

# *Loss of structural integrity of a coil based ureteral stent*

Danielle D. Sweeney, MD, Matthew H. Hayn, MD, Daniel Ricchiuti, MD, Stephen V. Jackman, MD

Department of Urology, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania, USA

---

SWEENEY DD, HAYN MH, RICCHIUTI D, JACKMAN SV. Loss of structural integrity of a coil based ureteral stent. *The Canadian Journal of Urology*. 2009;16(4):4750-4752.

*We present the first reported complication of the Silhouette, (Applied Medical, Santa Margarita, CA) 4 Fr. soft, nitinol coil-reinforced double-J ureteral stent, that is specifically related to its unique construct and design. These novel ureteral stents were placed in a medically unstable patient with bilateral partially obstructing proximal ureteral*

*calculi. At the time of ureteroscopy, it was noted that a mild to moderate amount of encrustation was present on the distal curl of the ureteral stent. Upon removal of the stent, resistance was encountered and disintegration and fragmentation of the stent was noted. The patient eventually underwent staged ureteroscopy and shock wave lithotripsy (SWL) to remove the remaining portions of the encrusted ureteral stent.*

**Key Words:** complications, ureteroscopy, ureteral stents

---

## Introduction

The 4 Fr soft, coil-reinforced double-J ureteral stent, marketed under the name Silhouette, (Applied Medical, Santa Margarita, CA) was introduced to the United States market in 2005. This novel ureteral stent differs from traditional stents in that it is composed of a coiled, nitinol wire encased in a hydrophilic coating. It is purported to provide superior patient comfort while posing no real disadvantage to the patient.

---

Accepted for publication December 2008

Address correspondence to Dr. Danielle D. Sweeney, Department of Urology, The University of Pittsburgh Medical Center, 3471 Fifth Avenue, Kaufmann Bldg, Suite 700, Pittsburgh, PA 15213 USA

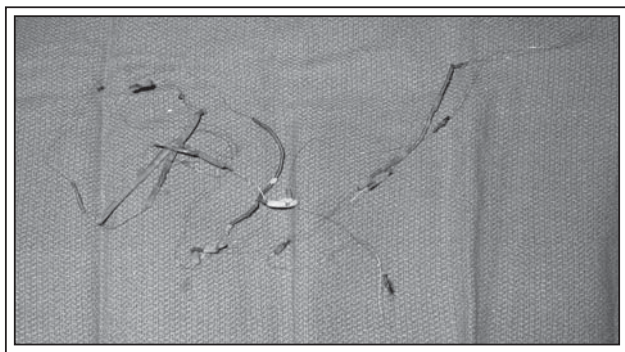
We report the initial complication of this specific ureteral stent that can be attributed to its unique construct and the patient outcome associated with this complication.

## Case report

A 55-year-old male presented with bilateral partially obstructing proximal ureteral calculi measuring 2 cm and 1.3 cm on the right and left sides, respectively. The stones were discovered during a work up for recently diagnosed stage IIB adenocarcinoma of the colon. Since the patient was to receive systemic chemotherapy and his serum creatinine was 1.3 the decision was made to place bilateral ureteral stents in order to maximize renal function.

Bilateral 4 Fr. x 26 cm Silhouette, (Applied Medical, Santa Margarita, CA) soft, coil-reinforced double-J ureteral stents were placed without difficulty or complication, Figure 1. During the interval between stent placement and the scheduled lithotripsy procedure the patient developed persistent pancytopenia. For this reason, definitive treatment of his nephrolithiasis was delayed for 4 months on the recommendation of his medical oncologist.

