

Safety of 120W High-Performance System Greenlight Laser for Benign Prostatic Hyperplasia

Hung-Ju Yang, M.D.¹, Po-Jen Hsiao, M.D.^{2,3}, Chun-Hou Liao, M.D.^{2,3}, Han-Sun Chiang, M.D.^{2,3}, Teng-Kai Yang, M.D.^{1,3}

Division of Urology¹, Department of Surgery, Cardinal Tien Hospital Yonghe Branch, Taipei, Taiwan; Division of Urology², Department of Surgery, Cardinal Tien Hospital, Taipei, Taiwan; College of Medicine³, Fu-Jen Catholic University, Taipei, Taiwan

ABSTRACT

Objective: Transurethral resection of the prostate has been the most commonly used procedure for benign prostatic hyperplasia (BPH). The 120W Greenlight high performance system (HPS)TM laser has evolved as a useful alternative but evidence about its safety is scarce. Our objectives are to evaluate the safety of the high power HPS. **Materials and Methods:** Sixty-one patients who underwent HPS for BPH were retrospectively followed. Functional outcomes, including improvement of International Prostate Symptoms Score, maximum flow rate, and post-void residual, were assessed. Perioperative and postoperative events were recorded and compared with those in the published literature. **Results:** The 120W HPS resulted in comparable functional improvement in patient symptoms and resulted in significantly shorter hospitalizations, less blood loss and fewer blood transfusions. No capsular perforation or transurethral resection syndrome was noted. **Conclusion:** The HPS showed adequate safety among Taiwanese men with BPH.

Keywords: laser, International Prostatic Symptoms Score, safety

INTRODUCTION

Transurethral resection of the prostate (TURP) has been the most commonly used procedure for benign prostatic hyperplasia (BPH) with apparently subjective and objective improvement in symptoms [1], but the associated bleeding and high complication rates restrict application to a selected population [2,3].

Photoselective vaporization of the prostate (PVP) with an 80W potassium-titanyl-phosphate laser has proven to be a useful alternative for symptomatic BPH [4,5]. Recently, the more powerful 120W Greenlight high performance system (HPS)TM laser was developed to utilize a higher rate of energy and improve efficacy [6-8]. Safety should be the major concern with the introduction of this new technology. In this study, we assessed the outcomes and investigated peri- and post-operative complications in patients after utilization of the HPS.

MATERIALS AND METHODS

From January 2007 to December 2009, 61 men with symptomatic BPH who had undergone HPS were retrospectively followed. The protocol was approved by the hospital ethics committee and informed consent was obtained from all patients. Inclusion criteria for the study were an International Prostate Symptoms Score (IPSS) greater than 7, maximum flow rate (Qmax) less than 15 mL/s or acute urinary retention. Patients who had prostate cancer, prior prostatic or urethral surgery, or a bladder tumor were excluded from the study.

Basic data were recorded after admission. Four outcomes, including the IPSS and quality of life scores, which were evaluated by a questionnaire, Qmax, and post-void residual urine, were evaluated as

baseline data. Other assessments included a urinalysis, serum sodium, hemoglobin and prostate-specific antigen (PSA) levels, and transrectal ultrasound (TRUS) measurement of the prostate. The American Society of Anesthesiologists (ASA) score for each patient was calculated by an anesthesiologist. TRUS-guided biopsies were performed in patients with elevated PSA levels or abnormal digital rectal examinations. The HPS procedure was performed with a 120W(Greenlight HPSTM) laser generator with the laser energy delivered by a side-firing fiber through a 24F continuous-flow cystoscope. The energy was absorbed by hemoglobin in the prostate tissue, and it vaporized the prostate tissue, resulting in a wide-open TURP-like cavity.

Serum sodium and hemoglobin levels were determined again within 4 hours after the operation. The operating time, length of hospitalization, and intra-operative and early complications were also assessed. Late complications such as urgent incontinence, gross hematuria, and urinary tract infections were evaluated at each visit postoperatively. If necessary, a cystoscopy was performed to confirm the diagnosis of urethral stricture and bladder neck contracture.

