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Case Report

## Diagnosis and management of iatrogenic ureteral injury in total laparoscopic hysterectomy

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### ABSTRACT

Ureteral injury is common in gynecological surgeries due to the proximity to organs. The risk of ureteral injury is higher in laparoscopic hysterectomy operations compared to abdominal or vaginal hysterectomies. Obesity, endometriosis, pelvic adhesions, history of previous surgery, enlarged uterus, and intraoperative hemorrhage are some of the risk factors identified for ureteral injury. Intraoperative cystoscopy and postoperative urinary ultrasonography can be used in the diagnosis of early ureteral injury. Management of ureteral injury differs according to the extent, type, and localization of the injury. In evaluating the ureteral injury, early diagnosis and early repair in appropriate patients are essential in morbidity and medicolegal.

**Keywords:** Ureteral injury, Total laparoscopic hysterectomy, Cystoscopy, Ureteroureterostomy, Urinary sonography

### INTRODUCTION

Ureter and intestinal injuries, hemorrhage, thromboembolism, and infection are the major complications seen in gynecological surgeries due to the proximity to the organs.<sup>1</sup> While the incidence of ureteral injury is seen in 0.3%-1.8%, approximately 50% of these are seen at the level and proximal of the uterine artery due to the ureter's neighborhood at the lateral border of the cervix.<sup>2</sup> Enlarged uterus, obesity, pelvic adhesions, history of previous surgery, endometriosis, and intraoperative hemorrhage have been identified as risk factors for ureteral injury.<sup>3</sup> The incidence of ureteral injury after laparoscopic hysterectomy is 0.4%-2.5%, 0.02% after vaginal hysterectomy, and 0.13% after abdominal hysterectomy.<sup>4,5</sup> As a result of ureteral injury, morbidities such as ureterovaginal fistula, ureteral stenosis, and potential loss of kidney function can be seen if early diagnosis and successful management are not implemented.

### CASE REPORT

Our 51-year-old postmenopausal patient, who had two normal spontaneous vaginal deliveries and four curettages, had no history of previous abdominal surgery and no other chronic disease. Total laparoscopic hysterectomy (TLH), bilateral salpingo-oophorectomy, and diagnostic cystoscopy were planned due to chronic pelvic pain, BRCA1 gene mutation, and abnormal uterine bleeding resistance to levonorgestrel-releasing intrauterine device. In the preoperative evaluation, endometrial biopsy and smear tests were found to be benign. Urinary ultrasonography is performed on our patients before each TLH operation to be performed in our clinic. In this patient, urinary ultrasonography was performed one day before the operation, and no pathological finding was detected in the urinary system. During the operation, the right ovary was observed to densely adhere to the lateral wall of the uterus and abdomen in laparoscopic observation, and this adhesion was removed with sharp

and blunt dissections. TLH BSO and diagnostic cystoscopy procedure were completed. The duration of intra-abdominal gas was 45 minutes, and the total operation time was 70 minutes. In our clinic, the integrity of the bladder wall and jet flow from the bilateral ureteral orifice is evaluated by cystoscopy after each TLH, and jet flow from both ureters was seen intraoperatively in our patient. Urinary ultrasonography revealed right grade 1 renal pelvictasis. CT urography revealed slight enlargement of the right kidney collecting system and right ureter and delayed right kidney function. It was observed that creatinine values, which were 0.8 mg/dl on the 1st postoperative day, were 1.2 mg/dl. The patient was consulted to the urology. On the 2nd postoperative day, a nephrostomy catheter was inserted by interventional radiology, anterograde pyelography was performed in the same session, obstruction in the right kidney collecting system was inserted, and the lower end of the ureter was observed.

The patient was evaluated in the urology council, and a decision was made for explorative laparotomy. On the 4th postoperative day, the patient was operated by the urology department. Right ureter obliteration, which was thought to be connected to the advanced bipolar sealing device, was observed 4 cm proximal to the ureterovesical junction. Ureteroureterostomy was performed over the ureter with a 4.6 Fr 28 cm double-J stent (DBJ), and the procedure was terminated. Postoperative urea-creatinine and electrolyte values were normal. On the 4th postoperative day of the ureteroureterostomy, the nephrostomy catheter was removed, and the double-J stent was found to be in place with direct radiography. On the 9th postoperative day after TLH and the 5th postoperative day after ureteroureterostomy, the patient was discharged with full recovery, with the plans to come for the control one week later and DBJ 6 weeks later.

