Predictability of irritative voiding symptoms following photoselective laser vaporization of the prostate

Derek J. Matoka, MD, Timothy D. Averch, MD

Department of Urology, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania, USA

MATOKA DJ, AVERCH TD. Predictability of irritative voiding symptoms following photoselective laser vaporization of the prostate. The Canadian Journal of Urology. 2007;14(5):3710-3714.

Background: *Photoselective laser vaporization of the prostate (PVP) is recognized as an alternative for the surgical management of BPH. Our experience suggests a higher incidence of persistent irritative symptoms than expected. Characteristics of our population were evaluated to determine whether postoperative symptomatology could be predicted.*

Methods: *We retrospectively reviewed those patients who underwent PVP at our institution between June 2004 and February 2006. Lower urinary tract symptoms as measured by the American Urological Association Symptom Index (AUA-SI) score and quality of life (QoL) score were recorded. In addition, peak urinary flow rate (Qmax) and ultrasound prostate volumes were also measured. PVP was performed using an 80 W KTP side-firing laser (LaserScope, San Jose, CA). Total energy used was recorded. AUA-SI score, QoL and Qmax were monitored at 1, 3 and 6 months postoperatively.*

Results: *Twenty-nine men were evaluated retrospectively. Their mean AUA-SI score, prostate volume and energy used were 17.8, 49.8 cm^3 and 96.8 kJ respectively. At 1 month, 34 % complained of significant urgency, frequency and dysuria. Anticholinergic therapy was initiated in six patients. At 6 months, the number of patients complaining of symptoms decreased to 17% and five of the six patients were no longer requiring therapy. An association between finasteride therapy prior to PVP and post-operative symptoms was identified. In our series, 70% of those patients experiencing persistent symptoms had been managed with finasteride. No association between irritative voiding symptoms, laser energy utilized and volume of treated prostate gland was observed. However, a statistically significant association was noted between persistent irritative voiding symptoms and both lower preoperative AUA-SI scores and preoperative use of finasteride.*

Conclusions: *Although a therapeutic benefit is observed following PVP, persistent irritative voiding symptoms are not uncommon. Lower preoperative AUA-SI scores and treatment with finasteride appear to be associated with bothersome postoperative symptoms. This information can be used to effectively select candidates and to counsel those patients with regard to both the therapeutic objective and expectations related to this procedure.*

Key Words: photoselective laser vaporization of the prostate, PVP, BPH

Accepted for publication September 2007

Acknowledgement: The authors would like to thank the Study Design and Statistical Consultation Service at the University of Pittsburgh's Office of Clinical Research, Health Sciences, for assistance with statistical aspects of this project.

Address correspondence to Dr. Derek J. Matoka, Dept. of Urology, University of Pittsburgh School of Medicine, 3471 5th Avenue, Kaufmann Building, Suite 700, Pittsburgh, PA 15213-3232 USA

Introduction

Photoselective laser vaporization of the prostate (PVP) has recently gained recognition as a promising safe and effective alternative to standard transurethral resection of the prostate for the management of symptomatic benign hypertrophy of the prostate that is refractory to medical therapy.[1,2] Objective and subjective outcomes reported in the literature for PVP compare quite favorably to that reported for standard

TURP. The parameters of AUA-SI score, QOL score, Qmax and post-void residual have shown improvements that are comparable to TURP at one month. This improvement is consistently maintained through sequential follow-up to one year. In addition, proponents of this modality emphasize its greater safety profile, shorter catheterization times and decreased hospital stays, with the ability to actually perform this procedure on an outpatient basis.[2,3]

The KTP laser takes advantage of both optical and mechanical properties of the tissue. It delivers an increased power density that efficiently induces ablative vaporization of the prostate that is confined to superficial tissues and a coagulation effect that is also minimal. Subsequently, there is a shallow penetration depth with a corresponding overall minimal thermal coagulation depth. Therefore, less edema, tissue necrosis and resulting sloughing of tissue occurs as less tissue volume is exposed to thermal heating.[2] It is thought that this technology should lead to a decrease or possibly even eliminate the constellation of symptoms that include urgency, frequency and dysuria.

The significant irritative voiding symptoms of urgency, frequency and dysuria have been reported to occur in only 6%-9% of patients following this procedure.[2,3] However, in our experience, we have noted a higher incidence of bothersome symptoms, especially with regard to dysuria. The duration of these symptoms also appears to be longer than what generally is expected. On the basis of these findings, the characteristics of our patient population were critically evaluated to determine whether or not we could predict those likely to have greater post-operative symptomatolgy.

