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Original Article

# Laparoscopic Management of Ureter Injury During Total Laparoscopic Hysterectomy

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## ABSTRACT

**Objective:** Iatrogenic ureteral injuries are critical consequences of pelvic and vaginal surgeries that can lead to severe morbidity and even death. Therefore, the purpose of this study was to evaluate the outcomes of primary laparoscopic repair of ureteral injuries during laparoscopic hysterectomy (LH).

**Methods:** Patients who underwent LH between November 2018 and October 2021 were evaluated retrospectively. Medical records of all patients with ureter injury were reviewed and their causes of injury, incidence, treatment and follow-up were evaluated.

**Results:** A total of five patients had ureter injury during laparoscopic surgery. All ureter injuries immediately repaired during the same operation without conversion to laparotomy or additional trochar insertion.

**Conclusion:** Identification of intra-operative urinary tract injury during gynecological operations allows for appropriate and immediate repair. The result of the study showed that gynecologists experienced in endoscopic surgery can successfully and effectively managed ureteral injury during laparoscopy.

## INTRODUCTION

Ureteral injuries are rare and complications, such as urinoma, urinary tract infections, ureteral stenosis, and acute kidney insufficiency, and death may occur with delayed diagnosis or mismanagement.[1,2]

Ureteral injury incidence is reported in approximately 5% of oncologic surgical procedures and about 0.1–1.5% of benign gynecologic procedures.[3,4] Hysterectomy is the most commonly performed gynecological procedure for benign uterine disease.[5] Unfortunately, ureteral injury can be observed during hysterectomy due to the close course of the ureter to the cervix and uterine artery. Laparoscopic hysterectomy (LH) has become more popular and is widely accepted surgical approach due to the decrease in length of stay, reduced post-operative analgesic demand, and faster recovery over conventional methods.[6-8] A recent meta-analysis showed that there was an in-

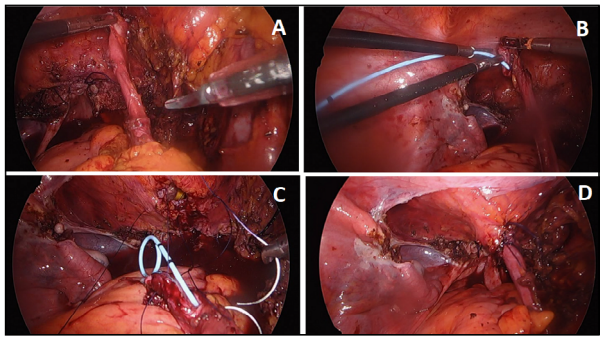


**Figure 1.** Intraoperative photos of the surgical technique. The ureter is dissected and released (A). The proximal and distal ureteral edges were identified, approximated by suturing at the 6 o'clock position. A double J ureteral stent was inserted in the ureter (B). 3/0 Vicryl sutures were placed at the 9, 12, and 3 o'clock positions (C). Repaired ureteral appearance (D).

creased risk of urinary tract injury in LH compared to abdominal hysterectomy.[7] It is of great importance to determine whether urological complications of laparoscopic surgeries can be properly managed with minimally invasive surgical approach. Therefore, we aimed to document the outcomes of the laparoscopic repair of ureteral injuries during gynecologic surgeries in our clinic.

## MATERIALS AND METHODS

The medical records of patients who underwent LH in the Department of Obstetrics and Gynecology at the Kartal Dr. Lütfi Kırdar City Hospital, between November 2018 and October 2021 were reviewed. A total of five patients with ureteral injury during LH were identified. Patients with comorbidities (cerebrovascular disease, chronic respiratory diseases, cardiovascular disease, and coagulopathy) and previous ureteral surgery were excluded from the study. The research was in line with the principles of the Declaration of Helsinki. The ethical approval of the present study has been taken from the local ethics committee (Approval number: 2021/514/214/24, date: November 30, 2021). Following induction of anesthesia, a lithotomy position was applied to all patients. After urinary bladder catheterization, uterine manipulation was performed using a RUMI II manipulator and the vaginal cuff was closed using the intracorporeal method. The same gynecologist surgeon with extensive experience in laparoscopy performed all ureter repairs.

