

Trauma and reconstruction

## Inverted mucosa and avulsion ureteral injury in ureteroscopic procedure: A very rare complication of a common procedure in urology

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## ABSTRACT

An avulsion is very rare and the most serious complication that may occur during ureteroscopy in 0.06–0.45% of patients during the ureteral stone procedure. A sixty years-old female with a small stone in the upper third of the right ureter with high-grade hydronephrosis and underwent a ureteroscopy procedure. During withdrawal of the scope, the ureter was brought out in urethral meatus, with inverted fashion, nearly the whole length of the ureter was avulsed out. A nephrectomy of the right kidney was then performed. Knowledge about signs of the ureteral avulsion, pitfalls when to stop, and treatments is really important.

## Introduction

Ureteroscopy is an important tool for urologic procedures worldwide today, some led to unexpected multiple types of complications. An avulsion is the most serious complication that may occur during URS, ureteral avulsion during the ureteral stone procedure has been reported 0.06–0.45%. We report our patient with unexpected complete ureteral avulsion.

## Case presentation

A 60 years old female comes to the district hospital with right flank pain 4 months ago. The patient was worked up and found to have a 16 mm stone in the upper third of the right ureter with high-grade hydronephrosis during renal sonography (Fig. 1A). She underwent ureteroscopy with semirigid 8 Fr URS. The ureter lumen was a bit tight for the ureteroscope, we tried to solve it with double nitinol wire. We observed pale and narrow lumen along the right ureter mucosa (Fig. 1B).

Resistance was felt along the ureter, at the site just below stone each side of the ureteral wall met each other when we advance the scope, but somehow, we got the way to go through. We finally reached the level of stone impaction. Laser lithotripsy stone fragmentation was done. However, during the withdrawal of the scope to extract the stone fragment, the sensation of “loss of restraining” was felt. The ureter was brought out in urethral meatus, with inverted fashion, nearly the whole length of the

ureter was avulsed out (Fig. 2A). Based on the patient’s age, the vitality of the ureter, facility, normal function of the contralateral kidney, and high grade of hydronephrosis, we decided to perform a nephrectomy of the right kidney (Fig. 2B).

## Discussion

In the modern era, ureteroscopy procedures have replaced open surgery in a vast majority of cases of ureteric calculus and the most common indication for ureteroscopy is ureteral calculus about 63.2%. Complications of ureteroscopy have been categorized into minor and major events: minor complications include asymptomatic ureteral perforations, ileus, and fever, whereas major complications, which are more often associated with stone extractions, including tears, perforations during basketing, avulsions, intussusception, and sepsis.<sup>1</sup> Among all complications of the ureteroscopic lithotripsy procedure, complete avulsion of the proximal ureter is one of the most challenging that happens in 0.06–0.45% of the cases.<sup>2</sup> Ureteral avulsion can occur as a result of stretching in the weakest point of the ureter most commonly cause by iatrogenic ureteral injuries.<sup>3,4</sup>

One of the literature had made classification for ureteral avulsion based on disruption side number, this is important to define and understand the kind of avulsion and different situation require different treatment.<sup>4</sup> The mechanism of ureter avulsion in this patient occurs during withdrawal of scope after hard advancement through the narrow

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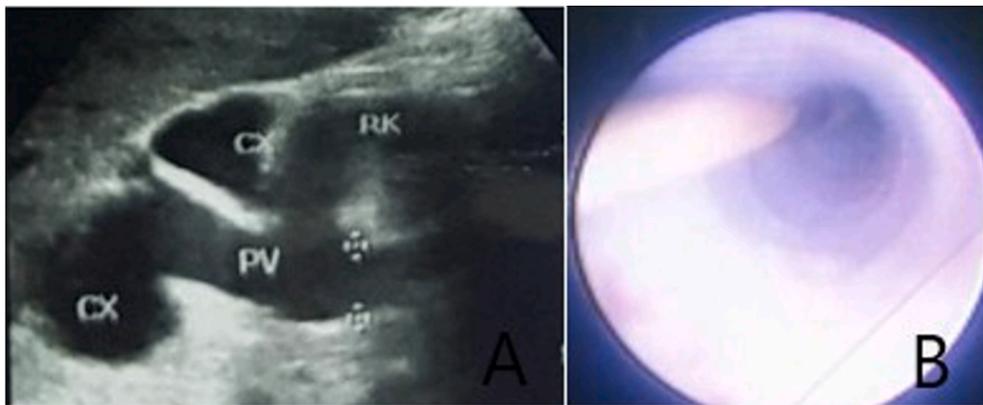


Fig. 1. High-grade right hydronephrosis (A), Pale and narrow ureter (B).

