Photoselective Vaporization of the Prostate for Benign Prostatic Hyperplasia Using the 180 Watt System: Multicenter Study of the Impact of Prostate Size on Safety and Outcomes

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Abbreviations and Acronyms

BPH = benign prostatic hyperplasia

HoLEP = holmium laser enucleation of prostate

I-PSS = International Prostate Symptom Score

PSA = prostate specific antigen

PV = prostate volume

PVP = photoselective vaporization of prostate

PVR = post-void residual urine volume

Qmax = maximum urinary flow rate

QOL = quality of life

TRUS = transrectal ultrasound

TURP = transurethral prostate resection

XPS-180W = GreenLight XPS 180 W system

Purpose: We evaluated photoselective vaporization of the prostate using the GreenLight™ XPS™ 180 W system for benign prostatic hyperplasia treatment in a large multi-institutional cohort at 2 years. We particularly examined safety, outcomes and the re-treatment rate in larger prostates, defined as a prostate volume of 80 cc or greater, to assess the potential of photoselective vaporization of the prostate as a size independent procedure.

Materials and Methods: A total of 1,196 patients were treated at 6 international centers in Canada, the United States, France and England. All parameters were collected retrospectively, including complications, I-PSS, maximum urinary flow rate, post-void residual urine, prostate volume, prostate specific antigen and the endoscopic re-intervention rate. Subgroup stratified comparative analysis was performed according to preoperative prostate volume less than 80 vs 80 cc or greater on transrectal ultrasound.

Results: Median prostate size was 50 cc in 387 patients and 108 cc in 741 in the prostate volume groups less than 80 and 80 cc or greater, respectively. The rate of conversion to transurethral prostate resection was significantly higher in the 80 cc or greater group than in the less than 80 cc group (8.4% vs 0.6%, $p < 0.01$). I-PSS, quality of life score, maximum urinary flow rate and post-void residual urine were significantly improved compared to baseline at 6, 12 and 24 months of followup without significant differences between the prostate size groups. The re-treatment rate at 2 years reported in 5 of 411 patients was associated with the delivery of decreased energy density (2.1 vs 4.4 kJ/cc) in the group without re-treatment.

Accepted for publication March 13, 2015.

Study received institutional review board approval.

* Financial interest and/or other relationship with American Medical Systems.

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‡ Financial interest and/or other relationship with Intuitive Surgical.

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Editor's Note: This article is the fourth of 5 published in this issue for which category 1 CME credits can be earned. Instructions for obtaining credits are given with the questions on pages 602 and 603.

0022-5347/15/1942-0462/0
THE JOURNAL OF UROLOGY®

http://dx.doi.org/10.1016/j.juro.2015.03.113
Vol. 194, 462-469, August 2015
Printed in U.S.A.

Conclusions: Photoselective vaporization of the prostate using the XPS 180 W system is safe and efficacious, providing durable improvement in functional outcomes at 2 years independent of prostate size when treated with sufficient energy.

Key Words: prostate, prostatic hyperplasia, laser therapy, volatilization, organ size

GreenLight laser PVP as BPH treatment has significantly evolved in the last decade. The third generation XPS laser system introduced in 2010 features an increased laser beam diameter and a maximum power output to 180 W. Investigators reported that XPS-180W shows significantly decreased operative time and fiber use with increased energy delivery efficiency compared to the previous generation HPS™ 120 W system.[1,2]

For earlier generations of the GreenLight laser system such as the HPS 120 W the higher re-treatment rate in patients with a prostate greater than 80 cc was attributed to insufficient adenoma removal.[3–5] To our knowledge whether this limitation can be palliated using the novel XPS-180W remains to be determined.

We prospectively assessed XPS-180W clinical outcomes at 2 years of followup in a large, multicenter, prospectively collected cohort. In particular special attention was given to the safety and durability of outcomes in patients with a large prostate (greater than 80 cc) to assess the potential of GreenLight PVP as a size independent procedure.

PATIENTS AND METHODS

Study Population

Eligible for study were all men with BPH who underwent Greenlight PVP using XPS-180W from May 2011 to May 2012, as performed by 1 of 7 high volume, experienced surgeons at a total of 6 sites in Canada, the United States, France and the United Kingdom. Excluded from study were patients with known prostate cancer, previous pelvic radiation or known neurological disorders. After receiving institutional board review approval 1,196 patients were identified. Indications for surgery in each country were based on similar criteria established by CUA (Canadian Urological Association), AUA (American Urological Association) and EAU (European Association of Urology) guidelines on BPH management.[2]

Surgical Procedure

All patients underwent PVP as previously described using XPS-180W.[6–8] Procedures were done according to published IGLU (International GreenLight User) guidelines and incorporated the technique and experience of the operating surgeon.[9] Procedures were performed with the patient under general or spinal anesthesia and preoperative antibiotic prophylaxis was administered according to local guidelines. All surgeons were well beyond the learning curve for surgical technique and for several years had used various previous generations of GreenLight systems (greater than 200 PVP procedures).

In all cases a 23Fr continuous flow cystoscope with a 30-degree lens was used while being irrigated with room temperature saline. A working space was typically created initially at a power of 80 W. For the remainder of the procedure power was increased to 180 W adjusted in steps of 10 to 20 W. For coagulation the TruCoag™ feature pulse was used, modulated at 12 Hz and 5 to 40 W. The MoXy™ fibers were manufactured with a maximum energy delivery capacity of 650 kJ per unit. These fibers also featured a cooling system and a protective cap at the tip to minimize fiber devitrification. According to the manufacturer these features were designed to improve fiber durability and preserve optimal energy delivery on prostate tissue during the procedure.[10] The intended surgical end point was tissue ablation down to the surgical capsule from bladder neck to verumontanum circumferentially to create the same defect as complete TURP.

Primary Outcomes

Safety was evaluated by measuring the adverse events related to primary treatment. Efficacy was assessed by quantitative uroflowmetry parameter improvements as well as the subjective I-PSS score, including the QOL score, 6, 12 and 24 months after XPS-180W treatment. In addition, PSA reduction served as a surrogate marker of tissue removal.[9] In 322 patients prostate size reduction was also determined by subtracting postoperative TRUS size at 3 months (6 to 12 weeks) from preoperative TRUS size.

The endoscopic re-treatment rate was assessed 1 and 2 years after treatment. Subgroup comparative analysis was performed in patients with a prostate less than 80 vs 80 cc or greater as determined by preoperative TRUS PV. The effect of prostate size on safety efficacy and the re-treatment rate was examined.

Assessment

We retrospectively collected preoperative data, including patient age and PV on TRUS, along with operative parameters, including total operative time, laser time, total energy use and number of fibers. Energy density was defined as the ratio of the amount of energy applied during treatment divided by prostate size defined according to preoperative TRUS measurements.

Statistical Analysis

Parameters such as prostate size, energy and PSA were not normally distributed. Accordingly data are shown as the median and IQR. Because variables such as I-PSS or age were continuous data, they are shown as the mean and 95% CI. To compare the 2 groups of patients with a