

VISUAL LASER ABLATION OF THE PROSTATE (VLAP) WITH BARE FIBER IN CONJUNCTION WITH LASER BLADDER NECK INCISION IN THE TREATMENT OF PATIENTS WITH BENIGN PROSTATIC HYPERPLASIA (BPH)

Hasan M. A. Farsi, FACS, FRCS(C); Hisham A. Mosli, FACS, FRCS(C);
Mohammed F. Alzemaity, FACS, FRCS(C); Ahmed Bahnasy, MD, PhD

The objective of this paper was to assess the effectiveness of visual laser ablation of the prostate (VLAP) using a bare fiber with simultaneous laser incision of the bladder neck for patients with symptomatic benign prostatic hyperplasia. Sixty-seven patients with symptomatic bladder outlet obstruction due to benign prostatic hyperplasia were entered into a prospective trial where VLAP was done with neodymium:YAG laser, while the bladder neck incision was done with KTP laser. The laser was delivered using a bare fiber. There was marked improvement demonstrated at three months post-lasing in symptom score and flow rate. No significant changes were noticed in the subsequent follow-up. However, the addition of the bladder neck incision increased the rate of retrograde ejaculation without appreciable improvement in symptom score or flow rate when compared to other published data. None of the patients developed bladder neck contracture. VLAP, using a bare fiber, in conjunction with laser bladder neck incision, produces durable improvement in urine flow rate and symptom score in patients with symptomatic benign prostatic hyperplasia without the development of bladder neck contracture. This method will reduce the costs of laser prostatectomy. *Ann Saudi Med 1997;17(2):191-194.*

Benign prostatic hyperplasia (BPH) is one of the most common disease processes in men. For more than 50 years, the gold standard of treatment for patients seeking surgical therapy from this disease has been transurethral prostatectomy. It is estimated that nearly 400,000 transurethral prostatic resections (TURP) are performed each year in the United States.¹ Transurethral incision of the prostate (TUIP) was recommended as an alternative to TURP in a small prostate.² Visual laser ablation of the prostate (VLAP) is a new modality being evaluated for the treatment of BPH. A pilot study was performed using VLAP in 17 male patients by Costello et al., which showed a significant improvement in postoperative flow rates and Madsen-Iversen symptom score.³ Many different treatment methods are currently evolving. Free-beam side-fire fibers, noncontact side-fire, contact vaporization, bare fiber, interstitial laser and ultrasound-guided laser prostatectomy have been reported.^{4,5-9} One disadvantage of VLAP is the expense of both the initial capital and the running cost. The single most expensive recurrent cost is the laser fiber. Recently, many companies have presented different side-firing laser devices. These are usually

recommended for one use only and cost about 3000 to 5000 Saudi riyals. To assess the value of VLAP using a bare fiber in conjunction with bladder neck incision, a prospective study was designed. Eligibility criteria included a patient's age being greater than 50 years and significant voiding symptoms secondary to BPH, leading the patient to request surgical therapy. The results were then compared to the published data using various laser techniques and without concomitant bladder neck incision.

Material and Methods

Sixty-seven patients aged 50 to 80 years (mean = 62 years) with symptomatic bladder outlet obstruction secondary to benign prostatic hyperplasia were prospectively studied. They were evaluated by a complete history and physical examination, including digital rectal examination, urinalysis and culture, creatinine, PSA, transrectal ultrasound examination, standardized American urological symptoms score and maximum urinary flow rates (Q MAX). Prostatic volume was calculated preoperatively using transrectal sound. Patients with a palpable prostatic nodule or PSA level of more than 4 as measured by the Hybritech method underwent transrectal ultrasound-guided biopsies. Patients with prostate cancer were excluded from the study.

Cystourethroscopy was performed first to rule out a coexisting pathological condition. Video display on a

From King Abdulaziz University Hospital, Jeddah.

Address reprint requests and correspondence to Dr. Farsi: King Abdulaziz University Hospital, P.O. Box 6615, Jeddah 21452, Saudi Arabia.