## DISCUSSION

Gynecological surgeries are responsible for 65%-75% of iatrogenic ureteral damage.<sup>6</sup> Enlarged uterus, obesity, pelvic adhesions, history of previous surgery, endometriosis, and intra-operative hemorrhage have been identified as risk factors for ureteral injury.<sup>3</sup> The ureter is most vulnerable to injury during several steps of pelvic surgery, when ovarian veins are cut, when uterine arteries are cut, near the ureterovesical junction during dissection of the bladder, and during vaginal cuff closure.<sup>7</sup>

Advanced bipolar devices are one of the safe methods used in tissue dissection and provide hemostasis during surgery. Advanced bipolar devices provide hemostasis by vessel compression and fusing collagen and elastin in the walls of blood vessels through electrical bipolar energy. Lateral thermal energy dissipation that can damage tissue is limited to 2 mm.<sup>8</sup> In monopolar energy, tissue and lateral thermal effects reach higher temperatures. It is recommended to use electrosurgical instruments with the shortest possible application time and low power settings

to avoid undesirable tissue damage.<sup>9</sup> Although our case did not have a history of previous surgery, iatrogenic ureteral injury at the level of the uterine artery was observed as a risk factor during the adhesiolysis of dense pelvic adhesions resulting from possible previous pelvic infections. Postoperative symptoms are usually abdominal or right flank pain, vomiting, hematuria and are usually diagnosed in 7-10 days postoperatively.<sup>10</sup> In our case, the patient did not have any symptoms until the nephrostomy.

Ureteral injury can be suspected and evaluated by direct visualization of ureteral dilatation or interruption and the absence of ureteral peristalsis, or it can be diagnosed by the presence of hematuria and absence of ureteral jet flow in cystoscopy. While bladder injury can be detected in 52%-87% intraoperatively, the rate of detecting ureteral injury is 4%-12%.<sup>3</sup> Although cystoscopy is not recommended routinely after gynecological surgeries, it is recommended to be performed in cases where the suspicion of urological injury is high, or the surgical experience is not high, although there are different opinions in the literature.<sup>11</sup> Some normal cystoscopy findings interpreted as "abnormal" may lead to unnecessary intervention. Some urological injuries, such as thermal injury, may not be immediately visible during cystoscopy.<sup>12</sup> In our case, despite the iatrogenic ureteral injury, peristalsis and jet flow were observed in both ureteral orifices in the diagnostic cystoscopy performed after the operation.

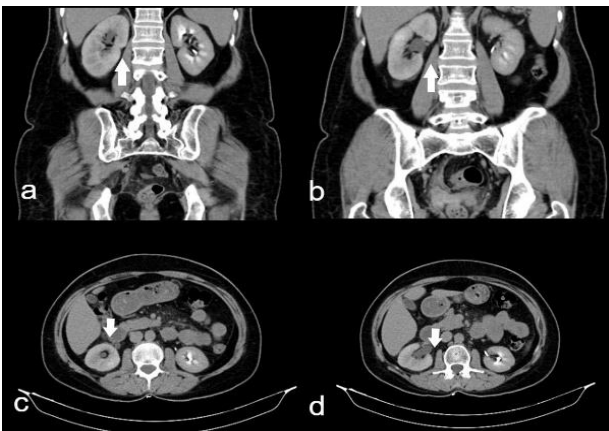
Urinary ultrasonography is a low-cost and useful diagnostic method used in the evaluation of ureteral injury after hysterectomy. It can be a reliable alternative to IVP, especially in countries with limited medical resources.<sup>13</sup> Urinary ultrasonography is preferred compared to IVP because of its cost-effectiveness, no need for contrast material, and similar effectiveness in diagnosing hydronephrosis.<sup>14</sup> Color Doppler ultrasonography can also be used to evaluate ureteral jet flow.<sup>15</sup> In our case, on the postoperative first day, grade 1 hydronephrosis was detected in the preoperatively normal urinary ultrasonography findings, and further investigation and treatment were planned.

In cases where the postoperative ureteral injury is suspected, the best diagnostic tool is contrast computed tomography (CT) with excretory phase according to the European Association of Urology (EAU) and the American Urological Association (AUA).<sup>16,17</sup> Findings that can be detected on CT include ureteral extravasation, urinoma, hydronephrosis, and ascites. In addition, retrograde or anterograde pyelography is one of the radiological diagnostic methods with high sensitivity for ureteral injury, especially when stenting is applied.<sup>18</sup> In our case, CT urography was taken as the second examination after renal ultrasonography. Delayed right kidney function was observed in CT urography, and no contrast material transfer into the right collecting system was observed. Therefore, there is no contrast material filling in the right

ureter. With these findings, a diagnosis of distal ureteral injury was made.



