

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

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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 width³. 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 a comprehensive 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.

Lumenis Pulse™ 30H System can be 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. 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.

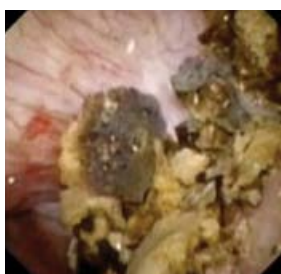
Examples of effectiveness of Lumenis Pulse™ 30H system in cases of fragmentation, papillotomy, tumor ablation are presented in Figures 1-4.

Figure 1

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



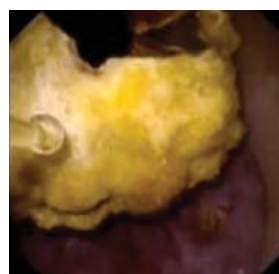
Before



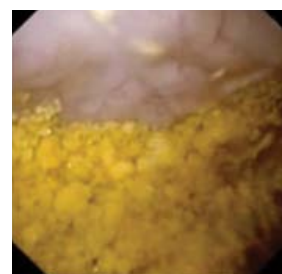
After

Figure 2

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



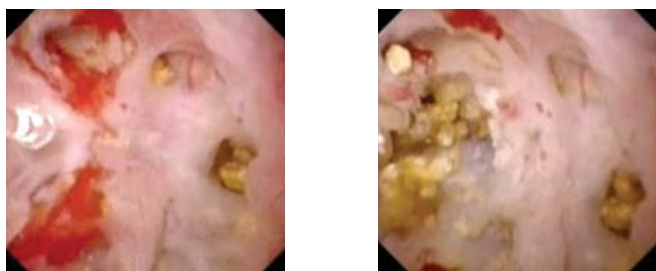
Before



After

Figure 3

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

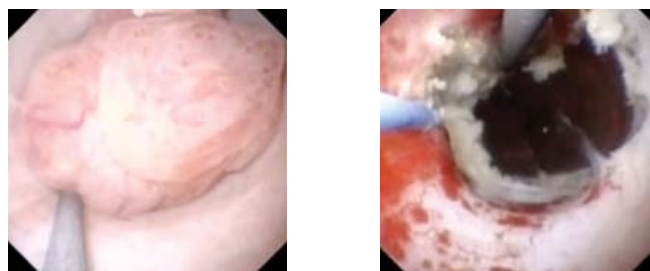


Before

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

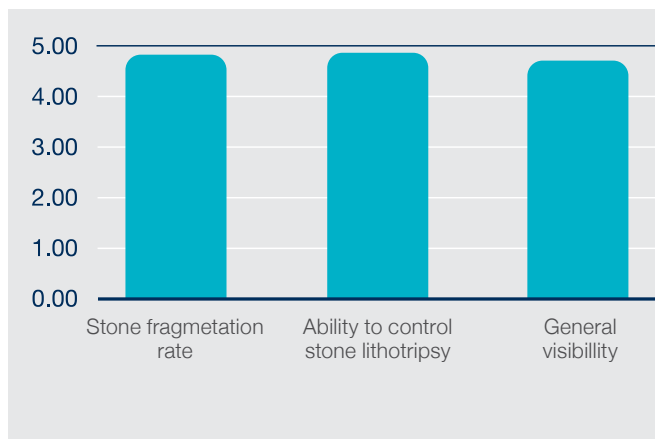
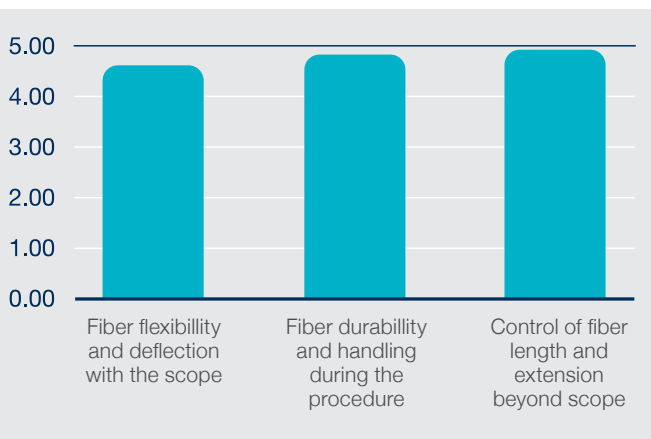


Table 2: Subjective surgeons' evaluation: The SlimLine™ 200 D/F/L fiber performance



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 comprehensive stone treatment.

Lumenis Pulse™ 30H system was able to deliver high energy of 5 joules per pulse, which was very helpful in PCNL and bladder stone lithotripsy.

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

Risk Information

The use of the Lumenis Pulse 30H in urology is contraindicated for patients who are unable to receive endoscopic treatments or are intolerant to prolonged anesthesia, as well as for resection or excision of large vascularized organs.

Holmium lasers are intended solely for use by physicians trained in the use of the Ho:YAG (2.1 μm) wavelength. Incorrect treatment settings can cause serious tissue damage. The laser should be used only on tissues that are fully observable.

See the system user manual for a complete list of contraindications and risks.

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