

## J-Tube Technique for Double-J Stent Insertion During Laparoscopic Upper Urinary Tract Surgical Procedures

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### Abstract

Double-J stent insertion has been generally performed during laparoscopic upper urinary tract (UUT) surgical procedures to prevent transient urinary tract obstruction and postoperative flank pain from ureteral edema and blood clots. Several restrictive conditions that make this procedure difficult and time consuming, however, include the coiled distal ends of the flexible Double-J stent and the limited bending angle of the laparoscopic instruments. To overcome these limitations, we devised a Double-J stent insertion method using the new J-tube technique. Between July 2011 and May 2013, Double-J stents were inserted using the J-tube technique in 33 patients who underwent a laparoscopic UUT surgical procedure by a single surgeon. The mean stent placement time was  $4.8 \pm 2.7$  minutes, and there were no intraoperative complications. In conclusion, the J-tube technique is a safe and time-saving method for Double-J stent insertion during laparoscopic surgical procedures.

### Introduction

THE INDICATIONS FOR A LAPAROSCOPIC upper urinary tract (UUT) surgical procedure include ureteral stones and ureteropelvic junction obstruction (UPJO). Although extracorporeal shockwave lithotripsy (SWL) and ureteroscopic ureterolithotomy (URSL) were applied as first-line treatments for the majority of patients with ureteral stones,<sup>1,2</sup> laparoscopic ureterolithotomy can be a viable therapeutic alternative to an open surgical procedure in selected patients.<sup>3–5</sup> In comparison with open pyeloplasty, laparoscopic pyeloplasty for UPJO can also be a feasible and safe treatment modality with fewer complications and better cosmetic results, if it is performed by experienced laparoscopic surgeons.<sup>6–8</sup>

In most laparoscopic UUT surgical procedures, intraoperative ureteral stent (Double-J stent) insertion is usually needed to prevent transient ureteral obstruction caused by ureteral edema and hematoma. Double-J stent insertion during a laparoscopic surgical procedure, however, is considered a difficult and time-consuming process because of several limitations, including the flexibility and coiled distal ends (“pig tail” shape) of the stent itself, the limited bending angle of the laparoscopic instruments, and the narrow laparoscopic visual field. To overcome these limitations and make the stent insertion procedure more convenient, we developed an antegrade Double-J stent placement method using the “J-tube technique” to obtain acceptable results (a supplementary video is available at [www.liebertpub.com/end](http://www.liebertpub.com/end)).

### Technique

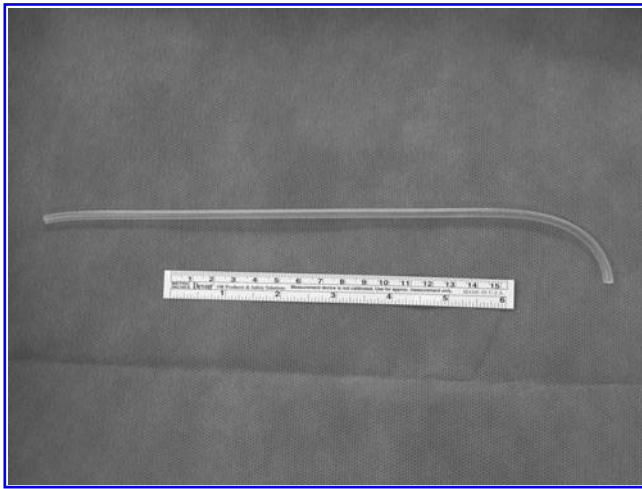
We devised a 25-cm long synthetic plastic tube with one end bent at approximately 90 degrees to represent a “J” (Fig. 1). Its outer diameter and inner diameter were 5 mm and 3 mm, respectively. The Double-J stents with a 6F or 7F thickness and 24 cm or 26 cm length were selected depending on patient characteristics such as the height of the patient (Fig. 2).

