

# Double-J stenting: initial management of injured ureters recognized late after gynecological surgery

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## Abstract

**Introduction and hypothesis** To evaluate the efficacy of double-J stenting as an initial procedure to manage ureteral injuries detected late after gynecological surgery.

**Methods** Eight patients whom the insertion of double-J stent was done primarily were evaluated. Medical records were investigated retrospectively.

**Results** Ureteral injuries were unilateral in seven and in one patient was bilateral (nine ureters in total). In two patients that double-J stentings were failed underwent open surgery. In six patients (seven ureters), double-J stentings were successful either by cystoscopy or ureteroscopy and four ureters were recovered without sequelae. However, in three ureters, stenosis was remained and managed by ureteral dilation with placement of double-J stent. But, one was lost at follow-up schedule.

**Conclusions** Ureteral double-J stenting, as first-line treatment, could avoid invasive urological surgery in damaged ureter detected after gynecological surgery. More cases are needed for accurate conclusions.

**Keywords** Iatrogenic · Injury · Ureter · Gynecology · Surgery

## Abbreviations

IVP	Intravenous pyelography
PCN	Percutaneous nephrostomy
LAVH	Laparoscopically assisted vaginal hysterectomy
RH	Radical hysterectomy
AH	Abdominal hysterectomy

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## Introduction

Iatrogenic ureteral injuries are caused by diverse surgeries in the abdomen and the pelvic cavity. In most cases, cause by gynecological surgeries is most prevalent because ureter is in close proximity to cervix [1]. Twenty to thirty percent of such ureteral injuries are detected during operation, and the rest are detected delayed after surgery. Cases detected during surgery could be cured by immediate surgical repair. On the other hand, in cases detected several days after surgery, it is recommended either to perform the delayed repair after 3 months or to repair immediately, although it is still controversial [2]. Surgical repairs, such as ureteroneocystostomy, resection and end-to-end anastomosis, reimplantation using psoas hitch or Boari flap, transureteroureterostomy, or renal autotransplantation are the most reliable methods leaving rare complications as the treatments of iatrogenic ureteral injury. However, additional surgical procedures come in stress to both patients and gynecologists. To make matters worse, ureteral injuries caused by gynecological surgery may result in litigation [3].

Fortunately, in cases of incomplete ureteral injury, it could be repaired by the placement of double-J stent at the time of recognition. We evaluated the outcome of double-J stent placement as the initial treatment prior to open urological surgery for ureteral injury detected delayed after gynecological surgery.

## Materials and methods

From 2002 to 2007, among patients with iatrogenic ureteral injury detected delayed after gynecological surgeries in the pelvic cavity, patients who were attempted to place ureteral stent as an initial treatment modality were included in this

study. Based on their disease history and radiological findings, a retrospective study was done. The patients were examined in details such as their gynecological disease, procedures of gynecological surgery, time of injury recognition, symptoms that led to the recognition of ureteral injury and the method of the insertion of ureteral stent (Table 1). The location of the injured ureter, type of injury was diagnosed either by intravenous pyelography (IVP) or CT scan pyelography, which showed leakage of contrast medium or ureteral dilatation or both. The double-J stents were kept in place for 6 to 8 weeks and the success of stent placement was assessed by IVP at 3 and 12 months after the removal of stent.

Double-J stent placement was performed under by using 21 Fr. rigid cystoscopy. The size of the double-J stent was 6 Fr. and 26 or 28 cm in length. As initial step, The insertion of a guidewire through the ureteral orifice followed by double-J stent. If this procedure was not successful, an 8.5 Fr. rigid ureteroscopy was inserted in the injured ureter under general anesthesia. When the proximal end of the injured ureter was observed, a double-J stent was placed by the insertion of a guide wire. But, in failed cases with this procedure, urological managements were converted to open surgeries after percutaneous nephrostomy (PCN).

## Results

During the 5-year period, eight patients (range, 39–62 years old) detected late after gynecological surgery were treated initially by placement of double-J stent (unilateral in seven and bilateral in one patient, nine ureters in total). Gynecological diagnoses were uterine myoma in four patients and cervix cancer in four patients. The gynecological surgeries which caused ureteral injury were radical hysterectomy in four patients, abdominal hysterectomy in two patients, and laparoscopically assisted vaginal hysterectomy in two patients. The injured ureters were localized as follows; six patients in the lower ureter (three left-sided and three right-sided ureters), one patient in both mid right-sided and lower left-sided ureters, and one patient in the mid right-sided

ureter (Table 1). Types of injury were incomplete laceration in four ureters, partial obstruction in three ureters, and both in two ureters.

