
The safety wire with a ureteral access sheath – does it hurt more than it helps?

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Introduction: Studies indicate that with a safety wire in the ureter, an increased amount of force is necessary to advance ureteral access sheaths up to the proximal ureter. Theoretically, the compression of the ureter with the wire could lead to an increase in number and severity of ureteral injuries secondary to placement of a sheath. This prospective study aims to evaluate if there is a correlation between the use of a safety wire and ureteral injury from sheath placement by evaluating the location of the wire in relation to the injury after ureteroscopy.

Materials and Methods: Fifty-nine consecutive patients underwent ureteroscopy for upper tract urinary stone disease. A 12/14 French ureteral access sheath was used with a safety wire in place. Ureteroscopy during withdrawal of the sheath was video recorded and reviewed by a blinded observer. Visible ureteral injuries

were graded per the Traxer ureteral injury scale and the proximity of the wire to the injury was noted.

Results: Thirty-one of 59 patients (52.4%) had a ureteral injury secondary to access sheath placement. Eighteen (30.5%) injuries were low-grade, 13 (22.0%) were high-grade (grade 2 and 3) and there were no grade 4 injuries. A total of 10 (32.3%) injuries occurred on the same side as the wire while 67.7% were on the contralateral side of the ureter. Of the injuries that occurred on the same side as the wire, 80% were grade 1 injuries and 2 (20%) were grade 3. Statistical analysis did not show a significant relationship between high/low injury grade and side of injury (p value = 0.088). This suggests that there is no association of between the safety wire and development of high injury. **Conclusion:** There is no association between the location of the safety wire and ureteral injury if injury occurs during the placement of a ureteral access sheath. This suggests that the use of a safety wire does not add significant morbidity to the procedure.

Key Words: ureteroscopy, safety wire, ureter

Introduction

Ureteroscopy is the standard of care for the endoscopic management of mid-sized renal stones. Studies suggest that the use of a safety wire during ureteroscopy does not add any significant benefit, and may actually cause additional morbidity by increasing the amount of force necessary to advance instruments up to the kidney.¹⁻³ The use of ureteral access sheaths during ureteroscopy

has many advantages, including increased irrigation, decreased intra-renal pressures, and ease of multiple passes to the collecting system with the ureteroscope.⁴ Theoretically, the force necessary to insert a ureteral access sheath is greater with a safety wire alongside the sheath, and the compression of the ureter with the wire could lead to an increase in number and severity of ureteral injuries secondary to placement of an access sheath. Typically the lesion seen is a linear tear - we hypothesized that this may reflect an injury from the safety wire alongside the sheath. This prospective study aims to evaluate if there is a correlation between the use of a safety wire and ureteral injury from sheath placement by evaluating the location of the wire in relation to the injury after ureteroscopy.

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TABLE 1. Traxer ureteral injury scale

Grade	Ureteral wall
0	No ureteral lesion or only mucosal petechiae
1	Mucosal erosion or mucosal flap without smooth muscle injury
2	Injury involves mucosa and smooth muscle, but not adventitia
3	Full thickness ureteral perforation
4	Ureteral avulsion with loss of ureteral continuity

Materials and methods

A prospective study was completed at a single tertiary care center. A single surgeon performed ureteroscopy for urinary stone disease using a Boston Scientific Navigator or Cook Flexor 12/14 French ureteral access sheath. Prior to access sheath placement a 0.035" Boston Scientific Sensor safety wire, was placed in the ureter under fluoroscopic guidance. The ureter was then inspected with a semi-rigid ureteroscope and a second wire, an Amplatz 0.035" super stiff wire, was placed under direct visualization and fluoroscopy. The access sheath was then advanced up to the proximal ureter over the super stiff wire under fluoroscopic guidance. Flexible ureteroscopy during withdrawal of the sheath was video recorded and reviewed by a blinded observer. Visible ureteral injuries were graded per the Traxer ureteral injury scale, Table 1 and the proximity of the wire to the injury was noted.⁵ Fisher's exact test for categorical

data was conducted using IBM SPSS Statistics for Windows, version 24 (IBM Corp., Armonk, NY, USA). A p value of < 0.05 was considered statistically significant.

Results

Fifty-nine consecutive patients undergoing ureteroscopy for renal stones were included in the study. Thirty-one of 59 patients (52.4%) had a ureteral injury secondary to access sheath placement, consistent with prior published data.^{5,6} Eighteen (30.5%) injuries were low-grade (grade 1). Thirteen (22.0%) were high-grade (grade 2 and 3) and there were no grade 4 injuries. A total of 10 (32.3%) injuries occurred on the same side as the wire while 67.7% were on the contralateral side of the ureter, Figure 1. Of the injuries that occurred on the same side as the wire, 80% were grade 1 injuries and 20% were grade 3 injuries, Figure 2. Fisher's exact test