After resolution of his pancytopenia, the patient was brought to the operating room for bilateral ureteroscopy and laser lithotripsy. A mild to moderate amount of encrustation was noticed on the right ureteral stent as it protruded from the ureteral orifice. A 0.035 inch Sensor Guidewire (Boston Scientific, Natick, MA), was placed into the right ureteral orifice and into the right collecting system without resistance. The right stent was grasped cystoscopically and appeared to move easily. Resistance was encountered at the level of the bulbar urethra, and fluoroscopy demonstrated that the proximal portion of the stent remained in the right renal pelvis. Reinsertion of the cystoscope noted nitinol wire protruding from the right ureteral orifice. At this time a rigid ureteroscope was passed into the ureter and several segments of intact stent were found to be separated by segments of nitinol wire that had uncoiled. A now distal obstructing ureteral calculus was present and possibly contributed to uncoiling of the stent. The wire was cut with a holmium laser and the distal most portions of the stent fragments were removed. This process of cutting and removing fragments was carried out numerous times until only the encrusted proximal curl remained. This curl was severely encrusted, preventing it from unraveling. Holmium laser energy was applied to the area of encrustation, but due to lengthy duration of the procedure, the patient's poor overall medical condition and the lack of success with removing the encrustation from the curl, a traditional 6 Fr. ureteral stent was placed and the procedure was terminated.



**Figure 1.** Photo of uncoiled stent.

The patient was taken for shock wave lithotripsy (SWL) of the right and left proximal curls and subsequent ureteroscopy to retrieve the proximal curl of the right stent. This curl was successfully removed and the left ureteral stent was removed cystoscopically without event.

## Conclusion

Encrusted ureteral stents represent a difficult problem for urologists and often require combined endourologic techniques in order to safely remove the stent.<sup>1</sup> The 4 Fr. soft, coil-reinforced ureteral stent, while possibly a more comfortable alternative to patients, has the potential to uncoil leading to complicated removal. This may be particularly true in situations in which the stent has been indwelling for a lengthy interval, in which a large obstructing calculus remains in the ureter, or in which the stent has become encrusted. In our patient all of the above factors were present and it is unclear which factor most contributed to the uncoiling of the stent.

Pedro et al, measured the compressive and tensile strength of the 6 Fr. Cook Resonance metallic coil stent, (Spencer, IN) and the 4.6 Fr. coil-reinforced Applied Medical Silhouette stent (Santa Margarita, CA). Although the Silhouette stent was more resistant to compressive forces, it had a weaker tensile strength as compared to the Cook Resonance metallic coil stent.<sup>2</sup>

The manufacturer is aware of this complication and modifications to the stent design have been made to increase the tensile strength of the stent.<sup>3</sup> In July 2006, Applied Medical (Santa Margarita, CA) discontinued the 4 Fr. Silhouette stent for adult use. Currently 4.6 Fr. is the smallest diameter Silhouette stent approved for use in adults.<sup>3</sup> However, until conclusive data is available, urologists should be aware of the possibility of coil-based stents to unravel in complicated situations. □

---

## References

1. Aravantinos E, Gravas S, Karatzas AD et al. Forgotten, encrusted ureteral stents: a challenging problem with an endourologic solution. *J Endourol* 2006;20(12):1045-1049.
2. Pedro R, Hendlin K, Kriedberg K et al. Wire-based ureteral stents: impact on tensile strength and compression. *Urology* 2007;70(6):1057-1058.
3. Personal communication with stent design specialist, Applied Medical, January 2005 and July 2006.

## EDITORIAL COMMENT

In urologic practice, ureteral stents are what I would consider a necessary evil. Stenting is invaluable for the acute management of urinary obstruction secondary to urolithiasis, malignancy, or other etiologies. However, stents undoubtedly have associated morbidity. Contemporary series suggest that up to 85% to 90% of patients with indwelling ureteral stents report irritative lower urinary tract symptoms (frequency, urgency, dysuria), flank/suprapubic pain, or hematuria. This constellation of symptoms has prompted an ongoing search for potentially more tolerable stents that are of smaller caliber or different structural design.

In this case report, the authors present an adverse event associated with a recently introduced 4 Fr. Nitinol coil-based stent. I applaud the authors first and foremost for presenting a complication and outlining its subsequent management. All too often the medical literature is guilty for highlighting the positives and superlatives, while glossing over complications and adverse events. Complications will always occur and much can be gleaned from management strategies. I secondarily congratulate the authors for relating this complication to the manufacturer to prompt modification of stent design as well as revision of surgical indication (this 4 Fr. stent is no longer approved for adult use).

As ureteral stent technology continues to evolve, timely feedback as provided by this report is essential to determine whether newer stents are necessarily better.

Jay D. Raman, MD  
Assistant Professor of Urology  
Penn State Milton S. Hershey Medical Center  
Hershey, PA, USA