Accepted for publication 29 September 1996. Received 9 July 1996.

television monitor optimized visualization of the operation. A suprapubic tube catheter was then inserted. Laser prostatectomy was performed with a tip firing bare fiber delivery device using a standard neodymium:YAG laser source (Laserscope) at 40 watts power setting. A fiber was passed first through a ureteric catheter, then through the working element of a size 23.5 F Cystoscope. An Albarran deflecting bridge was used to direct the fiber to the desired area of treatment. Laser energy was applied for a continuous 90 seconds to each lateral lobe at the 3 and 9 o'clock positions. For a larger prostate, the treatment was done at the 2, 4, 8 and 10 o'clock positions and was repeated at two or three intervals between the verumontanum and the bladder neck. A bladder neck incision was done using the KTP laser at 38 watts, using the tip firing fiber. The aim of the bladder neck incision was to reduce the chances of development of bladder neck cicatrization and to decrease the post-treatment catheterization time. The incision was done at the 6 o'clock position, starting from the trigone just distal to the interureteric ridge down to the verumontanum. No postoperative bladder irrigation was used. The patients were usually discharged within 24 hours with the suprapubic tube connected to a drainage bag. They were given a three-day supply of an anti-inflammatory medication. In the first 12 patients, the suprapubic tube was removed 48 to 72 hours postoperatively. However, they experienced significant irritative voiding symptoms. A urethral Foley catheter was inserted in five patients who developed urinary retention. Thereafter, the patients were discharged with the suprapubic catheter in place and it was left indwelling for one week. In the clinic, the tube was then clamped and the patient was given a voiding trial. If he could not void, the catheter was unclamped and left indwelling for another week. The flow rate and the symptom score were rechecked at 1, 3, 6, 9 and 12 months post-treatment. Changes in frequency of intercourse and the presence of retrograde ejaculation were documented.

TABLE 1. Results of concomitant VLAP and laser bladder neck incision.

	Baseline n=67	3 months n=67	6 months n=61	9 months n=55	12 months n=52
AUA score	21.1±5.2	5.6±2.8	5.8±2.0	5.9±1.8	6.2±1.7
Q max	5.9±1.8	14.2±5.7	14.1±4.5	14.7±3.4	14.9±2.3

TABLE 2. Complications of VLAP with laser bladder neck incision.

	Number
Repeat VLAP	2
Epididymitis	3
Retrograde ejaculation	18
Weak erection	5
Retention	5

The AUA score and Q Max for patients before and after operation and for every single follow-up time were evaluated using the *t*-test. Analysis of variance (ANOVA) was used to test the differences between means of quantitative variables at different times. The Scheffe method for comparisons among groups was used. The BMDP statistical package release 7.0 on PC was used to perform the statistical analysis.

Results

The mean postoperative catheterization time was 8.7 days (range two to 32 days). The results of assessment at 3, 6, 9 and 12 months are presented in Table 1.

Comparisons among means of AUA score before operation, and 3, 6, 9 and 12 months after operation showed significant differences in different times ($P<0.001$). Readings for the AUA score before operation were significantly higher than the means at times of follow-up. However, no significant differences were noticed among different AUA scores after operation in the various periods of follow-up ($P=0.3$).

With respect to Q Max, the same results were noticed. It was significantly higher in the follow-up ($P<0.001$), while no significant differences could be noticed in 3, 6, 9 and 12 months follow-up ($P=0.42$).

The main problems encountered were a persistent urgency and dysuria that remained for four to six weeks. This was controlled by prescribing a short course of a parasympatholytic. Complications were relatively few (Table 2). No patient required a blood transfusion and none developed urinary incontinence, bladder neck contracture or urethral stricture. Three patients developed epididymitis. Two patients had a repeated VLAP two months later because of persistent obstructive symptoms. Eighteen patients experienced retrograde ejaculation, while five patients claimed to have developed a weak erection.

Discussion

There are a variety of commercially available surgical lasers, including the CO₂, holmium:YAG, argon, diode, Nd:YAG, and KTP. The neodymium:yttrium-aluminum-garnet (Nd:YAG) is currently the primary laser energy source of choice to treat BPH. Nd:YAG 1063 nm wavelength is suited to thermal ablation of the prostate.^{10,11} Its wavelength is poorly absorbed by water and penetrates deeply into adenoma heating target tissue faster than its thermal relaxation time. Deep tissue coagulative necrosis occurs and deeper still, thrombosis of the prostatic arteries. This deep vascular effect may cause delayed transition zone necrosis with clinical improvement noted months after laser treatment. The KTP laser has a wavelength of 532 nm and it differs from the previous laser in that its

TABLE 3. Changes in Q max (3, 6 and 12 months) after laser prostatectomy.