Regarding the urological symptoms of the patients, they presented with flank or abdominal pain, fever, urinary leakage, or oliguria. In the matter of the time discovered ureteral injury after gynecological surgery, two patients were perceived within 1–2 weeks, two patients within 2–4 weeks, and four patients took longer than 4 weeks.

Ureteral double-J stentings were performed by cystoscopy first, and in failed cases, by ureteroscopy. Thus, double-J stentings were successful in 6 patients (7 ureters). However, in 2 unilateral patients that double-J stentings failed open surgeries were done after PCN. Double-J stent was removed through cystoscopic examination after 6 to 8 weeks of placement (Table 2).

IVP taken after 12 months of removal of stent showed good patency without stenosis in three (four ureters) including one bilateral patient (Figs. 1 and 2). However, three patients (three ureters) showed stenotic findings, and thus ureteral dilation with reinsertion of double-J stent was performed. As the results, two patients (two ureters) were kept well without further ureteral dilation. But one patient was lost to follow-up.

## Discussion

Ureter is vulnerable to be injured by extensive pelvic surgery because it travels very close to cervix in female patients. Among the causatives of iatrogenic ureteral injury excluding ureteral injury caused by endourological surgeries, the most prevalent causative is gynecological surgery in the pelvic cavity. Particularly, abdominal hysterectomy has been known to be the most frequent causative. The incidence of ureteral injury during hysterectomy is known to be approximately 2–3% [4]. And recently, a trend is the increase of reports as the increase of laparoscopic surgery [5]. In addition, ureteral injury may be caused by cystocele and enterocele repairs, and other transvaginal surgery. One of the risk factors of iatrogenic ureteral injury is radical

**Table 1** Patients characteristics

Patient	Age	Diagnosis	Surgery	Injured ureter	Recognition (weeks)
A	41	Uterine myoma	LAVH	Lt. lower	2
B	53	Uterine myoma	LAVH	Rt. lower	4
C	40	Uterine myoma	AH	Rt. lower	4
D	51	Uterine myoma	AH	Lt. lower	4
E	62	Cervical cancer	RH	Lt. lower	1
F	54	Cervical cancer	RH	Rt. middle, Lt. lower	2
G	39	Cervical cancer	RH	Rt. middle	4
H	42	Cervical cancer	RH	Rt. lower	1

LAVH laparoscopically assisted vaginal hysterectomy, RH radical hysterectomy, AH abdominal hysterectomy

**Table 2** Double-J stenting and results

Patient	Route	Success(S) or failure (F)	Duration (weeks)	Stricture	Additional treatments
A	Cystoscopy	S	8	No	(-)
B	Ureteroscopy	F	PCN	No	Psoas hitch
C	Ureteroscopy	S	7	No	(-)
D	Ureteroscopy	S	8	No	(-)
G	Ureteroscopy	F	PCN	No	Ureteroneocystostomy
F	Cystoscopy	S	8	Yes (Rt.)	Ureteral dilation
G	Cystoscopy	S	8	Yes	Ureteral dilation
H	Cystoscopy	S	6	Yes	Ureteral dilation

Route route for stenting, PCN percutaneous nephrostomy, (-) no treatment

resection of malignant tumors rather than benign tumors and other risk factors are the presence of radiation therapy prior to surgery, the existence of inflammatory diseases within the pelvic cavity (endometriosis, pelvic inflammatory disease, diverticulitis), malignant tumors invading the ureter directly, severe pelvic organ prolapse, adhesion and scar caused by previous ureteral surgery [1, 6].

The most frequent site of ureteral injury is the lower ureter within the pelvic cavity including particularly, the lower part of infundibulopelvic ligament, the crossing area of the uterine artery and the ureter, and the vicinity of the cardinal ligament. Unilateral lesion is approximately 85%, and the left side is more prevalent than the right side. But, the reason is not clear [7, 8]. In our patients, the left to right ratio was 4:5.

The early symptoms associated with ureteral injury are flank or abdominal pain and fever. It could manifest as non-specific symptoms such as ileus, abdominal distension and

no symptom, which causes delayed detection. However, it could be detected early when the urine leaks out of operational site [6, 9]. In our patients, symptoms were relatively similar to those of mentioned above. Ureteral injury detected delayed is diagnosed by validating the leakage of contrast medium, hydronephrosis and hydro-ureter through IVP or CT scan pyelography. Retrograde pyelography may help assess the site and level of ureteral injury. However, this method is not applicable to the all patients, since the injury level is difficult to assess accurately in some patients [10]. We did not do retrograde pyelography as well.

The treatment of ureteral injury basically depends on the general condition of patient, the location of injury, the type of the previous surgery, associated injuries and the level of adhesion rather than pathological mechanisms. Subsequently, the surgery time and method are determined upon the conditions mentioned above.



