



Laser endoureterotomy with cut-to-the-light technique for complete ureteral obstruction - A case report

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ABSTRACT

Ureteral stricture and obstruction following ureteroscopy are often difficult to treat. We report successful laser endoureterotomy using the cut-to-the-light technique for complete obstruction. A 44-year-old man developed complete ureteral obstruction at the ureteropelvic junction following transurethral ureterolithotripsy. We performed laser endoureterotomy and recovered the remaining stone by an antegrade percutaneous approach, while a second surgeon illuminated the obstruction with a ureteroscope by a retrograde approach. The minimally invasive cut-to-the-light technique might be an effective alternative to conventional invasive treatments, such as pyeloplasty, ureteroureterostomy and bowel interposition, in patients with complete ureteral obstruction in whom a ureteral stent cannot be placed.

1. Introduction

We report a case of complete ureteral obstruction that occurred following ureteroscopy (URS), in which laser endoureterotomy using the cut-to-the-light technique, whereby the obstruction was illuminated by the light of a ureteroscope, successfully relieved the obstruction.

2. Case presentation

The patient was a 44-year-old man who complained of fever and back pain. He was diagnosed with acute calculous pyelonephritis based on observation of a 4 mm stone at the ureteropelvic junction (UPJ) on computed tomography (CT) (Fig. 1). Finally, we performed percutaneous nephrostomy because the guide wire could not be passed beyond the stone by the transurethral approach and flexible URS indicated that the ureter was completely obstructed at the UPJ.

We had performed lithotripsy for an 8 mm stone at the same side in this patient one year earlier, using a Holmium YAG laser (270 μm fibers, Quanta Laser Litho, Italy) at frequency 10 Hz and energy 0.8 J (J), and a 11/13 Fr ureteral access sheath had been inserted into the ureter close to the impacted stone. The ureteral stent had been subsequently removed 6 weeks postoperatively without evaluating the degree of hydronephrosis,

because we were confident that there was no residual stone. At that time, the kidney was not atrophic.

We, thus, determined that the current kidney atrophy and obstruction were the result of the URS performed one year earlier, and decided to perform endoureterotomy using a combined antegrade and retrograde approach one week later, since the obstruction was less than 1 cm long.

2.1. Surgical technique

With the patient in the modified Valdivia position, an 18 Fr nephrostomy sheath was positioned through the nephro-urinary tract. Then, one surgeon observed the obstruction from the renal pelvis side by flexible URS (LithoVue™, Boston Scientific), while another surgeon illuminated the obstruction with the light of the ureteroscope from the transurethral side (Fig. 2). Laser endoureterotomy was performed from the renal pelvis side using the URS light as a guide. The ureteral obstruction was expanded by balloon dilation after guide wire passage through the obstruction, and the target stone was recovered. Finally, we placed tandem double-J ureteral stents. Balloon dilation was repeated 9 weeks postoperatively because of persistence of the stricture despite improved ureter mucosal healing (Fig. 3A). The stents were removed

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Fig. 1. Preoperative CT scan showing the stone in the right ureter.

after ureteral dilation, and CT performed two years after the first surgery showed that the patient had no hydronephrosis (Fig. 3B).

3. Discussion

Complications of URS reportedly occur in 9–25% of cases, most of which do not require treatment, with ureteral stricture occurring in less than 1% of cases. In this case, we struggled to peel the stone from the ureteral wall because it was severely adhered to the ureteral mucosa at the initial URS. Hence, the cause of obstruction was probably inflammation due to adherence of a residual stone to the ureteral mucosa, in addition to thermal injury of the ureter by the higher frequency laser setting.¹

Recently, due to advances in endoscopic technology, the less-invasive endoureterotomy has been performed instead of invasive treatments such as pyeloplasty, ureteroureterostomy and bowel interposition as a treatment for post-URS ureteral strictures.² The success rate of endoureterotomy is reportedly relatively high in strictures ≤ 2 cm long. Hence, contrast pyelography is useful for evaluating whether endoureterotomy can be performed, because strictures longer than 2 cm decrease the success rate of endoscopic surgery.

