basket through fully deflected ureteroscope without damaging working channel; using flywheel handle, surgeon can open, close, and rotate basket; holmium laser fiber cannot go through deflected ureteroscope but, using basket, can remove stone from lower pole, place it in more favorable location in ureter, then fragment stone and remove fragments with basket; 1.3F nitinol basket results in 28% increase in flow of irrigant and improved deflection compared with 1.5F basket

Ureteral access sheath: used routinely to manage stones in proximal ureter; sheath facilitates management, significantly reducing operative time by 20% (10 min); decreased operative time and eliminating need for dilating balloon resulted in savings of $700 per patient; use of sheath improves stone-free rates in ureter and kidney; sheath decompresses collecting system; this feature important when treating obstructing stone that might have infection behind it, because high intrarenal pressure can result in pyelovenous backflow of infected urine; sheath facilitates access to proximal ureter, obviates need for dilatation of ureter, and prolongs life of flexible ureteroscope

Stone Cone: made of nitinol and stainless steel wire; device expands into tapered cone; used in distal ureter to prevent migration of large stones when ureter dilated; place device proximal to stone to prevent migration of fragments upward in ureter; protective coating on Stone Cone prevents damage from laser; when withdrawn, Stone Cone uncoils in narrower areas of ureter and reforms in dilated portions; can use cone to clean out stone fragments

BackStop gel: helpful when using flexible ureteroscope for proximal ureteral stones; stone fragments stay in place during fragmentation; although cold saline dissolves gel, can also leave gel in ureter because normal peristalsis expels gel along with stone fragments; in randomized trial including 68 patients, incidence of migration of fragments 9% with BackStop and 53% without it; no complications reported; BackStop does not form good seal if ureter significantly dilated

Escape basket: used with digital, semirigid ureteroscope; prevents stones treated with laser from migrating back up ureter; basket traps stones during fragmentation; must take care not to cut through basket; useful in profoundly dilated ureters

Holmium laser: fragments all types of stones; laser drills rather than explodes stones, so method time consuming in patients with particularly large or hard stones; must avoid injury to mucosa; low-power holmium lasers useful for managing stones, strictures, and tumors; use 10- or 20-W power setting; stone-free rate similar whether low-power laser used or high-power laser used on low-power setting; laser useful for patients taking anticoagulants

Medical expulsive therapy: prospective randomized trial used medical expulsive therapy (MET) in patients undergoing ureteroscopy and fragmentation of stones with holmium laser; patients randomized to placebo vs tamsulosin (Flomax); patients on MET had 20% increase in stone-free rate and 4-fold reduction in ureteral colic during passage of fragments; α-blockers also reduce morbidity of stents, decrease urinary symptoms and pain, and improve general health; patients with stones ≤1 cm routinely treated with tamsulosin at time of diagnosis; if stone not passed after 6 wk, do ureteroscopy, but continue tamsulosin during and after procedure

Summary: digital endoscopes significantly improve vision and facilitate identification of pathology; keep supply of stents, guide wires, and sheaths in operating room; use low-pressure saline irrigation, usually with access sheath, to promote drainage of irrigating fluid; consider staged procedure if problems encountered; use tamsulosin to improve clearance of stones and reduce morbidity
Questions and Answers

Price of digital ureteroscope: cost of scope $25,000 to $30,000, but can lease scope for lower price; digital scopes remain in service longer before requiring repair, but more expensive than other scopes.

Sizes and manufacturers of scopes: Olympus scope 10.3F, but large size not problematic when access sheath used; new, 7.5F, digital ureteroscopes from ACM1 and Storz not approved by Food and Drug Administration; Olympus developing 8F flexible scope; digital scope larger because of charge-coupled device chip at tip of scope.

Types and sizes of instruments: sensor guide wire from Boston Scientific has relatively solid shaft and flexible proximal tip; standard sheath measures 10F internally and 14F externally; digital scopes pass through this sheath easily, but must dilate ureter in >20% of cases to insert sheath.

Use of BackStop with stent: can place guide wire and stent through gel and leave gel in place; presence of stent does not seem to interfere with peristalsis of gel.

Passage of stone fragments: unknown why stone fragments pass more easily after extracorporeal shock wave lithotripsy than untreated stones of similar size; fragmented stones possibly more fragile than untreated stones.

When to use flexible ureteroscope with sheath vs semirigid scope: semirigid scope preferred in distal ureter below vessels; if difficult to treat stone from below, consider treating from above with flexible scope.

Difficulty placing access sheath: in virgin ureter in which size of ureteral orifice appears normal, attempt to pass access sheath with inner stylet; if not possible, dismantle sheath try to pass inner stylet alone to dilate ureter, then reassemble sheath and attempt to pass; if this technique does not work, use balloon dilator, then place sheath.

Stone growing around foreign body (wire, broken basket, fragmented laser fiber, or suture): use holmium laser to break up stone; if necessary, use laser to cut basket fragment into smaller pieces, then remove them.

Suggested Reading


Acknowledgments

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KIDNEY CANCER/URETERAL STONES

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1. Therapeutic decisions in patients with transitional cell carcinoma (TCC) in the upper urinary tract should be based on:
   (A) White light ureteroscopy  (B) Narrow band imaging  (C) Histologic biopsy

2. Which of the following is a side effect of BackStop gel when used in the ureter?
   (A) Inflammation  (B) Increased intrarenal pressure  (C) Necrosis  (D) Ureteral dilatation

3. In a retrospective comparison of nephron-sparing surgery (NSS) and radical nephroureterectomy in patients with upper tract TCC, the incidence of _______ was significantly higher in patients undergoing NSS.
   (A) Recurrence in bladder  (B) Metastasis  (C) Recurrence in upper tract  (D) All the above

4. Of the following, which is the most important predictor of outcome in a patient with TCC of the upper tract?
   (A) Grade  (B) Number of tumors  (C) Distant metastasis  (D) Presence of bladder tumors

5. A patient who has been treated for upper tract TCC has a negative ureteroscopy 6 mo postoperatively; the patient should be asked to return for another procedure in:
   (A) 3 mo  (B) 6 mo  (C) 1 yr  (D) 2 yr

6. In a meta-analysis evaluating ureteroscopic management of ureteral stones, what was the stone-free rate in patients with stones >3 cm in size?
   (A) 53%  (B) 85%  (C) 93%  (D) 96%

7. In a prospective study, the digital ureteroscope was associated with shorter operative times than the fiberoptic ureteroscope.
   (A) True  (B) False

8. Advantages of the ureteral access sheath include:
   1. Decreased operative time
   2. No need for balloon dilation of ureter
   3. Cost savings of ≈$700 per patient
   4. Decompression of collecting system
   5. Higher stone-free rate
   (A) 1,2,3  (B) 4,5  (C) 1,3,5  (D) 1,2,3,4,5

9. In a randomized trial in patients with stones, BackStop gel:
   (A) Prevented or impaired peristalsis of the ureter
   (B) Sealed the ureter effectively, even in dilated organs
   (C) Reduced migration of stone fragments
   (D) All the above

10. Initial treatment of a patient presenting with a urinary tract stone measuring <1 cm should include:
    (A) Extracorporeal shock wave lithotripsy
    (B) Flexible ureteroscopy
    (C) Semirigid ureteroscopy
    (D) Tamsulosin

Answers to Audio-Digest Urology Volume 37, Issue 16: 1-B, 2-C, 3-B, 4-D, 5-A, 6-C, 7-D, 8-C, 9-A, 10-B