For laparoscopic ureterolithotomy or pyelolithotomy, the distal end of the J-tube was placed into the distal opening of the vertical incision site in the ureter or renal pelvis through an appropriate port after stone extraction. For laparoscopic pyeloplasty, the distal end of the J-tube was positioned into the ureteral lumen after the completion of posterior ureteropelvic anastomosis using a running suture. A guidewire was inserted through the J-tube into the bladder. Next, a pusher was used to advance a 6F or 7F Double-J stent through the lumen of the J-tube with the assistance of the inserted guidewire (Fig. 3A). While stabilizing the pusher, the J-tube and guidewire were withdrawn, and the coiled upper end of the Double-J stent was inserted into the proximal opening of the ureter (for laparoscopic ureterolithotomy) or the lumen of the renal pelvis (for laparoscopic pyeloplasty) using laparoscopic forceps. The laparoscopic forceps were also used while making adjustments, to ensure that both ends of the double-J stent were in the appropriate position (within the bladder and renal pelvis) (Fig. 3B).

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A video demonstrating this technique is available at [www.liebertpub.com/end](http://www.liebertpub.com/end)

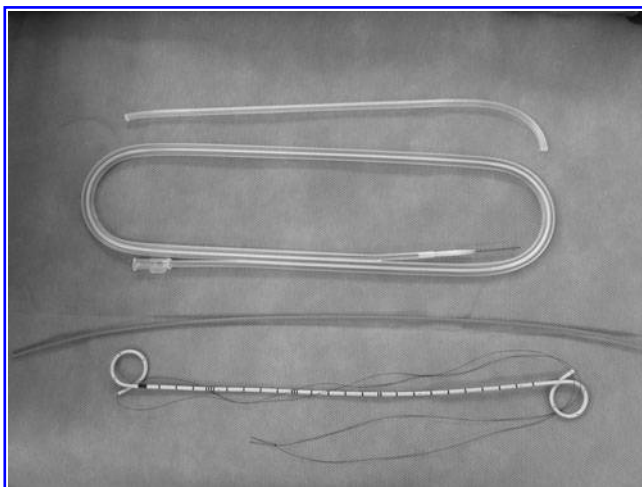


**FIG. 1.** J-tube: Synthetic plastic tube with approximately 25 cm length, 5 mm of outer diameter, and 3 mm of inner diameter.

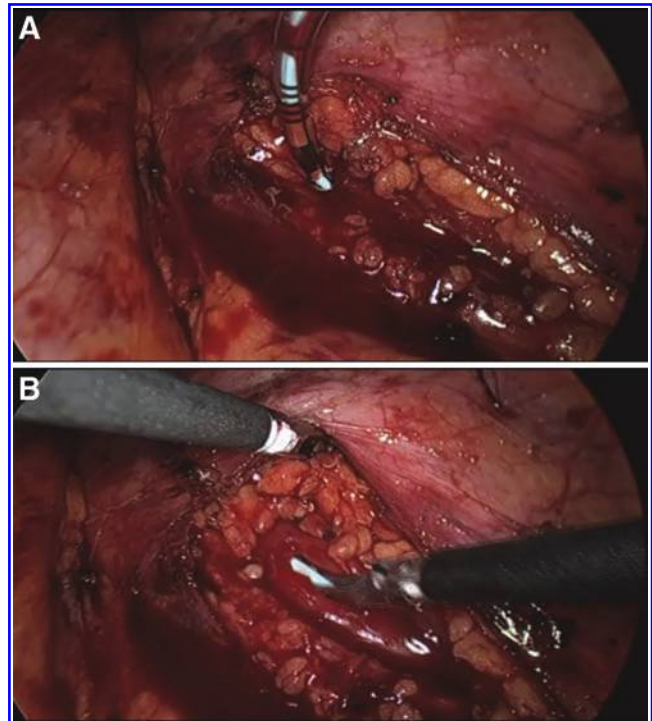
Even if this process was conducted with a blind method, we used the Double-J stent with the 2 cm longer length than a conventionally used stent for each patient and repositioned the inserted Double-J stent toward the proximal portion, if possible. At this point, if there was no more migration toward the proximal portion despite slightly excessive traction, the distal tip of the Double-J stent was considered being properly placed within the bladder. Finally, the open incision site of the urinary tract was intracorporeally closed with a continuous running suture.

#### Equipment

- Synthetic plastic J-tube
- Double-J stent with open ends (6F or 7F, 24 or 26 cm) and pusher
- Guidewires (0.035 inch)
- Laparoscopic grasping forceps



**FIG. 2.** J-tube, guidewire, pusher, and Double-J stent (top to bottom).



**FIG. 3.** Laparoscopic Double-J stent insertion using the J-tube technique. (A) Double-J stent advanced under assistance of guidewire within the J-tube. (B) The adjustment of the inserted Double-J stent using laparoscopic forceps.