RESULTS

Baseline data are listed in Table 1. The mean age (\pm SD) was 74.1 (\pm 9.76). Twenty-one patients (34%) were at high operative risk, including 13 with ASA scores of 3 and 8 who were under treatment with anticoagulants. The patients had significant improvements in the four outcomes after four weeks compared with baseline data (Table 2). Compared with updated data for TURP patients [9], our patients had significantly shorter hospitalizations, less blood loss and fewer cases of decreased serum hemoglobin.

Table 3 shows perioperative and postoperative events. Four patients had urgent incontinence which required oral medication; 5 patients experienced gross hematuria which required medical treatment, but no surgical coagulation was needed. Four HPS patients developed symptomatic urinary tract infections, 2 had urethral strictures (3.3%)

Received: May 26, 2011 Accepted: June 10, 2011

Address correspondence to: Dr. Teng-Kai Yang, Division of Urology, Department of Surgery, Cardinal Tien Hospital Yonghe Branch, 80, Zhongxing Street, Yonghe District, New Taipei City, Taiwan

E-mail: circulas1@yahoo.com.tw

and 1 had a bladder neck contracture (1.6%). The rates of all complications were lower or comparable to those in TURP series except the re-catheterization rate which was 8.2% in this study.

Re-intervention was needed in one patient after HPS because of

Table 1. Preoperative Demographics for Patients Receive HPS

	Mean	SD
Age (yrs)	74.1	9.76
Height (cm)	166	6.31
Weight (kg)	65.9	9.60
Body mass index (kg/m ²)	24.0	3.09
Prostate volume (gm)	60.9	26.1
Prostatic specific antigen (ng/mL)	7.48	10.4
IPSS	19.6	6.29
Postvoided residual (mL)	211	201
Maximum uroflow (mL/s)	9.83	3.49
Quality of life score	4.61	0.78
Anesthesia scores	2.14	0.59

HPS=high performance system; IPSS=International Prostate Symptoms Score.

Table 2. The Age-adjusted Outcomes for the Enrolled Patients, Four Weeks after HPS

	Baseline		Four weeks after HPS		P value
	Mean	SD	Mean	SD	
IPSS	19.6	6.29	6.14	4.60	<0.001
Postvoided residual (mL)	211	201	40.8	39.0	<0.001
Maximum uroflow (mL/sec)	9.83	3.49	17.2	6.03	<0.001
Quality of life scores	4.61	0.78	1.68	0.71	<0.001
Hospitalization days			3.54	1.99	
Operation times (mins)			148	53.5	
Blood loss (mL)			45.6	75.3	
Serum hemoglobin change (g/L)			0.80	0.68	
Serum sodium change (mmol/L)			0.98	1.56	

HPS=high performance system; IPSS=International Prostate Symptoms Score.

Table 3. Preoperative and Postoperative Events during 12 Months of Follow up

	HPS (N=61)	
	N	Percentage
Preoperative events		
Under anticoagulants	8	13.1%
Combine bladder stone	4	6.6%
Preoperative urinary retention	8	13.1%
Postoperative events		
Blood transfusion	0	0
Blood clots evacuation	1	1.6%
Catheterized when discharge	5	8.2%
Events at follow up		
Urgent incontinence	4	6.6%
Gross hematuria need treatments	5	8.2%
Urinary tract infection	4	6.6%
Urethral stricture	2	3.3%
Bladder contracture	1	1.6%

HPS=high performance system.

persistent urinary retention. No capsular perforation requiring secondary intervention was recorded. No transurethral resection (TUR) syndrome was noted in these patients.

DISCUSSION

This study recorded the four functional outcomes after HPS. The IPSS decreased 70% (13.2 points) from baseline, similar to many published series [5,6,9,10]. Because of the almost bloodless nature of the procedure and the use of saline irrigation during HPS, the surgeon may have a clear operative field most of the time, which accounts for the fewer blood transfusions and cases of TUR syndrome, even after a three-hour surgery. The energy delivered accounts for the success of the surgery. The more energy applied with more tissue ablation, the lower the re-intervention rate [11].

The incidence of adverse effects after HPS, including gross hematuria (8.2%) and symptomatic urinary tract infection (6.6%), were similar to that in published laser series [4,10] and lower than that in TURP. Some PVP studies showed a higher re-catheterization rate after surgery [11], especially in those with large prostate volumes. All five re-catheterized HPS patients had prostate volumes larger than 60 mL. No capsular perforation after HPS was noted as a result of the good operative field with minimal bleeding.