Patients and methods

We conducted a retrospective review of those patients who underwent PVP at our institution between June 2004 and February 2006. Approval was obtained through the University of Pittsburgh Institutional Review Board. An informed consent was signed by each patient at their initial clinic visit. Our population consisted of 29 men with symptomatic BPH that was refractory to medical management. The baseline characteristics of this group are shown in Table 1. They underwent physical examination and evaluation of their symptoms according to the AUA-SI and (QoL) questionnaires. Urodynamic investigation consisted of uroflowmetry with peak urinary flow rate (Qmax). The size and appearance of the prostate was evaluated by trans-rectal ultrasonography. A complete blood count, serum chemistry, urinalysis and serum prostate specific antigen (PSA) were obtained as part of a routine preoperative evaluation. Patients were included in this retrospective review if they had undergone a PVP at this institution over the specified time period. There were no specific inclusion or exclusion criteria that were applied.

Broad-spectrum intravenous antibiotics were given prior to every procedure. The decision to administer spinal or general anesthesia was made on a case-by-case basis by the anesthesiologist. Vaporization of the prostate was performed by a single surgeon using an 80 W KTP side-firing laser beam produced by a Laserscope Greenlight PV generator. The laser fiber was introduced through the lumen of a 23 F continuous-flow cystoscope. Normal saline was used as the irrigant. Vaporization of the prostate was accomplished as described in the manufacturer's guidelines by keeping the fiber approximately .5 mm-1 mm away from the adenoma with continual rotation of the laser fiber in a "paint brushing" motion. If a medium lobe was present, this was vaporized before turning our attention toward the lateral lobes. The adenoma was vaporized evenly to the level of the capsular fibers. Vaporizing distal to the verumontanum was avoided to preserve the external

TABLE 1. **A comparison of baseline characteristics and perioperative data of our patient population versus that reported in the literature[2]**

n = 29	Our population Mean ± SD	Literature review Mean ± SD
Age	69.1 ± 9.5	67.7 ± 8.7
AUA-SI score	17.8 ± 6.1	24.0 ± 5.9
QOL score	4.2 ± 1.4	4.3 ± 1.0
Qmax (ml/sec)	6.9 ± 3.2	7.8 ± 3.8
TRUS prostate vol (ml)	49.8 ± 25.3	54.6 ± 31.7
Total energy used (kJ)	96.8 ± 47.4	103.5 ± 64.5

TABLE 2. **Mean AUA-SI, QoL and Qmax at 0, 1, 3 and 6 months. Paired t-test utilized for calculating statistical significance**

	AUA-SI	QoL	Qmax
Preoperative	17.8	4.2	6.9
1 month	13.8 ($p < .001$)	3.4 ($p = .006$)	15.1 ($p < .001$)
3 months	10.4 ($p < .001$)	2.3 ($p < .001$)	16.2 ($p < .001$)
6 months	7.4 ($p = .001$)	1.9 ($p < .001$)	17.0 ($p = .001$)

sphincter. Care was also taken to avoid incidental lasing of the trigone. The procedure was terminated when a satisfactory transurethral resection defect was observed with clear evidence of the capsular fibers or a significantly diminished efficacy of the vaporization effect on the prostatic capsule was observed. The total laser energy used was recorded.

Symptomatic and urodynamic evaluation was initiated at the 1-month postoperative visit. The AUA-SI, QoL and Qmax were recorded and monitored at 1, 3 and 6-month time intervals. Statistical analysis was completed using SPSS version 14.0. The Paired T test, Mann-Whitney test and the Fisher's Exact test were used for statistical validation with $p < 0.05$ considered statistically significant. Bonferroni corrections were done to adjust for multiple comparisons.

Results

A total of 29 patients who underwent KTP PVP by a single surgeon between June of 2004 and February 2006 were reviewed retrospectively. The purpose was to determine whether or not there were preoperative or perioperative characteristics that could predict those likely to have greater postoperative symptoms. The preoperative and perioperative characteristics of our patient population closely resembled that reported in the literature, Table 1. Age (69.1 $\pm$ 9.5 versus 67.7 $\pm$ 8.7), QoL score (4.2 $\pm$ 1.4 versus 4.3 $\pm$ 1.0), Qmax (6.9 ml/sec $\pm$ 3.2 versus 7.8 ml/sec $\pm$ 3.8) and total laser energy used (96.8 kJ $\pm$ 45.8 versus 103.5 kJ $\pm$ 64.5) of our population was consistent with the literature. The AUA-SI score (17.8 $\pm$ 6.1 versus 24.0 $\pm$ 5.9) and the prostate volume (49.8 ml $\pm$ 25.3 versus 54.6 ml $\pm$ 31.7) of our population tended to be lower than that previously reported. In addition, in our study, two patients presented with acute urinary retention and two had a previous history of having undergone a standard TURP for the management of BPH.