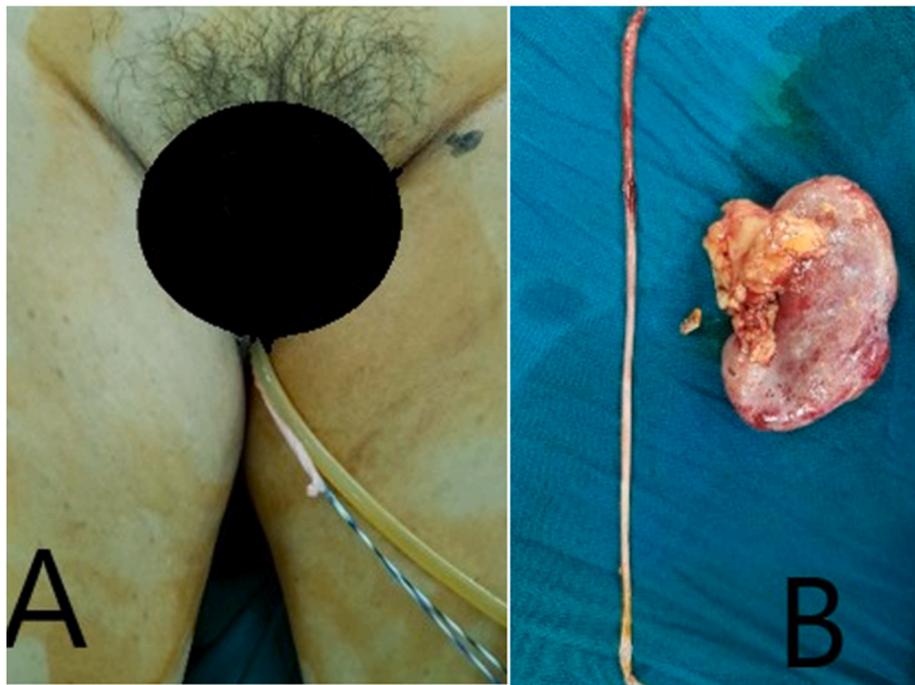


Fig. 2. (A) Avulsion "inverted" ureter, (B) ureter, stone, and kidney.

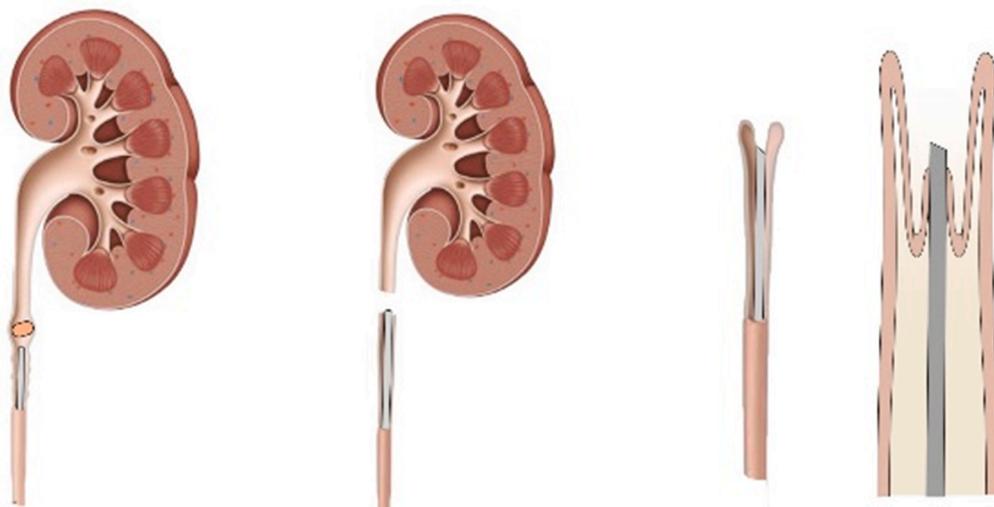
ureter. The discrepancy between the ureteroscope size and caliber of the patient's ureter was also a factor involved. In this case, we used semi-rigid 8 Fr scope, when the scope being pulled, the proximal ureter with less muscular support and fewer mucosal cell layer than the distal or intramural ureter and had the most tendency to be ruptured. Laser lithotripsy in impacted stone can impair fluid irrigation by blocking fluid circulation and cause direct injury toward ureteral mucosa, which further weakened the proximal ureter. As long ureteral mucosa tightly stick to the scope, the ureter brought out in an inverted fashion.<sup>5</sup> (Fig. 3).

Only a small percentage of the hospital has the facility for fluoroscopy with C-arm Xray. Fluoroscopy is critical for the ureteroscopic procedure, needed for initial ureteral access, monitor during endoscopy, and stent placement. In our hospital, with no C-arm Xray facility, we have a blind vision to the extent the wire over impacted stone, it gave risk to perforate the ureter through a thin ureteral wall, this is why we didn't go to stent placement, and try harder to solve the case in time by slowly advance URS in the narrow ureter. Olgin's study found fluoroscopyless ureteroscopic technique had the same complication rate compared with conventional ureteroscopic.

In general, management of ureteral avulsion depends on the location

of the injury, the length of the traumatized ureter, time of diagnosis, patient's age, and general health. Even immediate repair was recommended for the stable patient, some report shown nephrostomy sometimes taken for better preparation for the next operation. Some had managed ureteral avulsion with ureteral reimplantation, transureteroureterostomy, and ureteroneocystostomy. We considered a bad ureteric condition, old age, high-grade hydronephrosis, normal estimated-glomerular filtration rate (eGFR), and also patient family preference, we decided to do nephrectomy. With normal eGFR and high-grade hydronephrosis in the right kidney, the contralateral kidney was expected to be in a good condition. There was no literature found concerning the nephrectomy rate caused by a ureteric injury.

The precaution should be considered in every procedure because there always a possible occurrence of complication in every case, avoidance of forceful maneuvers and staging the procedure, or alternative procedure modality in case of difficulty. When negotiation is difficult, the downsizing of ureteroscopy should be the first option. Be aware to stop when excessive resistance was felt and consider temporary stenting and rescheduling the patient after 2 weeks. If the stricture was seen, dilatation before insertion of the scope or incision of stricture



**Fig. 3.** Inverted avulsion mechanism.

should be performed.

### Conclusion

Knowledge about signs of the ureteral avulsion, pitfalls when to stop, and treatments is really important. Immediate repair is the best, but the patient condition, facility, and option to delay treatment with nephrostomy must take into account.

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None.

### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying image. A copy of the written consent is available for review by the editor in chief of this journal on request.

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### Declaration of competing interest

The author declare that they have no financial connection with any companies of relevance for this article.

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