### Surgical Techniques

Laparoscopic ureteral repair was postponed to the end of the surgery due to the possibility of further injuries. Intraoperative photos of the surgical technique are given in Figure 1. The ureters may be injured during inserting trocars or dissecting the surrounding urological structures. Ureteral injuries can be detected and managed during surgery. Laparoscopic examination revealed no bladder injuries. The ureter repair was carried out without conversion to laparotomy. There was no need to place an additional trocar during operation. The proximal and distal ureteral edges were approximated by suturing at the 6 o'clock position. After the Double-J ureteral stent application, 3/0 Vicryl sutures were placed in a clockwise order. Hemostasis was done, and an abdominal drain was implanted. The duration of catheterization was 7–10 days. All patients were monitored for 12 months after stent removal. During clinic visits, patients received a thorough work-up that included an examination of voiding symptoms, urine analysis, and ultrasonography.

## RESULTS

There were five patients with iatrogenic ureteral injuries during total LH procedure over a 3-year period. There was no conversion to conventional laparoscopy during operation. The patients' mean age was 53.8 years (range: 33–66). The mean BMI was 31.7 kg/m2 (range: 25–39). The baseline characteristics of patients are presented in Table 1. The mean time of ureteral repair was 57.4 min (range: 42–80). The median duration of hospital stay was 4–7 days. Estimated blood loss was negligible. The removal

**Table 1.** Baseline characteristics

| | Case-1 | Case-2 | Case-3 | Case-4 | Case-5 |
|---|---|---|---|---|---|
| Age (year) | 65 | 49 | 72 | 56 | 45 |
| BMI (kg/m2) | 28 | 35 | 26 | 28 | 29 |
| C-Section | 2 | 4 | 2 | 3 | 4 |
| Surgery Indications | Cervical cancer | Myoma uteri | Postmenopausal bleeding | Cervical cancer | Endometrioma |
| Ureter Repair Time (minute) | 60 | 42 | 55 | 50 | 80 |
| Length of Hospital Stay (day) | 5 | 4 | 5 | 7 | 4 |
| Duration of Ureteral Stenting (day) | 10 | 8 | 9 | 10 | 7 |
| Complication | No | No | Urinary tract infection | Bladder atony | Urinary tract infection |

BMI: Body Mass Index.

of vesical catheters and the ureteral stents was on the post-operative 7th–10th day. In the post-operative period, a catheter-associated urinary tract infection was developed in two patients and bladder atony developed in one patient. Since the catheterization lasted for a prolonged period of time, prophylactic antibiotics were used. A weekly examination of the urinary system was performed during the 1st month, followed by a monthly examination of the urinary system, a urine analysis, and a urine culture for up to 12 months. None of the patients had any pelvicalyceal ectasia. The patients had an uneventful recovery with normal renal function.

## DISCUSSION

Considering the close anatomical proximity between genital and urinary structures, injury to the urinary tract, including the ureter and bladder, is a possible complication of hysterectomy.[9,10] LH is a non-invasive technique compared to abdominal hysterectomy, but a higher risk of urinary tract injury has been reported compared to abdominal or vaginal hysterectomy.[11] The probability of ureteral injury in laparoscopic operations varies between 0.2% and 6.0%. Urinary system injuries can be avoided with mastery of pelvic anatomy and surgical experience.[12]

It is important to note that ureter ligation, ureter, and bladder lacerations are acute complications, whereas vesicovaginal fistula, ureterovaginal fistula, and renal loss are chronic complications.[13] Ureteral injuries may be detected late, but in our cases, ureteral injuries were discovered and immediately repaired intraoperatively. The diagnosis and management of ureteral injuries at the time of injury reduce morbidity.[14]

Most patients with urinary tract injuries may have no risk factors. However, the risk of ureteral injury is characterized by a 2-fold increase in endometriosis cases. Apart from endometriosis, a number of pathological conditions disturb the urinary tract anatomy, which increases the risk of injury. These conditions include tubo-ovarian abscess, huge pelvic tumors, obesity, fibroids, prior surgical procedures, radiation to pelvic region, and congenital disorders of urinary tract.[15] The risk factors in our case series were leiomyoma, endometrioma, and a history of C-section, and it is hypothesized that the anatomical structural change linked with these caused ureteral damage.