Generally, our postoperative data compared favorably to the literature. We saw a statistically significant improvement in AUA-SI scores at 1, 3 and 6 months from that described preoperatively. The QoL scores also followed the expected trend with a statistically significant improvement noted at 1, 3 and 6 months when compared to that reported on preoperative questionnaires. Additionally, the improvement in Qmax that was seen in our population at the 1, 3 and 6 month time points was also statistically significant, Table 2. However, a higher incidence of irritative voiding symptoms was noted in our series. Moreover, these symptoms were present for a longer duration than what was expected based on a review of the literature. The frequency of irritative voiding symptoms that is consistently reported ranges from 6%-9% with a duration of symptoms that persists for approximately 10 days. In our series, 34% reported significant urgency, frequency and dysuria at 1 month. In fact, of those in this group, 6 of 10 required anticholinergic therapy at 1 month.

In evaluating the data, our patient population was divided into two groups based on AUA-SI and QoL

TABLE 3. **No statistically significant association between irritative voiding symptoms and age, prostate volume or energy was identified. *Mann-Whitney calculated for statistical significance**

	Symptom score improved Mean ±	Symptom score not improved Mean ±	P value*
Volume (ml)	52.0 ± 29.5	45.6 ± 14.7	0.89
Energy (kJ)	93.0 ± 47.8	104.0 ± 48.2	0.66
Age	68.2 ± 9.4	71.0 ± 10.0	0.35

TABLE 4. **Association between presenting AUA-SI score and irritative voiding symptoms at 1 month (p < .001) using Mann-Whitney test for statistical significance**

	Symptoms improved	Symptoms not improved
	Mean	Mean
Preoperative AUA-SI score	20.7	12.2
1 month AUA-SI score	13.1	15.2

TABLE 5. **Individuals managed with finasteride therapy prior to PVP were more likely to experience persistence of irritative voiding symptoms (p = .017). Statistical significance determined by Fisher's Exact test**

Improved symptoms	No finasteride	Finasteride
No	**3**	**6**
Yes	**12**	**4**

scores. Specifically, one group consisted of those who had shown symptomatic improvement postoperatively by demonstrating a quantitative improvement on their follow-up AUA-SI and QoL questionnaires. The second group was comprised of those with persistent irritative voiding symptoms as demonstrated by a worsening of AUA-SI and QoL scores in addition to a subjective complaint of significant dysuria. The two groups were then compared using the variables of age, prostate volume and laser energy used, Table 3. However, we were unable to identify an association between those with persistent symptoms and the parameters of age (68.2 $\pm$ 9.4 versus 71 $\pm$ 10.0, p = 0.35), prostate volume (52.0 ml $\pm$ 29.5 versus 45.6 ml $\pm$ 14.7, p = 0.89) and laser energy used (93.0 kJ $\pm$ 47.8 versus 104.0 kJ $\pm$ 48.2, p = 0.66).

Presenting AUA-SI scores were compared between the two groups, Table 4. Interestingly, those presenting with mild to moderate AUA-SI symptom scores (12.2 $\pm$ 4.5 versus 20.7 $\pm$ 4.7) were more likely to experience an increase in their perceived symptoms. This was statistically significant (p < 001). In addition, we also identified those patients on finasteride therapy preoperatively. A statistically significant association between those managed with finasteride prior to PVP and the persistence of irritative symptoms was observed, Table 5.

Discussion

KTP laser vaporization of the prostate has demonstrated its potential as a safe and efficacious alternative to standard TURP for the management of symptomatic BPH. Proponents of PVP emphasize the minimal perioperative and postoperative morbidity associated with the procedure. In addition, there is no evidence of fluid absorption, catheterization times tend to be of short duration and this procedure may be performed on an outpatient basis. The ability to perform a PVP laser prostatectomy on high-risk individuals with significant comorbidities or those that require chronic anticoagulation is an added benefit.[4]

The literature clearly indicates that PVP provides an immediate and sustained therapeutic benefit. Indeed, our data is in agreement with that reported in the literature. In our series, there was an overall statistically significant improvement in AUA-SI and QoL scores. A statistically significant improvement in flow rate was also noted. However, the degree of postoperative urgency, frequency and significant dysuria that we observed was both surprising and concerning and prompted a review of characteristics specific to our patient population. We postulated that the overall volume of the prostate may contribute to postoperative symptoms. Larger glands demand greater technical ability, attention to detail and longer treatment times. There is a greater risk of excessive tissue coagulation with resulting edema formation. Insufficient tissue removal may also lead to an increase in symptoms. In addition, total laser energy used is likely to be proportionally higher with a possible greater thermal effect leading to associated irritative symptoms. Total laser energy used was also evaluated independently. A statistically significant association between the size of the prostate or total laser energy used and irritative voiding symptoms was not identified. Age was also not noted to be a factor in our series.

