

The New 30-Watt Lumenis Holmium Laser for Endourological Procedures: Initial Experience

Guido Giusti, Silvia Proietti

San Raffaele Hospital, Ville Turro Division, Dept of Urology, Milan, Italy

Introduction

Holmium laser lithotripsy is widely used as a treatment of upper and lower urinary stones with successful results in stone pulverization and fragmentation^(1, 2).

Holmium laser can fragment any type of calculi into fine fragments with minimal retropulsion; pending varying delivered energy, pulse frequency and width⁽³⁾. Therefore, it is accepted that holmium laser devices are an ideal solution for ureteroscopic and intrarenal calculi treatments^(4, 5). Recently, holmium laser has been used for the treatment of renal calculi during percutaneous nephrolithotomy (PCNL) with successful results^(6, 7). Moreover the holmium laser is used for the endourological treatment of upper urinary tract tumors^(8, 9).

The recent release of a new 30-watt holmium laser system, The Lumenis Pulse™ 30H, provides an ultimate solution for urology treatments within the low-power systems' category while keeping a comprehensive range of laser settings. Reaching up to 5 Joules per pulse (J) and 25 Hertz (Hz) with more than 185 setting combinations, this system enables a versatile solution for addressing even difficult scenarios and large stone burden.

For optimal results during flexible ureteroscopy, the Lumenis Pulse™ 30H System is used in combination with SlimLine™ 200 D/F/L fiber. This fiber can pass through a fully deflected scope, without damaging the working channel; it is designed to maximize the power and repetition rate transmission to the target, even when it is fully deflected. The system is also optimized to work with other Lumenis fibers including the SlimLine™ 365 and 550 micron fibers which enable the delivery of maximum 5 Joules per pulse (J) for the treatment of bladder stones or are used during laser treatment in mini or standard PCNL.

The aim of this evaluation was to demonstrate the effectiveness of the new Lumenis Pulse™ 30H system for the treatment of urinary stones and upper urinary tract tumors, by using the SlimLine laser fibers specifically the 200 D/F/L fiber.

Materials And Methods

During February 2016 to May 2016 we treated patients who underwent endourological procedures for urinary stones and upper urinary tract tumors where the holmium laser was needed. The laser system used was the Lumenis Pulse™ 30H with its compatible laser fibers.

Patient, stone and procedure characteristics were recorded; moreover, the diameter of the laser fiber, laser settings, average lasing time and energy, were monitored case by case.

Patients on anticoagulant therapy were treated without therapy discontinuation. All treatments were done using the standard protocol routinely used in the facility.

A subjective surgeon's evaluation of the laser system and the laser fibers performance were analyzed at the end of every procedure, by using a 5-point Likert rating scale from 1 (poor) to 5 (excellent). The parameters that were analyzed for the evaluation of the laser system included: effectiveness of stone fragmentation, ability to control stone lithotripsy, stone retropulsion and migration and general visibility. The characteristics that were analyzed for the evaluation of the laser fibers included: fiber flexibility and deflection with the scope, fiber durability and handling during the procedure, and control of fiber length and extension beyond the scope.

Results

During the evaluation period we treated 31 patients.

Twenty eight (28) procedures were performed for stones of the upper and lower urinary tract; 3 procedures were performed for upper urinary tract tumors.

Among 31 surgical procedures, 6 of them were laser mini-PCNL or laser PCNL, one bladder stone lithotripsy, 3 semi rigid ureteroscopies and 19 flexible ureteroscopies.

The versatility performance of the system was tested throughout the trial more than 20 different laser setting were utilized covering most of the system's performance envelope enabling range of 0.2-5J and 5-25Hz.

Procedure time and lasing duration were according to standard practice and aligned with common time tables published for these type of cases. Only minimized retropulsion was noticed and no complications occurred while using this holmium Lumenis Pulse™ 30H system.

