

Safety and Efficacy of Single-Session Nonstented Laser Ureteroscopic Lithotripsy

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Abstract

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| Background | Ureteric stone is quite common; management involve medical and surgical intervention. Surgically the ureteroscope is the most commonly used instrument. |
| Objectives | This study was done to demonstrate the safety and efficacy to fragment and remove ureteral calculi with an ureteroscope using Holmium laser and render patients stone free with a single procedure without the need for ureteral stenting. |
| Methods | One hundred and twelve patients aged between 4 to 63 years, who proved to have ureteric stones regardless the size or location of those stones, where subjected to ureteroscopy procedure under spinal or general anesthesia, and Holmium laser was used to fragment the stones. |
| Results | The majority (92.86%) of those patients was stone free with single session, no stent was left. |
| Conclusion | The stone can be disintegrated and achieving stone free state in single session and no stent was needed. |
| Key words | Laser, Holmium, ureteroscope, stent, stone |

List of abbreviations: ESWL = Extracorporeal shock wave lithotripsy, EU = Excretory urogram, CT= Computed tomography, URS = Ureteroscope, F = French, nm = nanometer, KUB = Scout plain x-ray (kidney, ureter, bladder).

Introduction

The goal of the surgical treatment of patients suffering from ureteral calculi is to achieve complete stone clearance with minimal attendant morbidity.

Improvements in surgical technology, such as extracorporeal shockwave lithotripsy (ESWL), rigid and flexible ureteroscopes, the holmium laser, and basket devices, have greatly augmented the urologist's ability to efficiently treat such patients, regardless of the size or location⁽¹⁾.

Ureteric stone is quite common; management involve medical and surgical intervention. Surgically the uretroscope is the most commonly

used instrument, intracorporeal lithotripsy used mostly ultrasonic, pneumatic and laser lithotripter. Holmium laser is the best for lithotripsy its safety and efficacy make it superior to the other^(2,3).

The ability of the holmium laser to fragment all stones regardless of composition is a clear advantage over other modalities⁽¹⁾.

Holmium laser is one of the safest, most effective, and most versatile intra-corporeal lithotripsy anywhere in the urinary tract⁽⁴⁾.

This study was done to demonstrate the safety and efficacy to fragment and remove ureteral calculi with an ureteroscope using Holimum laser and render patients stone free with a single procedure without the need for ureteral stenting.

Methods

From Nov. 2011 till Dec. 2012, 112 patients, aged from 4 years to 63 years (average 36 years), having ureteric stones, proved by ultrasonography, scout plain x-ray (KUB), excretory urography (EU) or computed tomography (CT) scan were admitted to the Surgical Specialty Hospital and Nursing Home Hospital, Medical City Complex.

Ureteroscopy was done using 7 F and 8.5 F semirigid ureterscope (according to the availability), the ureteric orifice was dilated using ureteral dilators in some patients, and the ureterscope was advanced carefully to the stone sites over hydrophilic guide wires. Holmium laser with low power and low frequency setting was delivered through 350-600 nm laser fiber; stones were carefully distracted to small fragments not more than 3 mm in size, stone retrieval with basket for larger fragments used infrequently. Ureteral stenting was unnecessary in majority of the cases.

Those patients were followed within 14 days with ultrasonography, KUB, urinalysis to prove stone free-state.

Results

Stone sizes ranged from 6 mm to 20 mm (average 11 mm), localized as 38% at the lower ureter, 45 % at the mid part of the ureter and 17 % at the upper portion of the ureter.

Total disintegration of stones with fragments less than 3 mm; was achieved in 104 patients and no any kind of stent was left behind. Ureteric stents (JJ stent) were used only in 5 cases where big stone fragments pushed back to the kidney or ureteric perforation occurred. The demographic criteria of the patients were shown in table 1.

Among the total number of cases, three of them (2 impacted pelviureteric junction stones, 1 mid ureteric stone) were unsuccessful, stones were so impacted and ureters were kinked and un-negotiable by ureterscope, then they were converted to open surgery.