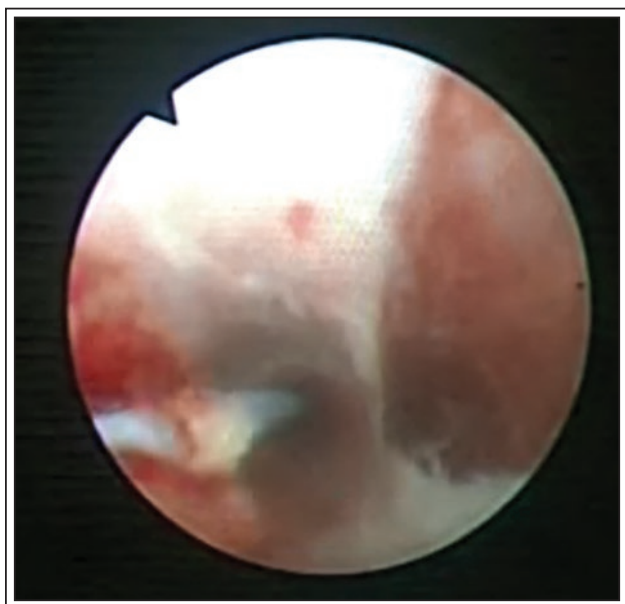


Figure 1. Grade 3 ureteral injury with the wire on the contralateral side of the ureter.

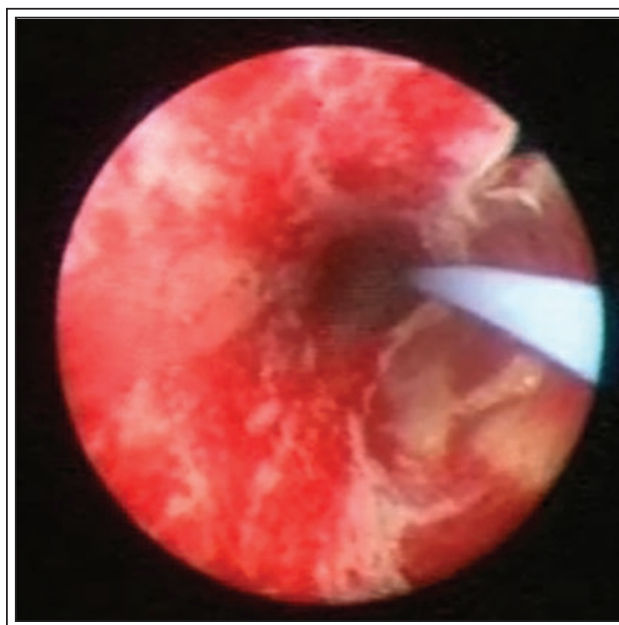


Figure 2. Grade 3 ureteral injury with the wire on the same side as the injury.

found no statistically significant relationship between injury grade (low-grade versus high-grade) and side of injury (two-sided p value 0.088). This suggests that there is no association between the safety wire and development of a high-grade injury.

Discussion

Ureteral access sheaths have many advantages, including improved irrigation, decreased intra-renal pressures, ease of multiple passes to the proximal collecting system and decreased damage to the ureterscope.⁴ While sheaths are advantageous in many cases, they are also associated with a significant risk of ureteral injury, with a reported rate of 46.5%.⁵ There has been no literature reporting factors that may modify the risk of such injuries, for example, the use of a safety wire. This study aims to investigate whether or not the use of a safety wire is associated with an increased risk of ureteral injury during ureteroscopy with a ureteral access sheath.

The use of a safety wire during ureteroscopy has historically been regarded as a mainstay portion of the procedure. Recent literature, however, has reported that ureteroscopy without a safety wire is safe and effective.^{1,2} Nakada et al evaluated 268 patients who underwent ureteroscopy without a safety wire and found a similar complication rate to the general reported literature of ureteroscopy with a safety wire.¹ No patients had a ureteral perforation or ureteral avulsion, indicating that the safety wire does not add a significant benefit.¹ In fact, there is some evidence a safety wire may add some morbidity to the procedure. Eandi et al investigated the force necessary to insert and advance a ureterscope in the porcine ureter with and without a safety wire.³ With a safety wire alongside the sheath, the force necessary to pass the ureterscope was an average of 12-20 g greater than without a safety wire.³ Although the study was done with ureterscopes, it can be assumed that the force necessary to advance a ureteral access sheath is also greater with a safety wire in place.

In addition to studies that have assessed visible ureteral injuries secondary to ureteral access sheaths, there have been animal studies which indicate decreased blood flow to the ureter from sheath use.⁷ Theoretically, the increased force necessary to place a sheath next to the wire, combined with decreased blood flow to the ureter would lead to an increased injury rate on the side of the wire secondary to the compression of the wire into the ureter. That was not the case in this study, as the visible injuries were only on the side of the injury in 32.3% of the time. The grade

of the injury also did not correlate to wire proximity, as 80% of the injuries that occurred on the same side as the wire were low-grade. Eighty-four percent of the high-grade injuries did not occur adjacent to the wire.

Limitations of this study include the small patient sample size and the potential for viewer subjectivity bias. It would be helpful to have a comparison group of patients without a safety wire for a prospective comparison as well as including clinical follow up in future research. Follow up imaging to assess for any subsequent ureteral stricture formation would be helpful to identify any additional risk of a safety wire, however prior research indicates an overall low stricture rate of 1.4% after ureteroscopy with a ureteral access sheath.⁸

Conclusion

There is no correlation between the location of the safety wire and ureteral injury if injury occurs during the placement of a ureteral access sheath. This indicates that the use of a safety wire does not add significant morbidity to the procedure. □

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