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Laparoscopic Ureteroureteral Anastomosis for Distal Ureteral Injuries during Gynecologic Laparoscopic Surgery

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ABSTRACT **Study Objective:** To estimate the feasibility and surgical outcomes of laparoscopic ureteroureteral for treatment of distal ureteral injuries.
Design: Retrospective clinical study (Canadian Task Force classification II-2).
Setting: University teaching hospital.
Patients: Four women with ureteral transection or ureterovaginal fistula.
Intervention: Laparoscopic ureteroureteral .
Measurements and Main Results: Median age of patients was 44 (range, 33–63) years, and median operating time was 110 (range, 85–150) minutes. There were no conversions to laparotomy. No intraoperative or postoperative complications occurred. Follow-up ranged from 20 to 46 months. All patients have been asymptomatic, and follow-up intravenous pyelograms and ultrasound examinations have been normal.
Conclusion: Laparoscopic ureteroureteral anastomosis is an alternative surgical option in women with distal ureteral injuries during gynecologic laparoscopic surgery. Journal of Minimally Invasive Gynecology (2010) 17, 468–472 © 2010 AAGL. All rights reserved.

Keywords: Anastomosis; Complication; Gynecology; Laparoscopic surgery; Ureter

The reported incidence of ureteral injury related to pelvic surgery is 0.1% to 2% [1–4]. Recently, the frequency of genitourinary tract complications or injuries has tended to increase as complex and varied laparoscopic surgical procedures are more frequently performed in gynecology [5–7]. Unlike injury to the bladder or urethra, ureteral injury may directly influence ipsilateral renal function; thus, early detection and treatment are crucial to prevent deterioration of renal function and to secure a good prognosis [1]. Gynecologically, the frequency of distal ureteral injury is higher than injury to other parts of the ureter. The treatment of choice for surgical management of such distal ureteral injuries was introduced by Harrow in 1968, and recent studies have shown its positive long-term results [8–10]. Since Reddy et al reported successful laparoscopic ureteroneocystostomy in adults, many studies have been reported using this technique to treat distal ureteral strictures caused by endometriosis, distal ureteral transection during surgery, or ureterovaginal fistula [5,8–15]. Although this surgical method requires diverse and complicated surgical procedures and a long operating time, it is preferred over ureteroureteral anastomosis as a surgical method for distal ureteral injuries because of concerns about the increased possibility of stricture. Consequently, the number of reports of ureteroureteral anastomosis is relatively small [2,4,6,7,16]. Accordingly, the present study focuses on analyzing the feasibility and surgical outcomes of laparoscopic ureteroureteral anastomosis for treatment of distal ureteral injuries such as transection and ureterovaginal fistula that have occurred during gynecologic laparoscopic surgery.

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Materials and Methods

Four patients who underwent laparoscopic management of distal ureteral injuries was selected from 3798 patients who had undergone various gynecologic laparoscopic surgeries at Kangbuk Samsung Hospital from March 2003 through December 2009. All injuries occurred 3 to 4 cm from the ureterovesical junction and were identified intraoperatively except for 1 ureterovaginal fistula identified after laparoscopically assisted vaginal hysterectomy. We reviewed the patient medical, operative, and anesthesia records. Operating time was defined as the time from detection of ureteral transection to confirmation of no leakage of indigocarmine from the anastomotic site using intravenous indigocarmine injection. The study was approved by the Kangbuk Samsung Hospital Institutional Review Board.

Operative Techniques

As soon as ureteral transection injury was detected, the ureter was freed from the ureterovesical junction to the cross-region over the iliac vessels. The proximal and distal ends of the cut ureter were resected, making sure to leave 2 healthy endings. The ureteral ends were mobilized to enable anastomosis without tension, and the ends were transected at 45 degrees to the length of ureter to maximize the contact area without spatulation of both ureteral ends [2]. After a urogynecologic expert (K.W.L.) inserted a guidewire through the ureteral orifice in the urinary bladder via cystoscopy, a laparoscopic surgeon (J.S.C.) placed a guidewire from the cut distal ureteral end into the kidney without tension by inserting the guidewire into the proximal end of the ureter. After safely placing the guidewire, both surgeons replaced it with a double-J catheter. After this procedure, the laparoscopic surgeon placed 1 or 2 polyglactin 910 sutures (3-0 Vicryl; Ethicon, Inc., Somerville, NJ) in the part of bladder wall close to the periureteral tissues and the proximal end of the ureter. This served 3 purposes during laparoscopic ureteroureteral anastomosis: it prevented secondary ureteral injury, averted breakage of the 4-0 Vicryl sutures, and made sewing easier. Laparoscopic ureteroureteral anastomosis was performed using 4-0 Vicryl interrupted sutures with intracorporeal suture techniques over a double-J catheter without tension. The first 2 sutures were placed at the 6- and 12-o'clock positions to establish proper alignment. Two or 3 additional sutures were then placed on each side of the anastomosis between the aligning sutures. After anastomosis was successfully completed, leakage of dye was checked after intravenous injection of indigocarmine. The previous 3-0 Vicryl sutures were removed (Fig. 1). The anastomosis site was wrapped with omentum to facilitate good healing except in 1 patient with ovarian cancer.

