

Chapter 12

Robot-Assisted Laparoscopic Ureteral Reimplantation

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Name of Procedure

Robot-assisted laparoscopic (RAL) ureteral reimplantation.

Lay Description

A minimally invasive surgery through a few small incisions to re-tunnel the ureter in the wall of the bladder and thereby correct vesicoureteral reflux (VUR).

Risks

Bleeding, urinary tract infection (UTI), surgical site infection, injury to intra-abdominal organs, ileus, migration or encrustation of stent (if placed), urinary leakage, persistent or recurrent VUR, de novo contralateral VUR (if unilateral surgery), ureteral obstruction, acute kidney injury, chronic kidney disease, lower urinary tract symptoms, urinary retention, open conversion, neuropathy, rhabdomyolysis, and anesthetic complication.

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Benefits

Correction of VUR, prevention of pyelonephritis, preservation of renal function, less postoperative pain and shorter convalescence than open surgery, discontinuation of antibiotic prophylaxis, and less frequent follow-up for imaging studies.

Technique

Cystoscopy may be performed before surgery to evaluate for the presence of UTI and suitability of the ureter for an extravesical approach at the discretion of the surgeon. Either a double-J ureteral stent or externalized ureteral catheter may also be placed at that time.

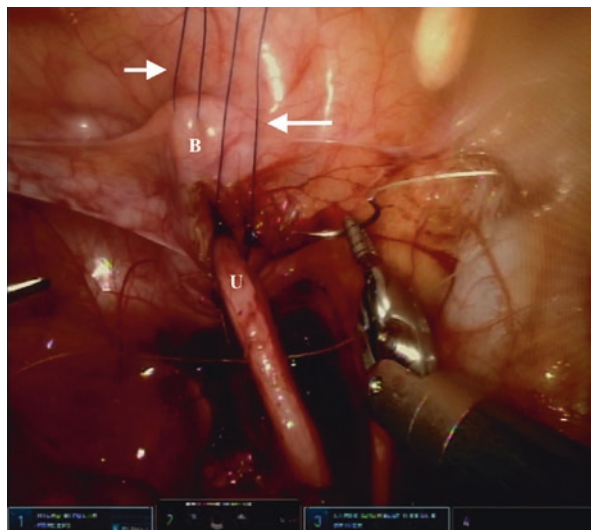
RAL ureteral reimplantation may be performed through either an intravesical or extravesical approach. Only a few small, single-center series have reported their outcomes with an intravesical approach. An extravesical approach seems to be preferred by most pediatric urologists due to its relative ease and reproducibility when compared to the more technically challenging intravesical approach [1, 2].

The extravesical approach replicates the Lich-Gregoir technique for open ureteral reimplantation. The patient is placed under general endotracheal anesthesia. The patient may be placed in a supine or modified dorsal lithotomy position. A Foley catheter is placed on the sterile field to allow for intraoperative manipulation of bladder filling. A three-trocar configuration is typically used with one trocar for the endoscope through the umbilicus and two working trocars on each side of the midline. An assistant trocar may be used at the discretion of the surgeon. The ureter is mobilized from the pelvic brim to the bladder after opening the overlying peritoneum. The vas deferens or uterine artery is preserved. A detrusorotomy of adequate length is created in line with the ureterovesical junction (UVJ). The presumed dorsomedial location of the neurovascular bundles is avoided by dissecting in close proximity to the ureter and avoiding any circumferential dissection around the UVJ. A detrusorraphy is performed with either a running absorbable suture or simple interrupted absorbable sutures. Additional considerations to maintain the length of the submucosal tunnel include an advancement suture at its distal aspect and incorporation of the ureteral adventitia along the detrusorotomy. During the detrusorotomy and detrusorraphy, a transabdominal suture through the bladder and/or around the ureter is particularly helpful to allow for adequate exposure and retraction (Fig. 12.1). The fascia and skin are closed at each trocar site. A drain is not routinely placed.

Postoperative Course

The patient is typically admitted to the hospital, although select patients may be a candidate for outpatient surgery without a Foley catheter in our experience. The diet is advanced as tolerated on the day of surgery. Our preference is to start a regimen of scheduled and alternating intravenous acetaminophen and ketorolac for postoperative

Fig. 12.1 Transabdominal suture through the bladder (*B*, *short arrow*) and around the ureter (*U*, *long arrow*) during detrusorraphy



analgesia, which may be transitioned to oral acetaminophen and ibuprofen prior to discharge. Intravenous narcotics may be administered as needed but are not routinely required in our experience. A first generation cephalosporin is administered for perioperative antibiotic prophylaxis. Early ambulation is encouraged. The Foley catheter is removed for a voiding trial on postoperative day #1. A vast majority of patients are discharged to home on postoperative day #1.

Follow-Up

The patient returns for a postoperative evaluation with a renal and bladder ultrasound in 1–3 months.

Evidence

The success rate after RAL extravesical ureteral reimplantation is variable in the literature, ranging from 72 to 99% [3–13]. This variability may be attributed to the differing severity of VUR, treatment of contralateral non-refluxing ureters, and definition of success in these series. Some series routinely obtained a postoperative voiding cystourethrogram, while others only obtained them as clinically indicated or not at all. With the largest multi-institutional series to date, Grimsby et al. observed a fairly low success rate of 72% in 93 ureters by robotically experienced surgeons [12]. Nevertheless, the success rate has been improving over time. Gundeti et al. demonstrated an improvement in their success rate from 67 to 87% with specific technical modifications [13].