Bagley first reported in 1985 that the cut-to-the-light technique was

useful in a case of complete renal pelvis-ureteral junction obstruction after pyelolithotomy.³ The advantage of this technique is that it allows identification of the true lumen of the ureter opposite the side of obstruction, minimizing the risk of laser irradiation in the wrong direction and damage to the blood vessels around the ureter. We believe that the part where the light is more visible is the true lumen of the ureter, because it would be more vulnerable even if the organization of the true lumen were replaced scar tissue or re-epithelialization. More importantly, we believe the success rate of endoureterotomy increases by thoroughly removing scar tissue around the true lumen, creating an environment in which the urothelial mucosa replaces scar tissue. In this case, we removed scar tissue and the residual stone adhering to the ureteral mucosa by the laser technique.

Whether laser irradiation should be performed by the retrograde or antegrade approach is controversial. Taguchi reported the stone free rate was significantly higher with the antegrade than the retrograde approach for large proximal ureteral stones.⁴ We performed laser endoureterotomy using a disposable flexible URS by the antegrade approach because of the greater probability of the URS reaching the target ureteral site than a nephroscope. Besides, use of a disposable URS minimized the risk of damage to the reusable URS due to friction with the percutaneous tract sheath. The laser settings for endoureterotomy were frequency 5 Hz and energy 0.6 J, because we were concerned about thermal damage by the laser, since it reportedly produces more heat at the same power at higher frequency settings.¹

The purposes of placing a ureteral stent after ureterotomy are to promote ureteral healing by preventing extraureteral leakage of urine and to prevent ureteral re-stricture. Even if a thick stent is simply placed, ischemia around the ureter might cause fibrosis of the ureter and mechanical ureteral re-stricture. Hamdy et al. previously reported the usefulness of placing two ureteral stents rather than one for post-operative management after ureterotomy with strictures longer than 1.5 cm.⁵ Isogai et al. reported the usefulness of tandem stent placement after laser endoureterotomy for ureteral strictures.² Although the mechanism of the benefit of two ureteral stents is not clear, they reported that the gap between the two ureteral stents resulting from ureteral peristaltic movement might prevent ischemia and pressure necrosis of the ureter. The usefulness of placing tandem ureteral stents after laser incision for ureteral stricture, however, requires further evaluation.

4. Conclusion

We performed successful endoureterotomy by a combined antegrade and retrograde approach for complete ureteral obstruction. We believe this minimally invasive procedure might be as effective as conventional open surgery.

Consent statement

We obtained consent from the patient for publication of this case report.

