Step-by-step laparoscopic ureteroureterostomy for iatrogenic distal ureteral injury after laparoscopic hysterectomy: a video article

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Abstract

To demonstrate a step-by-step laparoscopic ureteroureterostomy technique for managing an iatrogenic distal ureteral injury after laparoscopic type A (Querleu-Morrow) hysterectomy. A 37-year-old patient (body mass index 25 kg/m^2) diagnosed with Stage IA2 cervical cancer underwent laparoscopic type A hysterectomy with bilateral salpingo-oophorectomy and indocyanine green sentinel lymph node mapping, without a uterine manipulator, following a prior cervical conization. On postoperative day 2, an unexpectedly high abdominal drain output prompted measurement of drain fluid urea and creatinine, which exceeded serum values and raised suspicion of a urinary leak. Urinary ultrasonography and contrast-enhanced abdominal computed tomography (CT) with a urographic phase were performed, revealing grade 1-2 hydronephrosis of the left kidney and a urinary leak from the left ureter, consistent with iatrogenic ureteral injury (IUI). The patient underwent emergency laparoscopic ureteroureterostomy in collaboration with the urology team. IUI is a rare but significant complication of gynecologic surgery. The distal ureter is the most commonly affected site, and up to 70% of cases may go unrecognized intraoperatively. CT urography is recommended as the first-line imaging modality for diagnosis. Early recognition and a multidisciplinary approach can facilitate successful repair using minimally invasive surgical techniques. This case reinforces the importance of close postoperative monitoring and illustrates that laparoscopic repair can be used to effectively manage such complications. [J Turk Ger Gynecol Assoc.]

Keywords: Ureter, ureteroureterostomy, minimally invasive surgical procedures, cervical cancer, sentinel lymph node

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Introduction

Iatrogenic ureteral injury (IUI) is a rare but potentially serious complication of pelvic surgery, occurring in approximately 0.2-1% of all gynecologic procedures and up to 50% of all ureteral injuries across surgical specialties (1,2). Despite advances in minimally invasive techniques, ureteral injuries remain a significant source of postoperative morbidity, and approximately 70% of cases are not recognized intraoperatively (1). Delayed diagnosis is associated with prolonged morbidity, urinoma formation, fistula development, and impaired renal function (3,4).

The distal ureter is the most commonly injured segment during gynecologic surgery, particularly at the point where it crosses the uterine artery approximately 1.5-2.0 cm lateral to the cervix (5). In laparoscopic hysterectomy, the ureter is especially vulnerable due to its close anatomical proximity to the uterine vessels and the paracervical tissue, as well as the risk of thermal injury from energy devices used during dissection (2). Although a uterine manipulator may facilitate exposure of the cervicovaginal junction and provide tissue countertraction, its deliberate omission as an oncologic precaution in cervical cancer surgery may reduce anatomical delineation and make

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identification of the distal ureter more demanding (6). A prior cervical conization may theoretically contribute to periureteral scarring that increases the difficulty of distal ureteric dissection, although direct evidence is limited. Contrast-enhanced computed tomography urography (CT urography) is regarded as the gold standard imaging modality in this setting, allowing accurate localization of the injury site, identification of urinoma, and assessment of hydronephrosis (7).

Herein, we present a case of iatrogenic distal ureteral injury diagnosed on postoperative day 2 following laparoscopic type A (Querleu-Morrow) hysterectomy**,** successfully managed by emergency laparoscopic ureteroureterostomy in collaboration with the urology team. This report was prepared in accordance with the SCARE 2025 guideline (8).

Case report

A 37-year-old patient (body mass index 25 kg/m^2) diagnosed with Stage IA2 cervical cancer underwent laparoscopic type A (Querleu-Morrow) hysterectomy with bilateral salpingo-oophorectomy and indocyanine green (ICG) sentinel lymph node mapping, without a uterine manipulator, following cervical conization performed six weeks before the definitive surgery. This management remains consistent with current NCCN recommendations for early-stage cervical cancer (9). Sentinel lymph node mapping was performed before the hysterectomy using ICG injected into the cervix at the 3- and 9-o'clock positions, with 1 mL administered at each site. Bilateral sentinel lymph nodes were successfully identified and removed before proceeding with the hysterectomy. The cone specimen had shown squamous cell carcinoma with no lymphovascular space invasion (LVSI) and negative surgical margins; the hysterectomy specimen revealed LVSI-negative residual tumor with 4 mm of stromal invasion, and the parametria and sentinel lymph nodes were negative.