A prophylactic ureteral catheter was not placed in any of our patients with ureteral injury. Feng et al.[16] showed that prophylactic ureteral catheter placement before laparoscopic gynecologic surgery, particularly in pelvic adhesions, provided benefits such as lower rate of ureteral injury, shorter length of the operation time, and less blood loss.

Urinary tract infections were developed in two cases and bladder atony in one case. However, no abnormality was found in the urinary functions of the patients in the follow-up for up to 10–12 months. This study indicated that a gynecologist or urologist with experience in minimal invasive surgery can successfully repair the injured ureters.

## Conclusion

Considering the close anatomical proximity between genital and urinary structures, injury to the urinary tract, including the ureter and bladder, is a possible complication of gynecology surgery. We believe that a gynecologist or urologist with experience in minimal invasive surgery can successfully repair the injured ureters.

### Ethics Committee Approval

This study approved by the Kartal Lütfi Kırdar City Hospital Clinical Research Ethics Committee (Date: 30.11.2021, Decision No: 2021/514/214/24).

### Informed Consent

Retrospective study.

### Peer-review

**Externally peer-reviewed.**

### Authorship Contributions

Concept: E.M., G.Y., E.K.; Design: E.K., E.M., G.Y., A.H.S.; Supervision: E.M., E.K., G.Y., P.B.İ. R.B.B.; Fundings: E.M., E.K., G.Y., U.S.; Materials: P.B.İ., R.B.B., A.H.S.; Data: P.B.İ., R.B.B., M.M.K.; Analysis: A.E., U.S., M.M.K., P.B.İ.; Literature search: M.M.K., P.B.İ., R.B.B.; Writing: P.B.İ., R.B.B., E.K., A.E.; Critical revision: G.Y., E.K. E.M., A.E.S.

### Conflict of Interest

None declared.

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## Total Laparoskopik Histerektomi Sırasında Üreter Yaralanmasının Laparoskopik Yönetimi

**Amaç:** İyatrojenik üreter yaralanmaları, ciddi morbidite ve hatta ölüme yol açabilen pelvik ve vajinal cerrahilerin kritik sonuçlarıdır. Bu nedenle, bu çalışmanın amacı laparoskopik histerektomi (LH) sırasında üreter yaralanmalarının primer laparoskopik onarımının sonuçlarını değerlendirmektir.

**Gereç ve Yöntem:** Kasım 2018 - Ekim 2021 tarihleri arasında LH uygulanan hastalar retrospektif olarak değerlendirildi. Üreter yaralanması olan tüm hastaların tıbbi kayıtları incelendi ve yaralanma nedenleri, insidansı, tedavisi ve takibi değerlendirildi.

**Bulgular:** Laparoskopik cerrahi sırasında toplam beş hastada üreter yaralanması oldu. Tüm üreter yaralanmaları laparotomiye geçilmeden veya ilave trokar yerleştirilmeden aynı ameliyatta hemen onarıldı.

**Sonuç:** Jinekolojik operasyonlar sırasında intraoperatif üriner sistem yaralanmasının tanımlanması, uygun ve acil onarımı sağlar. Çalışmanın sonucu, endoskopik cerrahide deneyimli jinekologların laparoskopi sırasında üreter yaralanmasını başarılı ve etkili bir şekilde yönetebileceğini gösterdi.

**Anahtar Sözcükler:** Laparoskopi; laparoskopik histerektomi; ureter yaralanması.