Table 1. Patient, stone and procedure characteristics

Parameter			
Stone number (% of procedures)	1 stone - 51.6%	2 stones - 22.5%	More than 3 stones - 25.8%
Stone location (% of procedures)	Kidney - 83.9% including 1 case of transplanted kidney	Ureter - 13%	Bladder - 3.2%
Average stone size (cm)	2.08		
Fibers used (% of procedures)	SlimLine 200 D/F/L - 64.52%	SlimLine 365 - 32.26%	SlimLine 550 - 3.24%
Average lasing time (min)	Per procedure - 20.4	Per stone - 12	
Average procedure time (min)	Per case - 53	Per stone - 38	
Average energy applied in each procedure	5.4KJ		

In PCNL cases and bladder stone lithotripsy the laser setting used was 5J-6Hz, reaching the maximum energy available, leading to efficient lithotripsy.

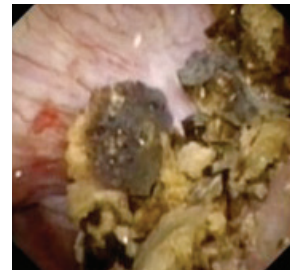
Examples of effectiveness of Lumenis Pulse™ 30H system in cases of fragmentation, papillotomy, tumor ablation are presented in Figures 1-4.

Figure 1

Before (left) and after (right) fragmentation of hard stone during Flexible Ureteroscopy (FURS) using the SlimLine™ 200 D/F/L fiber



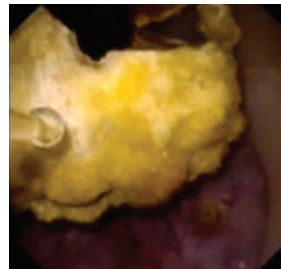
Before



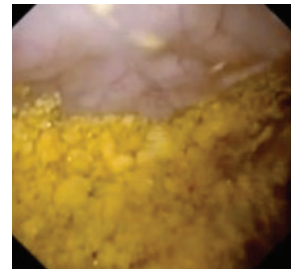
After

Figure 2

Before (left) and after (right) fragmentation of renal stone during FURS



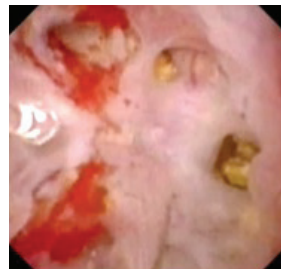
Before



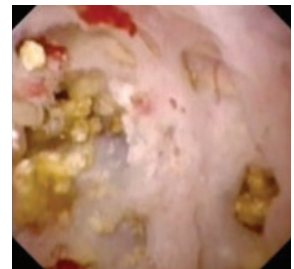
After

Figure 3

Before (left) and after (right) papillotomy during FURS in a patient with a medullary sponge kidney



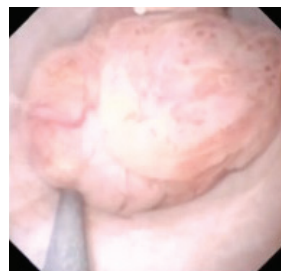
Before



After

Figure 4

Before (left) and after (right) ureteral tumor conservative treatment



Before



After

Subjective surgeon's assessment

Analysis of the surgeon's ranking scores for the different parameters showed average scores ranging between 4 (good) to 5 (excellent). For all the parameters evaluated the surgeon showed high satisfaction of both system and fiber performances during the different cases. The results are shown in tables 1, 2.