The overall complication rate is also variable, ranging from 0 to 30%. Specific complications include urinary leak (0–10%), ureteral obstruction (0–5%), and ileus (0–4%) [3–13]. Only one case of open conversion has been reported [13]. The incidence of de novo VUR for unilateral surgery has been inconsistently reported but observed to be as high as 22% of patients in one series [8]. Transient urinary retention is a complication that is unique to an extravesical approach, particularly when performed bilaterally. An overly aggressive dissection around the UVJ is thought to disrupt the neurovascular bundles from the pelvic plexus and contribute to this complication. Its incidence is quite low but has been demonstrated in up to 10–12% of patients in several small series [3–13]. Kasturi et al. reported the large single-center series of 150 patients undergoing RAL extravesical ureteral reimplantation with follow-up for at least 2 years. All patients were toilet trained before surgery and evaluated with a pre- and postoperative voiding diary, uroflowmetry, measurement of postvoid residual volumes, and validated questionnaire. They did not observe any de novo lower urinary tract symptoms or urinary retention after surgery. They argued that the magnified three-dimensional visualization with a robotic platform facilitates the careful dissection of tissues around the UVJ and preservation of the pelvic plexus [7].

Several studies have performed a retrospective comparative analysis between open and RAL extravesical ureteral reimplantation. A comparison was made to either an open intravesical or extravesical approach in two studies each. All studies demonstrated similar success and complication rates between open and RAL extravesical ureteral reimplantation. They also observed a decreased postoperative narcotic requirement in patients undergoing RAL extravesical ureteral reimplantation but conflicting results for operative time and length of hospitalization [4, 5, 9, 14].

References

1. Weiss DA, Shukla AR. The robotic-assisted ureteral reimplantation: the evolution to a new standard. *Urol Clin N Am.* 2015;42:99–109.
2. Schober MS, Jayanthi VR. Vesicoscopic ureteral reimplant: is there a role in the age of robotics? *Urol Clin N Am.* 2015;42:53–9.
3. Peters CA. Robotically assisted surgery in pediatric urology. *Urol Clin N Am.* 2004;31:743–52.
4. Marchini GS, Hong YK, Minnillo BJ, Diamond DA, Houck CS, Meier PM, Passerotti CC, Kalplan JR, Retik AB, Nguyen HT. Robotic assisted laparoscopic ureteral reimplantation in children: case matched comparative study with open surgical approach. *J Urol.* 2011;185:1870–5.
5. Smith RP, Oliver JL, Peters CA. Pediatric robotic extravesical ureteral reimplantation: comparison with open surgery. *J Urol.* 2011;185:1876–81.
6. Chalmers D, Herbst K, Kim C. Robotic-assisted laparoscopic extravesical ureteral reimplantation: an initial experience. *J Pediatr Urol.* 2012;8:268–71.
7. Kasturi S, Sehgal SS, Christman MS, Lambert SM, Casale P. Prospective long-term analysis of nerve-sparing extravesical robotic-assisted laparoscopic ureteral reimplantation. *Urology.* 2012;79:680–3.

8. Akhavan A, Avery D, Lendvay TS. Robot-assisted extravesical ureteral reimplantation: outcomes and conclusions from 78 ureters. *J Pediatr Urol.* 2014;10:864–8.
9. Schomburg JL, Haberman K, Willihnganz-Lawson KH, Shukla AR. Robot-assisted laparoscopic ureteral reimplantation: a single surgeon comparison to open surgery. *J Pediatr Urol.* 2014;10:875–9.
10. Hayashi Y, Mizuno K, Kurokawa S, Nakane A, Kamisawa H, Nishio H, Moritoki Y, Tozawa K, Kohri K, Kojima Y. Extravesical robot-assisted laparoscopic ureteral reimplantation for vesicoureteral reflux: initial experience in Japan with the ureteral advancement technique. *Int J Urol.* 2014;21:1016–21.
11. Diaz EC, Lindgren BW, Gong EM. Carbon dioxide laser for detrusor tunnel creation in robot-assisted laparoscopic extravesical ureteral reimplant. *J Pediatr Urol.* 2014;10:1283e1–2.
12. Grimsby GM, Dwyer ME, Jacobs MA, Ost MC, Schneck FX, Cannon GM, Gargollo PC. Multi-institutional review of outcomes of robotic assisted extravesical ureteral reimplantation. *J Urol.* 2015;193:1791–5.
13. Gundeti MS, Boysen WR, Shah A. Robot-assisted laparoscopic extravesical ureteral reimplantation: technique modifications contribute to optimized outcomes. *Eur Urol.* 2016; <http://dx.doi.org/10.1016/j.eururo.2016.02.065>.
14. Harel M, Herbst KW, Silvis R, Makari JH, Ferrer FA, Kim C. Objective pain assessment after ureteral reimplantation: comparison of open versus robotic approach. *J Pediatr Urol.* 2015;11:e1–8.