On postoperative day 2, an unexpectedly high abdominal drain output prompted measurement of drain fluid urea and creatinine, which exceeded serum values and raised suspicion of a urinary leak. Urinary ultrasonography and contrast-enhanced abdominal CT with a urographic phase were performed, revealing grade 1-2 hydronephrosis of the left kidney and a urinary leak from the left ureter, consistent with iatrogenic distal ureteral injury (7). The patient was taken to the operating room urgently and underwent emergency laparoscopic ureteroureterostomy in collaboration with the urology team. At re-operation, laparoscopic inspection confirmed a full-thickness injury of the left ureter approximately 2 cm proximal to the ureterovesical junction, and a double-J stent was placed cystoscopically.

The surgical procedure was completed in 65 minutes with an estimated blood loss of 50 mL, and was performed in eight sequential steps. In Step 1, laparoscopic exploration of the abdomen was performed, and the urinoma was identified and irrigated to achieve adequate visualization of the operative field. In Step 2, retroperitoneal dissection was carried out to mobilize the injured ureter, with careful attention to preserving its periureteral vascularity and achieving a tension-free anastomosis. In Step 3, cystoscopic evaluation was performed and a double-J stent was inserted to serve as an anastomotic guide. In Step 4, retroperitoneal dissection was continued for complete mobilization of the ureter, ensuring adequate length for a tension-free repair. In Step 5, the distal ureteral segment was identified and carefully exposed through meticulous dissection of the surrounding periureteral tissue. In Step 6, both ureteral ends were spatulated to widen the anastomotic diameter and minimize the risk of postoperative stricture formation. In Step 7, ureteroureterostomy was initiated with placement of the posterior anastomotic sutures under direct laparoscopic visualization. In Step 8, the ureteral anastomosis was completed using 4-0 absorbable sutures in a continuous fashion. The key steps of the procedure are demonstrated in Video 1.

Anastomotic integrity was confirmed intraoperatively by cystoscopic assessment showing no intra-abdominal leakage of intravesical fluid and verified by postoperative imaging. On postoperative day 3, the total abdominal drain output was 300 mL, and drain urea and creatinine had normalized to serum values; resolution of hydronephrosis and absence of free fluid were confirmed on ultrasonography. The patient was discharged on postoperative day 5 on ciprofloxacin. A surveillance urine culture ten days later grew *Escherichia coli* sensitive to nitrofurantoin, prompting a switch to nitrofurantoin, which was discontinued once a follow-up culture confirmed clearance. The double-J stent was removed at the sixth postoperative week, after cystography and cross-sectional imaging (CT and ultrasonography) confirmed a patent, non-leaking anastomosis without stricture or hydronephrosis. The patient remained asymptomatic at 24 months of follow-up.

Discussion

IUI is one of the most serious complications of gynecologic surgery; gynecologic procedures account for up to 50% of all IUIs across surgical specialties, with hysterectomy being the most commonly implicated procedure (1,2). Critically, approximately 70% of ureteral injuries are not recognized intraoperatively, and patients typically present in the early postoperative period with non-specific symptoms including flank pain, abdominal distension, fever, or signs of urinary leakage (1,2). In the present case, the injury was identified on postoperative day 2, through an unexpectedly high drain output with drain fluid urea and creatinine exceeding serum

values, highlighting the importance of careful postoperative monitoring, a high index of clinical suspicion, and of drain fluid biochemistry following laparoscopic pelvic surgery.

A distinctive feature of the present case is that the injury occurred following a low-radicality type A hysterectomy according to the Querleu-Morrow classification. Although the reported incidence of ureteral injury is highest during more extensive radical hysterectomy procedures, in which parametrial dissection approaches the ureteral tunnel, injury remains possible even during procedures involving limited paracervical resection. Two features of this case may have contributed. First, the deliberate omission of a uterine manipulator, increasingly adopted for oncologic reasons in cervical cancer surgery (6), which removes a landmark that helps delineate the cervicovaginal junction and displace the ureter laterally. Second, a prior cervical conization may induce paracervical scarring that increases the difficulty of distal ureteric dissection. This demonstrates that vigilance for ureteric injury should not be confined to radical procedures.