**Fig. 1** Leakage of contrast medium at the right lower ureter on IVP (arrow). Double J stent was inserted by ureteroscopy



**Fig. 2** No leakage of contrast medium is seen at the right lower ureter on 12 months after double J stent was removed

The preservation of kidney function by decompressing upper urinary tract is the main goal, and cessation of urine leakage improves quality of life for those patients [11]. To determine the appropriate time to treat ureter injury delayed detected, it is recommended either to perform surgical repair immediately [12] or after 3 months, depending on investigators [4]. The recommendation to perform repair immediately upon the detection of ureteral injury persists on the fact that if PCN placed, it may induce the development of pyelonephritis and the discomfort of patient. However, immediate repair may cause surgical failure because of inflammation or adhesion of tissues by previous gynecological surgery. Dowling et al. [4] reported that immediate repair is required for the cases detected within 3 days, and PCN or double-J stenting for 6–8 weeks is required when the injury is detected after 3 days. Gangai et al. [13] reported that for the cases detected within 8–10 days after surgery, good prognosis could be obtained by performing immediate repair when the patients had no previous radiation therapy or inflammation is not severe.

As the development of urological equipments and techniques, numerous attempts to heal the ureteral defects by placing the ureteral stent prior to surgical intervention were made. Giberti et al. [14] reported that ureteral injury detected delayed may be healed by placement of double-J stent first in some cases, and in case of ureteral stenosis after double-J stent, this could be managed by incising the stenotic tissues with a cold knife or dilating with a balloon.

Koonings et al. [15] reported successful outcomes of treatment in ureterovaginal fistula detected delayed by placing double-J stent under ureteroscopic examination in case that cystoscopic insertion of double-J stent was failed. In our cases, double-J stent under cystoscopy was tried first, however, in failed cases, the insertion was performed through ureteroscopy under general anesthesia. However, we should keep in mind that the placement of ureteral stent is not always successful and the procedure of the placement of double-J stent itself may cause additional injury [16]. In our cases, ureteral dilation was performed using a dilator because of stenosis after stent removal in only three out of nine ureters. Like these, if double-J stent could be placed successfully either by cystoscopy or ureteroscopy, good results could be obtained without PCN or open surgery [17]. Meanwhile, Liatsikos et al. [18] reported a successful case that a guide wire was inserted as antegrade route through the nephrostomy into the bladder followed by double-J stent. In our patients, we did not perform this method because we did not expect that antegrade insertion of double-J stent could be easily done and might have possibility of malposition of double-J stent.

However, in failed cases of double-J stenting, it is unavoidable to perform the PCN to preserve renal function for 3 months. In our cases, PCN were placed in two patients whom the insertion of double-J stent was failed. Once double-J stent was placed, open surgery could be avoided in 73% of patient [19], although its success rates was 20–50% [20]. In our cases, the placement of double-J stent could be achieved in six patients, and thus open surgery was not required.

However, Ku et al. [3] reported that the success rate of immediate surgery as the treatment for iatrogenic ureteral injury detected delayed was higher than both the placement of ureteral stent and PCN. They insisted that if the patient had wide injury area, the possibility of healing by PCN or double-J stenting was very low. In such cases, surgery should be considered first as an initial treatment. In addition, among patients performed PCN only, additional treatments were required in comparison with patients placed double-J stent. This is because of the fact that if PCN is performed without the placement of stent in the injured ureter, the possibility of the development of stenosis in the injured area is high. In our cases, two patients whom double-J stenting was failed were performed open surgery at 3 months after PCN.

In order to prevent iatrogenic ureteral injury, preoperative IVP or ureteral stenting to recognize the ureter during dissection prior to gynecological surgery should be considered, although these methods are not always effective in prevention [21]. The recognition of the anatomical variation of ureters and careful dissection during surgery may help reduce iatrogenic ureteral injuries. Furthermore, early recognition of ureteral injury and immediate repair during surgery would reduce the morbidity and urological complications. In addition, it is believed that even for ureteral injury detected late after the completion of gynecological surgery, attempting to place a ureteral stent first may be an acceptable method to avoid open surgery or reduce the morbidity of patient.

## Conclusion

In our study, double-J stent placement either by cystoscopy or ureteroscopy showed good results as the management of iatrogenic ureteral injury detected late after gynecological surgery in spite of limited number of applicable patients and recurred stenosis which needed ureteral dilatation. Therefore, we carefully suggest that prior to considering open surgery, attempting the placement of ureteral stent should be selected as one of treatment methods. However, more cases are needed to see the outcomes of double-J stent as initial treatment for iatrogenic ureteral injury recognized late after surgery.

**Conflicts of interest** None.

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