Safety and Efficacy of Single-Session Nonstented Laser Ureteroscopic Lithotripsy

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Abstract

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 ureteroscope 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 Holium 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 uretreoscope 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 where 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 ureteroscope, 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.

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

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 ureteric 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.

Acknowledgement
First and foremost praise is to Almighty Allah. We would like to express our deep respect and sincere gratitude to our families, colleagues and patients.

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.

Funding
This research was done depending on the bare efforts of the authors.

References

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Received 8th Apr. 2014: Accepted 31st Aug. 2014.