#### Role in Urologic Practice

Our study cohort included 33 patients who underwent Double-J stent insertion with the J-tube technique during a laparoscopic surgical procedure by a single surgeon (CWJ) from July 2011 to May 2013. The demographics of the patients and the perioperative results are listed in Table 1. The following types of laparoscopic surgical procedures were performed: Pyeloplasty (11 cases), pyelolithotomy (3 cases), ureterolithotomy (12 cases), concomitant pyeloplasty with pyelolithotomy (3 cases), and concomitant pyelolithotomy with ureterolithotomy (4 cases). Among these, eight procedures (24.2%) were performed by laparoendoscopic single-site surgery (LESS) and one case was a robot-assisted laparoscopic operation. There were no conversions to an open surgical procedure in any case.

Double-J stents were successfully positioned without any intraoperative complications in any case. The mean stent insertion time was  $4.8 \pm 2.7$  minutes, which could be achieved in  $< 10$  minutes, with the exception of only one operation that took 15 minutes. LESS needed a longer stent placement time than a conventional laparoscopic surgical procedure ( $8.2 \pm 3.5$  vs  $3.8 \pm 1.2$  min,  $P < 0.001$ ).

Laparoscopic surgical procedures for UUT disease, including ureteral stones and UPJO, have been known to comply with the basic surgical principles of existing open operations and have been proven to be a reliable and effective treatment, with comparable results to open procedures. Several studies, which involved a comparative analysis with open ureterolithotomy, demonstrated that laparoscopic ureterolithotomy showed similar outcomes for operative time and intraoperative blood loss, but had significant advantages

TABLE 1. PATIENT DEMOGRAPHICS AND PERIOPERATIVE RESULTS

Age (years)	47.5 ± 18.7	
BMI (kg/m <sup>2</sup> )	24.3 ± 3.2	
Sex (M:F)	23:10	
Laterality (Right:Left)	18:15	
Incision site (number) (%)		
Renal pelvis	3 (9.1%)	
Ureteropelvic junction	21 (63.6%)	
Upper ureter	9 (27.3%)	
Double-J stent size (number) (%)		
6F	3 (9.1%)	
7F	30 (90.9%)	
Double-J stent length (number) (%)		
24 cm	18 (54.5%)	
26 cm	15 (45.5%)	
Extracted stone size (mm)	18.6 ± 4.1	
Mean operative time (min)	162.9 ± 70.4	<i>P</i> = 0.002
Conventional laparoscopy	141.5 ± 62.1	
LESS	227.5 ± 60.5	
Mean stent insertion time (min)	4.8 ± 2.7	<i>P</i> < 0.001
Conventional laparoscopy	3.8 ± 1.2	
LESS	8.1 ± 3.5	
Mean stent removal time (days)	35.6 ± 10.7	

BMI = body mass index; LESS = laparoendoscopic single-site surgery.

for intraoperative analgesic dosage, postoperative hospital stay, postoperative recovery period, and cosmesis.<sup>4,9</sup> It has also been demonstrated that laparoscopic ureterolithotomy can be a therapeutic alternative in selected patients who need an open surgical procedure, such as those with failed SWL or URSL and large (>15 mm), dense, and impacted stones in the upper to midureter or renal pelvis.<sup>3,5,10</sup>

Currently, the standard treatment for patients with UPJO is open dismembered pyeloplasty, but there are several disadvantages of this procedure including surgical site pain and large long-term surgical scars. Since the first report regarding successful laparoscopic pyeloplasty for UPJO was published in 1993,<sup>11</sup> laparoscopic pyeloplasty has been described as a safe and effective treatment alternative for UPJO, with a comparable success rate to that of open pyeloplasty.<sup>6-8</sup>

The focus of our study was to describe the new technique used to place the ureteral stent during a laparoscopic surgical procedure; therefore, a detailed review of the process and outcomes of the laparoscopic procedures was not included.