CT urography is widely recognized as the gold standard imaging modality for the evaluation of suspected ureteral injury, enabling accurate identification of contrast extravasation, urinoma formation, hydronephrosis, and the precise site of ureteral disruption (7). In the present case, CT urography confirmed grade 1-2 hydronephrosis and a urinary leak from the distal left ureter, and aparoscopic inspection at re-operation localized a full-thickness defect approximately 2 cm proximal to the ureterovesical junction, facilitating prompt surgical planning. Early diagnosis is essential, as delayed recognition significantly increases the risk of prolonged morbidity and complex reconstructive procedures (3,4).

The choice of surgical repair technique depends on the location and extent of the ureteral injury. While ureteroneocystostomy is the most commonly performed repair for distal ureteral injuries at or very close to the ureterovesical junction, ureteroureterostomy represents an appropriate alternative when the ureteral defect is short, both ends are well-vascularized, and a tension-free anastomosis can be achieved (1,2). Key principles of successful repair include meticulous debridement of injured tissue, ureteral spatulation, watertight mucosa-to-mucosa anastomosis using absorbable sutures, internal stenting with a double-J stent and, where feasible, peritoneal or omental coverage of the anastomotic site (2). In the present case, ureteroureterostomy was considered feasible because the distal ureteral defect was limited in length, the surrounding periureteral tissue and vascular supply were preserved, and sufficient ureteral mobilization enabled a tension-free anastomosis. Compared with ureteroneocystostomy, this approach also avoided additional bladder dissection and mobilization, thereby reducing surgical complexity and operative morbidity. The principal determinant of failure in ureteroureterostomy is anastomotic tension; a defect that cannot be bridged without tension, a devascularized distal segment, an irradiated field, or extensive periureteral fibrosis favor re-implantation or a bridging procedure instead, with anastomotic stricture and urinary leak being the two principal late complications.

Regarding the minimally invasive approach to the index operation, the findings of the LACC trial, which compared minimally invasive and open radical hysterectomy, cannot be directly extrapolated to the present case (10). The patient had a low-risk clinicopathological profile, including 4 mm of stromal invasion in the residual tumor, absence of LVSI in both the cone and hysterectomy specimens, and negative conization margins. Final pathology subsequently confirmed negative parametria and sentinel lymph nodes. Evidence from the SHAPE trial supports less-radical surgery in appropriately selected patients with low-risk early-stage cervical cancer (11). Nevertheless, appropriate patient selection and preoperative counseling remain essential.

A multidisciplinary approach involving close collaboration between the gynecologic oncology and urology teams was instrumental in achieving a successful outcome. Laparoscopic repair of ureteral injuries, when performed by experienced surgeons, offers significant advantages over open surgery, including reduced postoperative morbidity, shorter hospital stay, and faster recovery (2,4). The patient in the present case was discharged on postoperative day 5, and the double-J stent was removed six weeks later. At 24 months of follow-up, she remained asymptomatic with no evidence of ureteral stricture or renal impairment, confirming the long-term efficacy of the minimally invasive repair.

Conclusion

IUI following laparoscopic type A hysterectomy is a rare but potentially serious complication that demands prompt recognition and a multidisciplinary surgical approach. Vigilance and postoperative monitoring for iatrogenic injury are warranted, even after low-radicality procedures, because of the difficulty of recognizing such damage intraoperatively and the potential for severe morbidity. This case demonstrates that postoperative ureteral injuries can be successfully managed laparoscopically through a tension-free ureteroureterostomy, avoiding the need for open reconstruction. CT urography plays a critical role in early and accurate diagnosis, and close collaboration between gynecologic and urologic surgeons is essential for optimal outcomes. In centers with sufficient minimally invasive surgical expertise, laparoscopic ureteroureterostomy represents a safe and effective treatment option with favorable short- and long-term results.

Video 1. Step-by-step laparoscopic ureteroureterostomy for a distal left ureteral injury after laparoscopic type A hysterectomy: exploration and urinoma drainage, ureteral mobilization, cystoscopic double-J stent placement, spatulation, and continuous 4-0 absorbable anastomosis.

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Ethics

Ethics Committee Approval: *Institutional review board approval was waived because this study is a single-case video article and does not involve research on human subjects.*

Informed Consent: *Informed consent was obtained from the patient.*

Footnotes

Conflict of Interest: *No conflict of interest is declared by the authors.*

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