Author	Procedure	# pts	Initial	3	6	12
Muschter ⁸	Interstitial laser	239	7.7	16.3	17.7	17.6
Gillatt ²³	Interstitial laser	80	7.9	14.5	14.9	–
Babayan ⁹	TULIP	222	7.4	12.3	12.1	11.6
Boon ²⁴	TULIP	211	7.4	12.3	12.3	11.6
Costello ⁵	Sidefire	74	8.86	15.1	14.9	16.8
Cowles ²²	Sidefire	80	6.3	–	14.3	14.3
Gomella ¹¹	Contact	14	6.7	12.5	–	10.3
Farsi	Bare-fiber + BNI	67	5.9	14.2	14.1	14.9

TULIP=transurethral ultrasound-guided laser-induced prostatectomy; BNI=bladder neck incision.

TABLE 4. Changes in AUA symptom score (3, 6 and 12 months) after laser prostatectomy.

Author	Procedure	# pts	Initial	3	6	12
Muschter ⁸	Interstitial laser	239	25.4	8.1	6.4	6.2
Gillatt ²³	Interstitial laser	80	20.0	8.6	7.9	–
Babayan ⁹	TULIP	222	18.4	7.6	6.9	6.9
Boon ²⁴	TULIP	227	18.3	7.6	6.9	6.7
Costello ⁵	Sidefire	74	18.85	9.28	7.09	7.52
Cowles ²²	Sidefire	80	20.8	–	7.1	6.5
Gomella ¹¹	Contact	14	17.4	5.7	–	7.3
Farsi	Bare-fiber + BNI	67	21.1	5.6	5.8	6.2

TULIP=transurethral ultrasound-guided laser-induced prostatectomy; BNI=bladder neck incision.

energy is visible green light. This color allows for a beam that is easily able to cut and coagulate simultaneously. At this wavelength, the beam cuts only where it is aimed. As with the Nd:YAG laser, the KPT laser energy can be easily delivered through a fiber and used under irrigation fluids. The uniqueness of the KTP laser is that it is primarily a cutting instrument with minimal thermal damage and minimal forward scatter. Experience at our institution has shown VLAP to be an appealing alternative to conventional TURP. Patients maintained their unobstructed voiding pattern. Some problems remain with this procedure. The urgency-frequency syndrome can persist for some weeks following VLAP. The improvement in the voiding pattern is gradual over six to eight weeks, unlike the immediate improvement seen with TURP. The peak improvement is in three months. No improvement is expected after that time. The present study implies that the cost of VLAP can be reduced simply by using a bare-fiber, which could be used many times, yet the results are similar to those in other recent studies (Tables 3 and 4).

The postprostatectomy bladder neck contracture is a common complication of prostatectomy. It has been reported to occur after 0.14% to 5.0% of prostatectomies.^{12,13} The exact incidence of bladder neck contracture following VLAP is not known. Of 40 patients treated by VLAP, five developed clinically significant bladder neck contracture that required transurethral incision.¹⁴ In another study of 76 patients, three developed bladder neck contracture.¹⁵ In a recent study on patients with three years of follow-up, bladder neck cicatrization was a significant complication, occurring in 12% of 126 patients.¹⁶ With interstitial laser prostatectomy, the incidence was reported to be 1.7%.⁸ Laser bladder neck incision for bladder neck contracture, without VLAP, was reported before.¹⁷ Of 21 patients treated with the Nd:YAG laser, only two developed recurrence of the contracture. None of our patients developed bladder neck contracture when followed up for one year. This might have been due to the concomitant bladder neck incision. However, a longer period of follow-up is needed.

The major drawback of VLAP is the lack of immediate effect on voiding symptoms. While some prostate tissue may be removed acutely, the predominant effect of the neodymium:YAG laser is tissue coagulation.¹⁸ Almost all patients can expect significant prostatic edema and ongoing loss of transition zone tissue for many weeks. Clinically, patients will need a catheter for a longer time and will experience prolonged irritative symptoms. To overcome this problem, KTP laser bladder neck incision with VLAP was attempted recently and was reported to reduce the postoperative catheterization time.¹⁹ However, in our study, we did not have similar results. The average catheterization time in our patients was 8.7 days. A unique innovative approach to this problem is the use of a biodegradable, self-reinforced stent, as reported by Petas et al. and Barnes et al.^{20,21}

Eighteen of our patients developed retrograde ejaculation. This was reported to occur after 4.5% to 16% of VLAP.^{5,22} Laser bladder neck incision might explain the higher rate of loss of ejaculation in our patients.