An important process when performing laparoscopic surgical procedures for the UUT is the placement of a ureteral stent such as the Double-J stent. This procedure is mandatory to prevent transient ureteral obstruction caused by intraoperative ureteral edema and hematoma formation and facilitate anastomotic healing by prompting adequate urine passage. Stent placement can be achieved with either an antegrade or retrograde approach. In laparoscopic procedures, a consensus, with reference to which of the two approaches is more superior and reliable, has not been reached.<sup>12-14</sup> Recently, however, cases of successful laparoscopic antegrade Double-J stent insertion have been reported.<sup>15-17</sup>

In all of the cases in our study, the Double-J stent was placed using an antegrade approach during the laparoscopic procedure because we believed that intraoperative antegrade

ureteral stent insertion would be more time-saving than cystoscopy-guided retrograde Double-J insertion before operation; the latter necessitates a separate cystoscopic set and change in the patient's position from the lithotomy position to the lateral decubitus, which can prolong total operation duration. Also, if the Double-J stent is placed preoperatively, it can lead to discomfort at the time of intraoperative incision for the UUT. In addition, keeping upstream hydronephrosis can make the surgical procedure more convenient.

Many ureteral stent insertion techniques have been reported in the literature thus far.<sup>16-19</sup> The use of various ureteral stent placement techniques during laparoscopic surgical procedures has been shown to make stent insertion easier and time-saving and prevent perioperative complications. One case series described a novel technique of percutaneous pyeloureteral stent placement using a Chiba needle and angiocatheter during laparoscopic pyeloplasty with a mean stent insertion time of 9 minutes and 55 seconds, and no perioperative complications.<sup>17</sup> Similarly, several case series reported the safety and reliability of the antegrade stent placement approach through the puncture site of the abdominal wall using a gauge needle and cannula.<sup>12,15,20</sup>

Unlike preceding studies, no additional puncture was needed for stent insertion in our study because we used an existing laparoscopic port for entry. As a result, there was no requirement for the extra instruments used in the previous studies, such as Chiba needle, angiocatheter, gauge needle, and cannula. Besides, because there was no need for additional incision or puncture in our technique, the definite benefits could be obtained in terms of postoperative better cosmetic result and reduction of pain.

It was also reported in laparoscopic ureterolithotomy that the application of a modified Double-J stent that was closed at both ends and a guidewire made the stent placement procedure easy and saved time.<sup>18</sup> The application of our antegrade J-tube technique in laparoscopic UUT surgical procedures made the stent placement procedure more time-saving, compared with precedent studies. In other words, average stent insertion time of 4.8 minutes using the new J-tube technique was superior to that reported in previous articles.<sup>16,17,19,20</sup> Although stent placement time during LESS was longer than conventional laparoscopic surgical procedures, a stent time of <10 minutes is regarded to be acceptable, compared with the results that have been previously reported.<sup>16,17</sup>

Strictly speaking, the material of our J-tube is not confined to the specific material. Rather, a variety of materials can be possible as a raw material for our new plastic device. In fact, in our practice, the J-tube was made by using the existing sheath around the guidewire. Therefore, it is possible to make the J-tube similar to ours by selecting the suitable guidewire sheath in other centers, which indicates a high likelihood of generalized application for the J-tube may be feasible. In the future, it may be helpful to many surgeons to make the distal end of the J-tube in a cone shape and to create the proximal part of the J-tube by applying a handling design for more comfortable control.

## Conclusions

In laparoscopic UUT surgical procedures, the application of our new J-tube technique would make the stent insertion procedure safe and less time consuming with little complications

and better cosmetic result. It can also be applied during a LESS operation, although this procedure takes longer than a conventional laparoscopic surgical procedure. Although it is currently not for sale in our center, it is fully possible to make the J-tube commercially available in other centers because the J-tube can be easily made and used with existing material.

### Acknowledgments

All of the procedures were conducted after obtaining approval from the Institutional Review Board (IRB) at the Bundang Hospital of Seoul National University (Seongnam, South Korea). The IRB approval number is B-1211/178-111.

### Disclosure Statement

No competing financial interests exist.

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### Abbreviations Used

LESS = laparoendoscopic single-site surgery  
SWL = shockwave lithotripsy  
UPJO = ureteropelvic junction obstruction  
URSL = ureteroscopic ureterolithotomy  
UUT = upper urinary tract