Perforation occurred twice, treated with JJ stent, (< 2%) as seen in figs. 1 and 2.

Table 1. Demographic features of patients who had ureteroscopy with laser.

| Feature | No. (Average) |
|----------------------------|---------------|
| No. of patients | 112 |
| Sex ratio | 69 M/43 F |
| Age range | 4-63 year |
| Stone size (range) | 6-20 mm |
| Success rate (non-stented) | 104 (92.86%) |
| Failure rate | 8 (7.14%) |
| Stented rate | 5 (4.46%) |

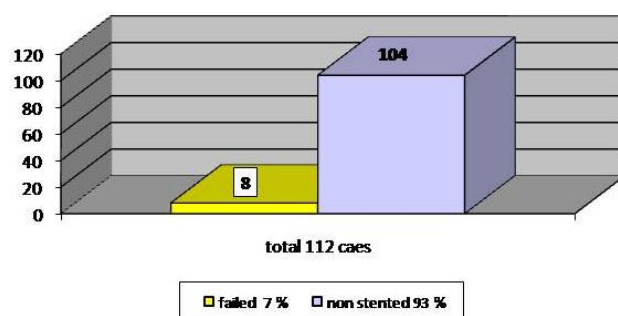


Fig. 1. Distribution of results successful versus failed cases.

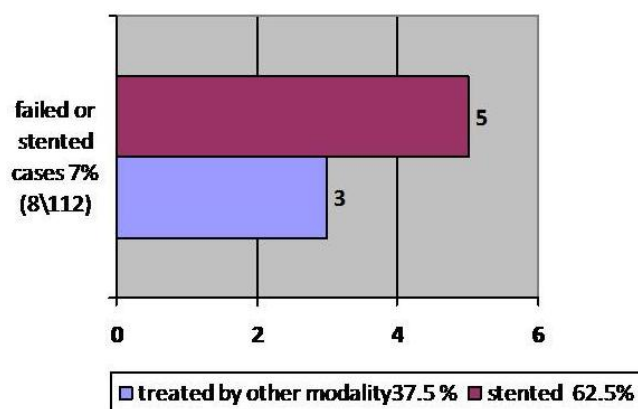


Fig. 2. Distribution of failed cases (stented, treated by other modalities)

Discussion

Ureteroscopy is the most effective way for ureteric stone treatment regardless its location or consistency ^(1,5,6), rate of disintegration reach 92% usually in single session ⁽⁷⁾. In the present study 93.75% full disintegration of the stones was achieved in single session with aid of repulsion prevention instruments ⁽⁸⁾. Stone retropulsion can result in increased operative time and cost-resulting from the need to change

from the semi-rigid ureteroscope to a flexible instrument to chase migrated calculi, additional procedures to treat residual migrated fragments are often required(9). In our study, it was 2.33 % compared to 3.3% in another study ⁽¹⁰⁾. Careful negotiation, low power laser and dual channel ureteroscope that we used can lower the risk of retropulsion.

Stenting of the ureters after stone disintegration varies, gravels may be retrieved with baskets if they are big or they pass spontaneously ⁽¹¹⁾. We use stent only in limited cases, (5\112) in another study (2/53) ⁽¹⁰⁾. Avoiding stents lowers costs and gives fewer irritative symptoms.

Stentless ureteroscopic holmium laser disintegration without gravels removal is a safe and effective method for pediatric ureteral stone less than 10 mm in diameter ⁽¹²⁾.

Uncomplicated ureteroscopic lithotripsy can be safely performed without the placement of a ureteral stent. Patients without stents had less operative time, pain and hematuria ⁽¹³⁾.

In the present study ureteric stented only in 5 cases 2 for ureteric injury and 3 for adjuvant ESWL because of big gravels push back to the kidney. No significant complications and the patient were kept on tamsulosine 0.4 microgram once per day and anti-inflammatory (diclofenac sodium) 50 mg for 7-10 days to facilitated gravel passage together with encouraged fluid intake. Ureteroscopic laser lithotripsy is recommended as the treatment of choice for distal ureteric calculi in children; we had 12 child treated with the small ureteroscope (7F) with laser all of them had distal ureteric stone and all were stone free. Using small ureteroscopes the target stone was treated safely and effectively ^(6,14,15).