Table 1 - Subjective surgeons' evaluation:
The Lumenis Pulse™ 30H performance

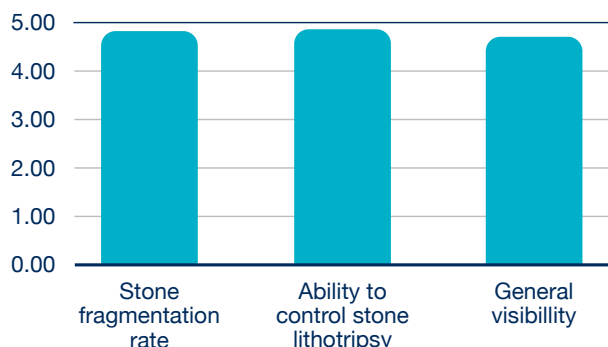
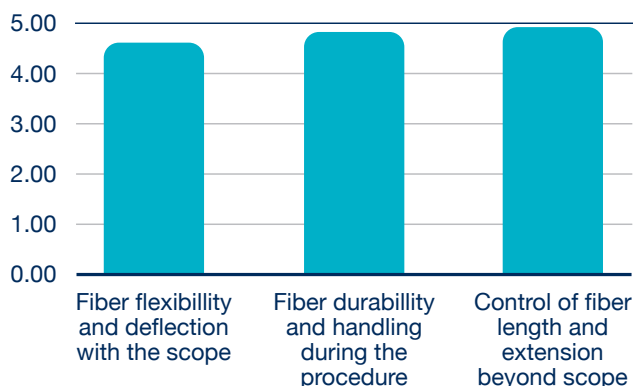


Table 2 - Subjective surgeons' evaluation:
The SlimLine™ 200 D/F/L fiber performance



Feedback parameter Index:

Excellent = 5 | Good = 4 | Average = 3 | Poor = 2 | Did not accord = 1

Conclusion:

In this evaluation, the Lumenis Pulse™ 30H system showed excellent effectiveness for the treatment of urinary stones and upper urinary tract tumours.

In addition, this evaluation highlighted the versatility of the Lumenis Pulse™ 30H system, having different laser setting combinations, which enables better stone treatment.

Lumenis Pulse™ 30H system was able to deliver the highest energy available on the market today among the low power laser systems, which was very helpful in PCNL and bladder stone lithotripsy.

The SlimLine™ 200 D/F/L fibers showed superior flexibility and durability without impairing the deflection of the scope while guaranteeing maximum power delivery.



Distribution Switzerland:



LASERMED AG
Frohheimstrasse 2
9325 Roggwil TG

LASERMED SA
Rte André Pillier 2
1762 Givisiez FR

Tel. 071 454 70 30
Fax 071 454 70 34
info@lasermed.ch

Tél. 026 466 38 15
Fax 026 466 38 16
www.lasermed.ch

References

1. Sofer M, Watterson JD, Wollin TA, et al. Holmium: YAG laser lithotripsy for upper urinary tract calculi in 598 patients. J Urol 2002 Jan;167(1):31-4.
2. Jiang H, Wu Z, Ding Q, et al. Ureteroscopic treatment of ureteral calculi with holmium: YAG laser lithotripsy. J Endourol 2007 Feb;21(2):151-4.
3. Alexander B, Fishman AI, Grasso M. Ureteroscopy and laser lithotripsy: technologic advancements. World J Urol 2015; 33: 247-56
4. Teichman JM, Vassar GJ, Bishoff JT, et al. Holmium:YAG lithotripsy yields smaller fragments than lithoclast, pulsed dye laser or electrohydraulic lithotripsy. J Urol 1998 Jan;159(1):17-23.
5. Bagley DH. Expanding role of ureterorenoscopy and laser lithotripsy for treatment of proximal ureteral and intrarenal calculi. Curr Opin Urol 2002; 12: 277-80.
6. Jou YC, Shen JH, Cheng MC et al. Percutaneous nephrolithotomy with holmium: YAG laser and a fiber guider-report of 349 cases. Urology 2005; 65: 454-8.
7. Gu Z, Qi J, Shen H et al. Percutaneous nephroscopic with holmium laser and ultrasound lithotripsy for complicated renal calculi. Lasers Med Sci 2010; 25: 577-80
8. Grasso M, Fraiman M, Levine M. Ureteropyeloscopic diagnosis and treatment of upper urinary tract urothelial malignancies. Urology 1999 Aug;54(2):240-6.
9. Gaboardi F, Bozzola A, Dotti E, et al. Conservative treatment of upper urinary tract tumors with Nd:YAG laser. J Endourol 1994 Feb;8(1):37-41.