In evaluating those individuals who did not show symptomatic improvement following PVP, it was observed that their AUA-SI scores tended to be lower

than those who demonstrated symptomatic improvement. This was statistically significant. An increase from a mean AUA-SI score of 12.2 $\pm$ 4.5 to a score of 15.2 $\pm$ 5.4 was seen postoperatively. In this group, despite a prevalent obstructive component with observed post-void residuals, these patients were not as bothered by voiding symptoms prior to the procedure. An explanation for the trend that was observed in those presenting with lower AUA-SI scores to subsequently experience an increase in their perceived voiding symptoms following PVP is not readily available.

An association between preoperative management with finasteride and postoperative symptoms was also identified. Five-alpha reductase inhibitors are known to alter the vascularity of the prostate with an associated reduction in size and an increase in the fibrous component.[4,-6] The efficiency of the GreenLight laser may be reduced in this setting as the quantity of blood vessels and associated hemoglobin that is responsible for absorption is reduced. The resulting altered distribution of the thermal effect may lead to a predisposition to edema, sloughing of prostatic tissue and associated irritative voiding symptoms.

Certainly, proper technique is integral in achieving a desired therapeutic outcome, as poor technique has been associated with a spectrum of postoperative symptoms and with a varying degree of severity.[7] Thus, we carefully monitored our technique so as not to inadvertently contribute to prolongation of post-operative symptoms. Appropriate distance between the fiber and tissue was consistently maintained to avoid thermal diffusion. Inspection of the urethra, prostatic defect and trigone of the bladder was routine following the procedure. No incidental lasing of the trigone, a potential cause for the development of voiding symptoms was observed. In addition, continuity was preserved in our series as the same surgeon was present for all cases.

Conclusions

In summary, our data correlates with that reported in the literature indicating a clear therapeutic benefit from PVP. However, in our experience, persistent urgency, frequency and especially dysuria are not uncommon following this procedure. These numbers may be explained in part by an association between finasteride therapy and persistent voiding symptoms. In addition, those patients presenting with only mild to moderate symptom scores are more likely to experience an increase in their perceived symptoms as well.

This information can be used to effectively counsel all patients and in particular those on finasteride therapy or presenting with only mild to moderate symptoms with regard to both the therapeutic objective as well as realistic expectations associated with this procedure. □

References

1. Hai MA, Malek RS. Photoselective vaporization of the prostate: initial experience with a new 80 W KTP laser for the treatment of benign prostatic hyperplasia. *J Endourol* 2003;17:93.
2. Te AE, Malloy TR, Stein BS, Ulchaker JC, Nseyo UO, Hai, MA, Malek RS. 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.
3. Malek RS, Kuntzman RS, Barrett DM. High power potassium-phosphate laser vaporization prostatectomy. *J Urol* 2000;163:1730.
4. Sutton MT, Yingling M, Vyas A, Humphrey A, Borkowski A, Jacobs SC, Kyprianou N. Finasteride targets prostate vascularity by inducing apoptosis and inhibiting cell adhesion of benign and malignant prostate cells. *Prostate* 2006;66:1194.
5. Hochberg DA, Basillote JB, Armenakas NA, Vasovic L, Shevchuk M, Pareek G, Fracchia JA. Decreased suburethral prostatic microvessel density in finasteride treated prostates: a possible mechanism for reduced bleeding in benign prostatic hyperplasia. *J Urol* 2002;167:1731.
6. Andriole G, Bruchovsky N, Chung LWK, Matsumoto AM, Rittmaster R, Roehrborn C, Russell D, Tindall D. Dihydrotestosterone and the prostate: the scientific rationale for 5a-reductase inhibitors in the treatment of benign prostatic hyperplasia. *J Urol* 2004;172:1399.
7. Muschter R, Perlmutter AP. The optimization of laser prostatectomy part II: other lasing techniques. *Urology* 1994;44:856.