The cost of PVP is not covered by national insurance in Taiwan, so patients must pay around 150 to 180 thousand NTD for this procedure. So patients who can not afford the procedure could be excluded from the HPS group. However, we think the basic characteristics of our patients truly reflect the current medical circumstances in Taiwan.

The limitations of HPS in this study were the long operative time and high recatheterization rate. The vaporization-only technique requires more time, energy and laser fibers during the procedure [12], especially in the first few cases. The depth of necrotic tissue (coagulation zone) after vaporization is larger than that in the enucleation technique and causes temporary urinary retention after the Foley catheter is removed. We think that modern modified techniques such as vaporization-resection or enucleation methods [12,13] will improve these drawbacks in the future.

CONCLUSION

Our results show that HPS offers advantages with regards to operative safety. Long-term follow up is needed to evaluate the durability and possible morbidity for HPS patients.

REFERENCES

1. Wasson JH, Reda DJ, Bruskewitz RC, Elinson J, Keller AM, Henderson WG: A comparison of transurethral surgery with watchful waiting for moderate symptoms of benign prostatic hyperplasia. The Veterans Affairs Cooperative Study Group on Transurethral Resection of the Prostate. *N Engl J Med* 1995; **332**:75-79.
2. Mebust WK, Holtgrewe HL, Cockett AT, Peters PC: Transurethral prostatectomy: Immediate and postoperative complications. A cooperative study of 13 participating institutions evaluating 3,885 patients. *J Urol* 1989; **141**:243-247.
3. Rassweiler J, Teber D, Kuntz R, Hofmann R: Complications of transurethral resection of the prostate (TURP)--incidence, management, and prevention. *Eur Urol* 2006; **50**:969-980.

4. Te AE, Malloy TR, Stein BS, et al: Photoselective vaporization of the prostate for the treatment of benign prostatic hyperplasia: 12-month results from the first United States multicenter prospective trial. *J Urol* 2004; **172**:1404-1408.
5. Bouchier-Hayes DM, Anderson P, Van Appledorn S, Bugeja P, Costello AJ: KTP laser versus transurethral resection: Early results of a randomized trial. *J Endourol* 2006; **20**:580-585.
6. Al-Ansari A, Younes N, Sampige VP, et al: GreenLight HPS 120-W laser vaporization versus transurethral resection of the prostate for treatment of benign prostatic hyperplasia: A randomized clinical trial with midterm follow-up. *Eur Urol* 2010; **58**:349-355.
7. Woo H, Oliver R, Bachmann A, et al: Outcome of GreenLight HPS 120-W laser therapy in specific patient populations: Those in retention, on anticoagulants, and with large prostates (≥ 80 mL). *Eur Urol Suppl* 2008; **7**:378-383.
8. Tasci AI, Ilbey YO, Luleci H, et al: 120-W GreenLight laser photoselective vaporization of prostate for benign prostatic Hyperplasia: Midterm outcomes. *Urology* 2011; **78**:134-140.
9. Wendt-Nordahl G, Bucher B, Hacker A, Knoll T, Alken P, Michel MS: Improvement in mortality and morbidity in transurethral resection of the prostate over 17 years in a single center. *J Endourol* 2007; **21**:1081-1087.
10. Rajbabu K, Chandrasekara SK, Barber NJ, Walsh K, Muir GH: Photoselective vaporization of the prostate with the potassium-titanyl-phosphate laser in men with prostates of >100 mL. *BJU Int* 2007; **100**:593-598.
11. Pfitzenmaier J, Gilfrich C, Pritsch M, et al: Vaporization of prostates of $>=80$ mL using a potassium-titanyl-phosphate laser: Midterm-results and comparison with prostates of <80 mL. *BJU Int* 2008; **102**: 322-327.
12. Son H, Ro YK, Min SH, Choo MS, Kim JK, Lee CJ: Modified vaporization-resection for photoselective vaporization of the prostate using a GreenLight high-performance system 120-W Laser: The Seoul technique. *Urology* 2011; **77**:427-432.
13. Szlauer R, Gotschl R, Razmaria A, Paras L, Schmeller NT: Endoscopic vaporesection of the prostate using the continuous-wave 2-microm thulium laser: Outcome and demonstration of the surgical technique. *Eur Urol* 2009; **55**:368-375.