Uncoiling of a Cook Resonance Metallic Ureteral Stent

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Abstract

Introduction and Background: The Cook Resonance[®] metallic ureteral stent's unique configuration allows adequate urine drainage while providing improved resistance to external ureteral compression. We report a case in which a stent broke and subsequently uncoiled during stent removal under cystoscopy.

Case Presentation: A 46-year-old woman with a history of cervical carcinoma treated with radiation therapy and chemotherapy and bilateral ureteral strictures presented for cystoscopic removal of bilateral Cook Resonance ureteral stents. During removal of the right ureteral stent, a snap was felt with subsequent uncoiling of the stent. Firm tension to the inner wire and outside curls allowed eventual complete removal of the stent without any retained fragments.

Discussion: The all-metal Cook Resonance stent is an attractive alternative to polymeric stents because of reduced frequency of stent exchange and resistance to external compression. However, the metal stent possesses risks such as increased urothelial hyperplasia and stent embedment.

Keywords: stent, metallic stent, ureteral stent, cystoscopy, stent embedment

Introduction and Background

THE ALL-METAL COOK Resonance[®] (Bloomington, Indiana) ureteral stent is a 6F double pigtail stent made of a corrosion-resistant alloy shaped into a tightly coiled spiral.¹ Although polymeric stents possess a tubular lumen through which urine drains, the Resonance[®] stent has a unique design without end holes. Rather, urine flows along the stent around the open space between coils. Compared with polymeric stents, the design of the all-metal stent provides improved resistance against extrinsic compression, which polymeric stents are vulnerable to. The metallic stent also requires less frequent replacement than polymeric stents, leading to improved quality of life (QoL).² Studies have found the all-metal Cook Resonance ureteral stent to be safe and effective in treating ureteral obstruction from both benign and malignant causes.² We describe a case in which a Cook Resonance ureteral stent snapped and uncoiled during stent removal, a complication not previously reported in the literature.

Case Presentation

A 46-year-old woman with a history of stage IIB cervical squamous cell carcinoma presented to our clinic for management of her upper tract obstruction. She had previously been treated with chemoradiation and subsequently developed bilateral ureteral strictures and a small contracted bladder with a volume of 20 cc. She was initially managed

with bilateral stents alone, but these had failed. Upon presentation to our clinic, she had bilateral Cook Resonance stents as well as bilateral nephrostomy tubes. These stents were placed >16 months ago at another hospital. The vast majority of her urinary output was through the nephrostomy tubes. To better define the extent of her ureteral strictures and for further treatment planning, we decided to proceed with cystoscopy, bilateral ureteral stent removal, and bilateral retrograde and antegrade pyelograms.

During the procedure, a 22F rigid cystoscope was advanced into the bladder. The bladder was noted to be small and contracted with an irritated urothelium. Both distal curls of the Cook Resonance metallic stents were observed. Using the grasper, the distal curl of the left ureteral stent was gripped. The surrounding tissue had ingrown into the stent and substantial force was required to remove the left ureteral stent in its entirety. The stent was noted to be intact and an antegrade pyelogram performed through her left nephrostomy tube identified a ureteral stricture proximal to the pelvic brim at the level of the iliac vessels extending down to the bladder.

Attention was then directed to the right ureteral stent. The distal curl was externalized through the urethra with the help of a grasper. But the stent would not come out despite several attempts at removing the stent. On recent CT and on fluoroscopy, no encrustation was seen on the stents. Upon further manipulation and pulling on the stent, a snap was felt and the

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FIG. 1. Uncoiled stent with inner metallic wire found to be broken as well.

stent began to uncoil. The inner metallic wire was found to be broken (Fig. 1). With the inner wire broken, we were unable to achieve a strong tensile force as pulling on the curls of the stent itself led to further unraveling. Ultimately, we were able to identify the inner wire protruding from the urethral meatus as well. By applying simultaneous tension to the inner wire

FIG. 2. Broken stent removed in its entirety with evident uncoiling.