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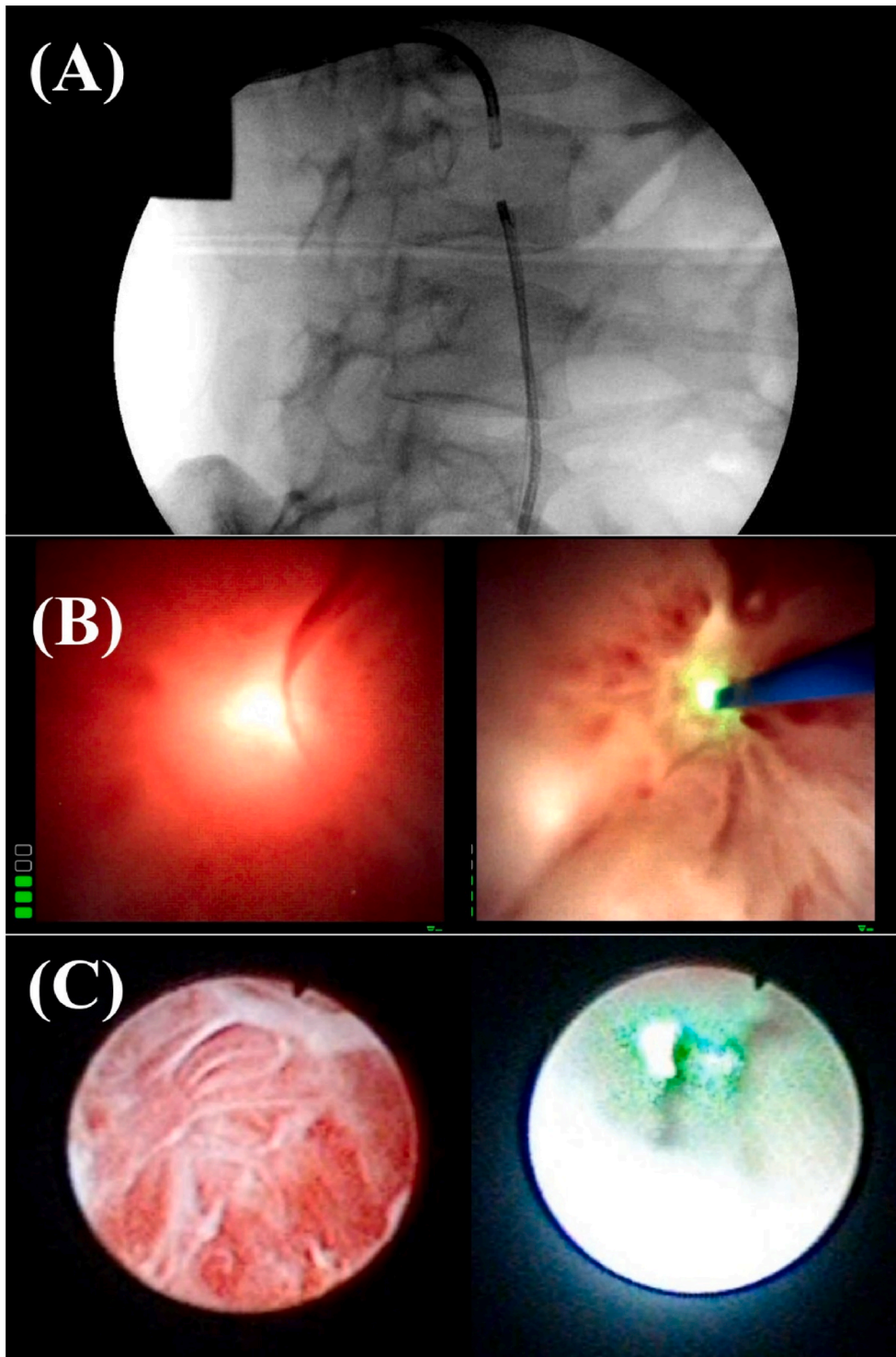


Fig. 2. Cut-to-the-light technique. (A) X-ray fluoroscopic image. (B) Laser endoureterotomy by the antegrade percutaneous approach. (C) Illumination of the obstruction by the retrograde approach.

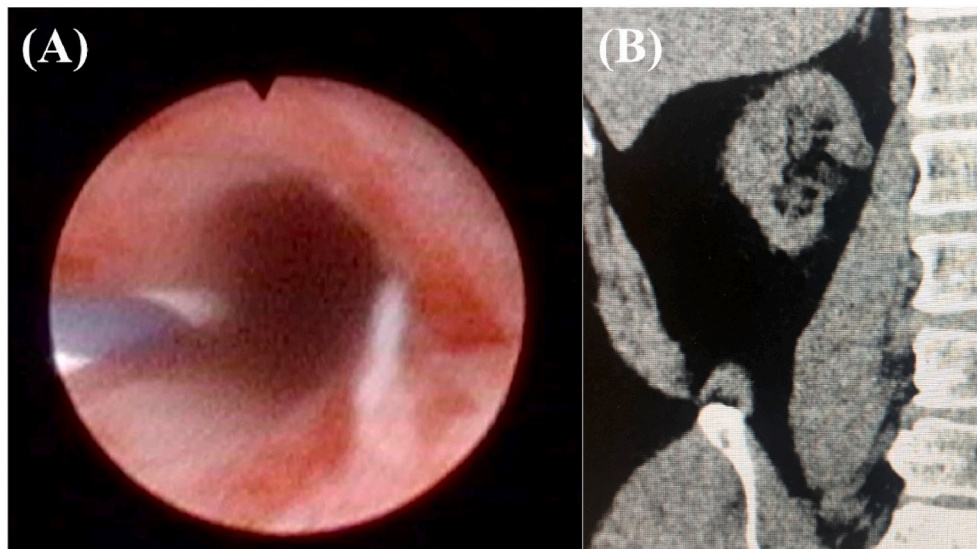


Fig. 3. Postoperative visualization of the complete ureteral obstruction site. (A) Ureteroscopy. (B) CT scan 2 years post-procedure.

Declaration of competing interest

None.

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