

# First Experience in Taiwan about Antegrade Ureteral Stenting with the Resonance Metallic Stent for Extrinsic Ureteral Compression: A Case Report

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Placement of double-J (D-J) ureteral stents in patients with high grade hydronephrosis may help relieve ureteral obstruction from both intrinsic and extrinsic causes. However, in some cases, the function of plastic stent is not satisfactory even with placement of double D-J stents or a larger 8 Fr diameter stent, because of severe extrinsic compression. We describe our first experience with a new 6 Fr metallic ureteral stent in a patient with colon cancer. A successful one-stage antegrade ureteral stenting procedure was achieved with creation of a percutaneous nephrostomy as well. An antegrade pyelogram showed well function of the indwelling metallic ureteral stent which was designed to provide long-term urinary drainage. This is our initial experience with antegrade ureteral stenting with a Cook Resonance metallic stent for extrinsic ureteral compression and the first reported case in Taiwan. Follow-up is still warranted to evaluate the long-term patency. (JTUA 20:133-6, 2009)

*Key words:* metallic, ureter, stent, extrinsic, ureteral compression.

## INTRODUCTION

Obstructive nephropathy is a common complication of retroperitoneal or pelvic malignancy. Adequate urinary drainage to protect renal function is important. Intrinsic or extrinsic ureteral obstruction can usually be relieved initially with a double-J (D-J) ureteral stent. However, in some cases, the function of a plastic stent is not satisfactory even with placement of double D-J stents or a larger 8 Fr diameter stent, because of severe tight extrinsic compression.<sup>1</sup> Therefore, efforts have been made to develop a ureteral stent suitable for long-term insertion which will remain patent in patients with malignant obstruction. Herein, we present the initial experience in Taiwan of antegrade ureteral stenting managed successfully with a Cook Resonance metallic stent for intractable malignant ureteral obstruction.

## CASE PRESENTATION

A 55-year-old man underwent a left side hemicolectomy for transverse colon cancer (T3N2M1). Para-aortic lymphadenopathy and hepatic metastasis were confirmed by computed tomography (CT). He underwent chemotherapy, first with oxaliplatin, leucovorin (LV) and 5-Fluorouracil (5-FU) three times, and later with irinotecan and LV followed by a 5-FU bolus and 5-FU infusion seven times. But tumor marker, carcinoembryonic antigen (CEA), continued to rise. Six months after presentation, CT revealed the left renal collecting system was dilated with partial adhesion to the splenic flexure of the colon. But there was no evidence of left ureteral lesion under the CT survey. Follow-up ultrasound and renal scan one month later confirmed the left hydronephrosis had worsened with obstructive nephropathy. Because of CT findings consistent with extrinsic ureteral obstruction, the patient received a left retrograde pyelography (RP) and D-J ureteral stent placement at the same time. But left RP showed stasis of contrast medium in the middle third of the left ureter even with forceful injection of contrast media (Fig. 1). Retrograde D-J ureteral stenting was attempted, but was unsuccessful because of the severe extrinsic compression at middle third ureter and an inadequate lithotomy position. After discussion of several therapeutic options,

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Fig. 1. Left retrograde pyelography, there is stasis of contrast medium appreciated at left middle third ureter.



Fig. 2. Postoperative antegrade pyelography, smooth passage of the contrast into the urinary bladder via the ureteral stent.

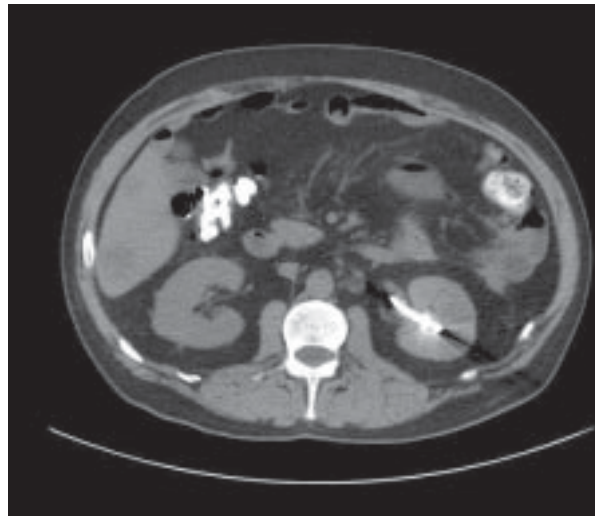


Fig. 3. No left hydronephrosis with the D-J stent still in place.