In conclusion, treatment of urteric stone with ureteroscope and holmium laser have a high success rate with very low complications. Although ureteric stenting is only indicated in limited cases, stent less ureteroscopic holmium laser disintegration without gravels removal is a safe and effective. The procedure is safe with high success and promising in treatment even in pediatric urterolithiasis.

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Author contribution

Patients were referred from the clinics and surgical subspecialty's outpatient of all authors and ureteroscopies were done by all authors almost equally, the theoretical and statistical parts were divided to be done almost equally by all authors.

Conflict of interest

There are no any financial and personal relationships that could bias this work.

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References

1. Brian R, James E. Surgical Management of Upper Urinary Tract Calculi. Wein AJ, Kavoussi LR, Novick AC, et al (eds). Campbell-Walsh Urology 10th ed. Philadelphia, WB Saunders; 2012. p. 1405-10.
2. Manohar T, Ganpule A, Desai M. Comparative evaluation of Swiss LithoClast 2 and holmium: YAG laser lithotripsy for impacted upper-ureteral stones. J Endourol. 2008; 22(3): 443-6.
3. Rosini R, Teppa A, Tonini G, et al. Comparison of low-power laser and ultrasound litotripsy in the management of middle-distal ureteral stones. Urologia. 2011; 78(3): 216-20.
4. Al'-Shukri SKh, Ryvkin Alu, Selivanov AN, et al. Contact laser lithotripsy--an effective minimally traumatic method of treatment of cholelithiasis with calculi of the kidney, ureter and urinary bladder. Vestn Khir Im I I Grek. 2010; 169(5): 71-3.
5. Mushtaque M, Gupta CL, Shah I, et al. Outcome of bilateral ureteroscopic retrieval of stones in a single session. Urol Ann. 2012; 4(3): 158-161.
6. Tan AH, Al-Omar M, Denstedt JD, et al. Ureteroscopy for pediatric urolithiasis: an evolving first-line therapy. Urology. 2005; 65(1): 153-6.
7. Takazawa R, Kitayama S, Tsujii T. Single-session ureteroscopy with holmium laser lithotripsy for multiple stones. Int J Urol. 2012; 19(12): 1118-21.
8. Rane A, Bradoo A, Rao P, et al. The use of a novel reverse thermosensitive polymer to prevent ureteral stone retropulsion during intracorporeal lithotripsy: a

- randomized, controlled trial. *J Urol.* 2010; 183(4): 1417-21.
9. Elashry OM, Tawfik AM. Preventing stone retropulsion during intracorporeal lithotripsy. *Nat Rev Urol.* 2012; 9(12): 691-8.
 10. Liu DY, He HC, Wang J, et al. Ureteroscopic lithotripsy using holmium laser for 187 patients with proximal ureteral stones. *China Med J (Engl).* 2012; 125(9): 1542-6.
 11. Başeskioğlu B, Sofikerim M. Is ureteral stenting really necessary after ureteroscopic lithotripsy with balloon dilatation of ureteral orifice? A multi-institutional randomized controlled study. *World J Urol.* 2011; 29(6): 731-6.
 12. Gamal W, Aldahshoury M, Hammady A, et al. Stentless pediatric ureteroscopic holmium: YAG laserstone disintegration: is gravels retrieval an issue? *Int Urol Nephrol.* 2011; 43(3): 613-7.
 13. Xu Y, Wei Q, Liu LR. A prospective randomized trial comparing non-stented versus routine stented ureteroscopic holmium laser lithotripsy. *Saudi Med J.* 2009; 30(10): 1276-80.
 14. De Dominicis M, Matarazzo E, Capozza N. Retrograde ureteroscopy for distal ureteric stone removal in children. *BJU International.* 2005; 95: 1049-52.
 15. Thomas JC, DeMarco RT, Donohoe JM, et al. Pediatric ureteroscopic stone management. *J Urol.* 2005; 174(3): 1072-4.
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