FIG. 3. Kidney, ureter, bladder ultrasound demonstrating no retained fragments.

and the outside curl, the stent was eventually released and removed in its entirety (Fig. 2). The stent was examined, and no retained fragments were suspected. An antegrade pyelogram of the right side was performed and a stricture was seen extending from the pelvic brim to the bladder.

A cystogram was performed and there was no evidence of extravasation. Both nephrostomy tubes were then placed to gravity. As the metallic stent appeared to be broken, a formal X-ray was obtained. No retained stent fragments were observed (Fig. 3). The patient was seen for follow-up in the clinic 3 months after the procedure and denied any further complaints. Options for reconstruction of both strictures and her bladder were discussed, but she elected for management with bilateral nephrostomy tube exchanges in the interim.

Discussion

Adequate renal drainage is critical to the function of the kidneys. In patients with ureteral obstruction, urologists have two primary methods for treatment: percutaneous nephrostomies or indwelling ureteral stents. Although percutaneous nephrostomies have the highest success rate, they are the most invasive option and significantly affect patients' QoL. Ureteral stents generally have a lower impact on patients' QoL. Polymeric stents need to be frequently replaced and are associated with complications, including infection, bacterial colonization, and biofilm formation. In addition, they are prone to failure because of extrinsic compression. Metallic stents such as the Cook Resonance ureteral stent have the benefit of reduced frequency of replacement but come with additional complications, including higher rates of migration, stone encrustation, and obstruction caused by urothelial hyperplasia.²

The unique metal coil configuration of the Resonance stent provides improved resistance to external compression. Studies on porcine models have found that although metal stents have lower intraluminal and extraluminal flow compared with polymeric stents, the metal stents are not occluded by simulated obstruction that would typically occlude a standard stent.³ Liatsikos et al. evaluated the effectiveness of the Resonance stent in the clinical setting with a cohort of 50 patients presenting with upper urinary tract obstruction.⁴ Their cohort consisted of 25 patients with extrinsic malignant disease obstruction, 18 with benign disease obstruction, and 7 with a previously obstructed metal mesh stent. Stricture patency was achieved in all of the patients with obstruction from extrinsic malignant disease at a mean follow-up time of 11 months. In the patients with obstruction from benign diseases, stricture patency was maintained for only 44% of the patients after a mean follow-up of 6.8 months. Macroscopic hematuria developed in six patients, all of which resolved spontaneously. Bladder irritation was reported in 10 patients, out of which 4 had positive urine cultures. Neither stent migration nor mechanical injury was reported. Kadlec et al. evaluated 147 metallic stents placed in 47 patients, of which 27 had malignant obstruction, 15 had bilateral obstruction, and 14 had received prior radiation therapy.² Thirteen of their patients (28%) experienced stent failure during the study as a result of pain, progressive renal insufficiency, recurrent urinary tract infection, stent migration, hematuria, or stent encrustation. Ultimately, the authors found no significant difference in duration of stenting or failure rate caused by prior radiation therapy, obstruction etiology, or bilateral obstruction.

Although the Cook Resonance metallic stent provides an attractive stent alternative with reduced replacement frequency and increased resistance to external compression, it carries its own inherent risks. One of these reported risks is urothelial hyperplasia, which can lead to stent embedment. In this case, the stent may have been embedded. This increased resistance led to the inner metallic wire breaking when pressure was applied upon attempted stent removal. As the outer coil unraveled when it is pulled, it is the inner wire that was responsible for the tensile force. After identifying the inner wire and securing it with a clamp, we were able to steadily apply force on both the inner wire and the outer coil. This allowed us to remove the remainder of the stent. Although the metal stent has been found to be an effective method in treating obstruction in both benign and malignant cases, these stents still need to be changed at recommended intervals.

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Abbreviations Used

CT = computed tomography
QoL = quality of life

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