the patient elected to proceed with placement of a 6 Fr Cook Resonance metallic stent. As such, a left 10 Fr percutaneous nephrostomy was created with internal ureteral dilatation and insertion of the antegrade metallic stent. He had a smooth postoperative course. Postoperative antegrade pyelography showed a smooth passage into the urinary bladder via the ureteral stent (Fig. 2). Three days later, the left nephrostomy tube was capped and subsequently removed.

Two weeks later, a repeated CT scan revealed no hydronephrosis with the D-J stent still in place (Fig. 3). The patient's serum creatinine concentration remained stable below 1 mg/dL. However, he complained of frequency and lower abdominal pain at the end of voiding. The international prostate symptom score (IPSS) increased, especially the irritative scores, compared with his pre-stent score. There was no urinary incontinence. The score on the visual analogue scale (VAS) was around 4~6 points. Six weeks after stent placement, a renal scan demonstrated no obstruction with equivalent bilateral renal function. The symptoms of discomfort had all improved according to the IPSS (less than 3 points) and VAS (less than 2 points). The patient had no flank pain or urinary tract infection. However he died 6 months after initial stent placement because of advanced colon cancer. The function of the Resonance metallic stent and serum creatinine concentration were stable until his death.

## DISCUSSION

With more effective oncologic treatments, patients

with malignancies are surviving longer. However, but more are developing complications such as ureteral obstruction because of retroperitoneal or pelvic malignancy.<sup>2</sup> Adequate urinary drainage is very important, especially in patients destined to undergo systemic chemotherapy. Percutaneous nephrostomy have traditionally been used to provide urinary drainage for patients with ureteral obstruction. But internal ureteral stenting for long-term urinary drainage in these patients is now widely accepted in clinical practice. This reduces a point of entry for bacteria and renders "tubeless", which offers them a better quality of life. But severe extrinsic compression by a pelvic tumor can interfere with the function of a plastic stent. Sometimes compression can be relieved by placement of double D-J stents or a larger 8Fr diameter stent, but the long-term failure rate of stents in the setting of malignant extrinsic compression is high, usually about 50%. Other disadvantages include the necessity for frequent changes of the ureteral stent as suggested by the manufacturers (most need to be changed every 3-6 months) and premature ureteral stent blockage due to encrustation.<sup>3</sup>

Ureteral stents of various materials are now available for use in antegrade, retrograde and combined approaches. Some metallic stents have been used in clinical practice over the past 15 years. Efforts have been directed at the development of metallic ureteral stents with better primary patency rates in malignant obstruction to minimize ureteral stent replacements, hyperplastic tissue response and encrustation. In 1991, Lugmayr and Pauer first reported their experience with self-expanding metallic stents consisting of an elastic mesh woven from stainless cobalt-based alloy filaments. A follow-up report of 40 patients with 54 ureters obstructed by malignancy demonstrated a 49% reintervention rate,<sup>4</sup> with a Kaplan-Meier estimated patency rate of only 31% at 12 months.<sup>5</sup> Recently, the most widely used metallic stents have proved disappointing due to ingrowth of hyperplastic urothelium and encrustation. Xun et al evaluated the long-term results of 13 patients with permanent metal stent implantation. The success rate of ureteral assisted patency was 69.2%. Urothelial hyperplasia and stone formation have been described as the main cause of re-obstruction. So patients who are predisposed to encrustation, e.g. a history of stone disease and recurrent urinary tract infection, must be closely monitored. Most re-obstruction can easily be managed with a holmium:YAG laser.<sup>6</sup>

The new 6Fr Cook Resonance metallic double-pig-tail ureteral stent is a tight, continuous and unfenestrated spiral metallic coil with an inner safety wire welded to both closed, tapered ends (Fig. 4). It is therefore deployed