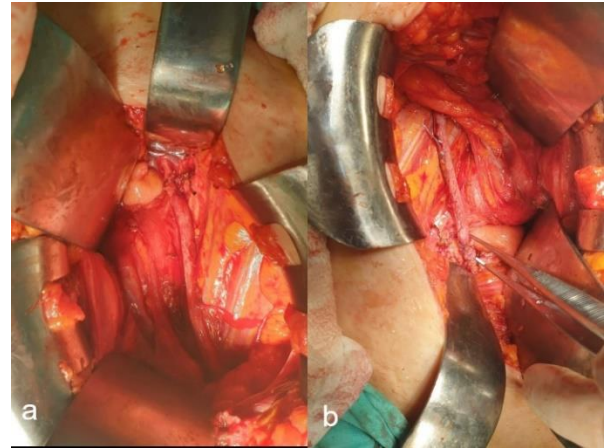
**Figure 1: Grade 1 pelviectasis.**



**Figure 2: (a and b) In the coronal section, delayed right kidney function was observed. Contrast material transfer into the right collecting system was not observed. (c and d) In the transverse section, delayed right kidney function was observed. Contrast material transfer into the right collecting system was not observed.**



**Figure 3: Anterograde pyelography distal ureteral obstruction.**



**Figure 4: (a) Ureteral injury before anastomosis, (b) view after ureteroureterostomy.**



**Figure 5: Double J stent and nephrostomy.**

According to EAU and AUA, urethral pathologies detected during surgery should be intervened if the patient is stable. If the patient is unstable or has a significant colonic injury requiring colectomy, definitive treatment is delayed by recommending ureteral ligation and urinary diversion procedures with a nephrostomy catheter. Although early repair is contradictory, it can be applied in the first 72 hours postoperatively. After this period, the ureteral stent, nephrostomy, or both procedures are delayed for six weeks to avoid the inflammatory process.<sup>19</sup> Although it varies according to the type and size of the ureteral injury, it heals spontaneously in 75% of the patients after stenting.<sup>18</sup> In our case, the early surgery option was successfully applied, and the patient was operated on on the 4th day and was discharged on the 9th day.

The surgical repair method to be chosen varies depending on the size, type, localization of the ureteral injury, and trauma type. Treatment options for proximal ureteral injury include ureteroureterostomy, ureterocalycostomy,

transureteroureterostomy, intestinal transposition, and auto-transplant.<sup>16</sup> Ureteroureterostomy is preferred if the lesion is smaller than 3 cm, and tension-free anastomosis can be performed.<sup>20</sup> In our case, the Gibson incision ureteroureterostomy method was preferred, which is the ideal incision for the extraperitoneal approach of accessing the distal ureter. Lower pole ureterocalicostomy is recommended when there is a risk of fibrosis or ischemia in the renal pelvis.<sup>21</sup> Transureteroureterostomy can be performed in patients with ureteral tissue loss greater than 3 cm.<sup>16</sup> One of the methods described in the literature for urethral stricture or injury is buccal mucosal graft, first described in 1999.<sup>22</sup> It is used to avoid intestinal transposition in long or complex proximal or complex proximal or mid-urethral injuries where ureteroureterostomy is not possible.

Most iatrogenic ureteral injuries occur at the distal ureteral level. Since distal injuries are at the level of the internal iliac artery, they are at high risk for ischemia. Therefore, according to EAU and AUA, reimplantation and stent placement are recommended instead of ureteroureterostomy for injuries distal to the iliac vessel.<sup>16,17</sup> When tension-free reimplantation is not possible, the surgeon may use a Psoas attachment or a Boari flap to close the opening. The Boari flap provides a tension-free ureteroneocystostomy to close longer openings in the medial to distal ureteral injuries. For longer openings, the Boari flap can be combined with a Psoas hitch.

## CONCLUSION

In our case, the patient had no postoperative symptoms. The ureteral injury was suspected when newly developing renal pelvic ectasia was detected by preoperative and postoperative renal ultrasonography, which we routinely performed after total laparoscopic hysterotomy operations. Although the ureteral injury is usually diagnosed in 9-10 days postoperatively according to the literature, although our was asymptomatic, we suspected ureteral injury by routine postoperative urinary ultrasonography and planned further examination and treatment. In this way, the diagnosis was made on the 1st postoperative day and the nephrostomy catheter on the 2nd postoperative day. The definitive treatment of the ureteroureterostomy on the 4th postoperative day showed the importance of urinary ultrasonography and a multidisciplinary approach in the early diagnosis of ureteral injuries.

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