In 1 patient, a ureterovaginal fistula was identified postoperatively. The affected ureter was identified and traced from above the level of the iliac vessels and dissected downward to the level of the ureterovaginal junction. The distal end of the ureter was freed from dense adhesions, and the fistula portion along with the diseased portion of the ureter were excised. Wide dissection was used to free the bladder from the space of Retzius. The anastomosis method was the same as described above. In all patients, the Foley catheter was removed after 2 weeks, and the stents were removed after 6 or 8 weeks. Intravenous pyelography and ultrasound examinations were performed, and were repeated at 6 and 12 months after treatment.

Results

During the study, 3 patients with intraoperatively detected ureteral transection and 1 patient with postoperatively detected ureterovaginal fistula underwent laparoscopic ureteroureteral anastomosis. In all 4 patients, laparoscopic ureteroureteral anastomosis was performed. All procedures were performed by an expert gynecologic laparoscopist (J.S.C.). Median patient age was 44 (range, 33–63) years, and operating time was 110 (85–150) minutes. There were no conversions to laparotomy, intraoperative complications, or postoperative complications that resulted from the laparoscopic ureteroureteral anastomosis. Patient characteristics are given in Table 1.

Patient 1 underwent laparoscopic radical vaginal hysterectomy (LRVH) with left salpingo-oophorectomy, laparoscopic pelvic lymphadenectomy, laparoscopic para-aortic lymphadenectomy, laparoscopic right ovarian transposition, and laparoscopic appendectomy because of cervical cancer FIGO stage IB2. Transection of the left ureter occurred during dissection of the left parametrial tunnel. After adjuvant radiation therapy for 6 weeks, the double J-catheter was removed. The patient has remained healthy without special problems or recurrence.

Patient 2 was discharged without complications on postoperative day 3. Three days later, the patient was readmitted because of watery vaginal discharge. On postoperative day 9, laparoscopic ureteroureteral anastomosis was performed because of ureterovaginal fistula. She is currently symptom free.

Patient 3 was hospitalized because of abdominal distention with massive ascites and peritoneal carcinomatosis. Based on intraabdominal inspection after laparoscopic bilateral salpingo-oophorectomy was performed for diagnostic tissue confirmation, there was no possibility of optimal debulking surgery. The patient underwent 6 cycles of taxol-carboplatin chemotherapy, followed by laparoscopic interval debulking surgery that included extrafascial type-II hysterectomy, laparoscopic pelvic lymphadenectomy, laparoscopic paraaortic lymphadenectomy, laparoscopic omentectomy, laparoscopic appendectomy, and multiple random peritoneal biopsies. Transection injury of the right ureter occurred while dissecting the right parametrium from the ureter; however, omental wrapping was impossible because the patient had already undergone laparoscopic omentectomy. The patient received 3 additional cycles of chemotherapy after the surgery. The double-J catheter was removed 6 weeks after laparoscopic ureteroureteral anastomosis, and 24-month follow-up has not demonstrated any evidence of cancer recurrence or surgery-associated complications.

Patient 4 with cervical cancer IB1 underwent LRVH, laparoscopic pelvic lymphadenectomy, laparoscopic appendectomy, and laparoscopic both ovarian transposition. A left ureteral transection injury was found during dissection of the left parametrial tunnel. At 16-month follow-up after this surgery, the patient was healthy.

Follow-up in these 4 patients ranged from 20 to 46 months. All 4 patients have been asymptomatic, and follow-up intravenous pyelograms and ultrasound examinations have been normal (Fig. 2).