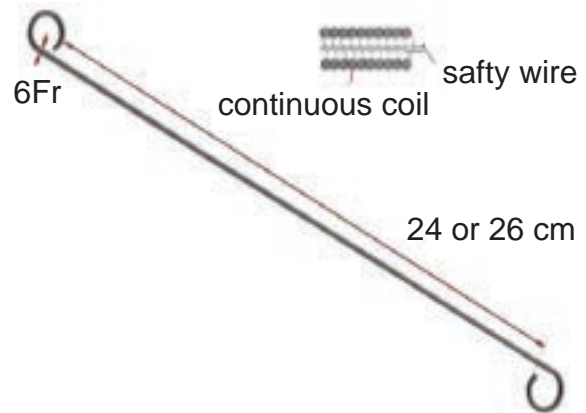


Fig. 4. The Resonance metallic stent, a composite of non-magnetic nickel-cobalt-chromium-molybdenum. Stent is continuous coil with inner safety wire welded to both ends that prevents elastic elongation, especially during removal.

through a long sheath rather than over a guidewire. It is constructed of a nickel-cobalt based alloy (MP35N®), which has an unique combination of ultrahigh tensile strength and excellent resistance to corrosion, sulfidation, high-temperature oxidation, and hydrogen embrittlement. It is also MRI-compatible and under comparable extrinsic compression testing conditions. Approximately 25 times more force was required to occlude the Resonance metallic stent than the plastic stents tested.<sup>7</sup> To avoid hyperplastic tissue ingrowth and provide a biocompatible device, the stent was made of a specially treated nickel-cobalt-chromium-molybdenum material. The urine drains primarily around the outer aspect of the spiral coiled metal, and if pressure within the urinary system increases, urine can enter the internal lumen of the coil and then drain outward to a low-pressure system (beyond the stricture). Although the means of drainage have not been fully studied, it is hypothesized that drainage occurs solely by capillary action along the metal coils of the stent. Further studies are needed to clarify this concern. Borin et al. compared the encrustation potential of the Resonance metal stent with that of silicone and polyurethane stents in an in-vivo rabbit model.<sup>8</sup> These studies demonstrated no increased risk of encrustation in the severe environment of the hypercalciuric rabbit bladder. Therefore, it functions with a better primary patency rate and has a 1 year indwelling lifespan. In Europe, the stent has been approved to remain in situ for 12 months. There have been no reports to date of stent fracture or inability to remove the stent secondary to encrustation. Tze et al. reported that the Resonance metallic stent was removed in their insti-

tution at 1 year and was free of any significant stent encrustation at that time. This metallic stent not only improves the quality of life of the patient but is also cost-effective. Despite the initial higher cost of a Resonance metallic ureteral stent, the cost per year is one third less than plastic stents which require at least two or three stent changes per year.<sup>9</sup>

This device was initially designed for cystoscopic retrograde insertion by urologists using a ureteral catheter / guidewire and introducer sheath. But in this patient, we used antegrade percutaneous insertion of this stent when retrograde insertion failed. Antegrade percutaneous insertion has proved to be an advisable orientation to pass a stricture when retrograde insertion is not suitable because of the sharp angle of ureter or inadequate lithotomy position. In our patient, the anchorage with the guidewire and inner ureteral catheter allowed negotiation with a wider bore introducer sheath. The introducer sheath allowed insertion of the metallic double-pigtail ureteral stent with ease.

Recent reports have demonstrated that indwelling ureteral stents can cause complications such as lower abdominal pain, dysuria, fever, urinary frequency and nocturia. Furthermore, indwelling stents can migrate, break, or even be forgotten in the patient. Vega et al. report that 90% of 100 patients with an indwelling ureteral catheter had urinary symptoms such as nocturia (the most common), frequency, tenesmus, dysuria and hematuria, 72% had some degree of pain or discomfort, and 60% reported a decreased quality of life.<sup>10</sup> The metallic ureteral stent could have the same side effects. Our experience in this patient and a literature review show that LUTS and the VAS improve six weeks after stent placement. However, further studies of side effects after metallic ureteral stent placement should be conducted.

## CONCLUSION

In terms of patency, quality of life and cost-efficiency, the new 6 Fr Resonance metallic ureteral stent may be an adequate alternative for patients with malignant extrinsic compression who require long-term urinary drainage. The antegrade or retrograde approach is all feasible for these stents.

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