Our 12-month results add to the increasing amount of data supporting the durability of VLAP as an alternative to TURP. Our patients demonstrated significant objective improvement in urine flow rate and subjective improvement of symptoms. No significant improvement is expected after three months. The use of bare fiber will reduce the cost of treating BPH in comparison with conventional methods and other laser therapy. The short inpatient stay after laser prostatectomy offers significantly short-term financial savings over TURP. The lack of postoperative bladder irrigation makes it far less demanding on nursing time.

The addition of laser bladder neck incision will not shorten the post-therapy catheterization time, but it might

increase the rate of retrograde ejaculation, and it reduces the chances of development of bladder neck contracture. A randomized prospective study is needed to validate this hypothesis.

References

- Holtgrewe HL, Mebust WK, Dowd JB, Cockett ATK, Peters PC, Proctor C. Transurethral prostatectomy: practice aspects of the dominant operation in American urology. *J Urol* 1989;141:248-53.
- Christensen MM, Aegaard J, Madsen PO. Transurethral resection versus transurethral incision of the prostate: a prospective randomized study. *Urol Clin N Am* 1990;17:621-30.
- Costello AJ, Bowsher WG, Bolton DM, Braslis KG, Burt J. Laser ablation of the prostate in patients with benign prostatic hypertrophy. *Br J U* 1992;69:603-8.
- Kabalin JN. Laser prostatectomy performed with a right angle firing neodymium:YAG laser fiber at 40 watts power setting. *J Urol* 1993;150:95-9.
- Costello AJ, Lusaya DG, Crowe HR. Noncontact sidefire laser ablation of the prostate. *J Endo* 1995;9:107-11.
- Sonn DJ, Badlani GH. Contact laser vaporization of the prostate: sidefire technique. *J Endo* 1995;9:113-6.
- Mattioli S. Use of bare fiber with sidefiring Albarran bridge in laser therapy of the prostate. *J Endo* 1995;9:125-7.
- Muschter R, Hofstetter A. Interstitial laser therapy outcomes in benign prostatic hyperplasia. *J Endo* 1995;9:129-35.
- Babayan RK. Transurethral ultrasound-guided laser-induced prostatectomy (TULIP): past, present and future. *J Endo* 1995;9:141-4.
- Norris JP, Norris DM, Lee RD, Rubenstein MA. Visual laser ablation of the prostate: clinical experience in 108 patients. *J Urol* 1993;150:1612-4.
- Gomella LG, Lofti MA, Rivas DA, Chancellor MB. Contact laser vaporization technique for benign prostatic hyperplasia. *J Endourology* 1995;9:117-24.
- Green LF, Robinson HP. Postoperative contracture of the vesical neck. Clinical findings, symptoms and diagnosis. *J Urol* 1965;94:141-8.
- Sikafi Z, Butler MR, Lane V, O'Flynn JD, Fitzpatrick JM. Bladder neck contracture following prostatectomy. *Br J Urol* 1985;57:308-12.
- Kabalin JN. Laser coagulation prostatectomy: evolution of clinical practice and treatment parameters. *J Endourology* 1995;9:93-9.
- Anson K, Nawrocki J, Buckley J, et al. A multicenter randomized prospective study of endoscopic laser ablation versus transurethral resection of the prostate. *Urology* 1995;45:305-10.
- McGregor R, Dawkins G, Thilagarajah R, Anson K, Miller R. Laser prostatectomy: three-year follow-up a cause for concern. *Br J Urol* 1966;77(suppl 1):9-34.
- Silber N, Servadio C. Neodymium:YAG laser treatment of bladder neck contracture following prostatectomy. *Laser in Surgery and Medicine* 1992;12:370-4.
- Kabalin JN, Gong M, Issa MM, Sellers R. Insight into the mechanism of neodymium:yttrium-aluminum-garnet laser prostatectomy utilizing the high-power contact-free beam technique. *Urology* 1995;45:421-6.
- Langley S, Gallegos C, Moisey C. KTP laser bladder neck incision, BNI, with Nd:YAG ablation of prostate reduces postoperative catheterization time. *J Urol* 1996;155:24.
- Petas A, Taari K, Talja M, Vaalimaa T, Tormala P, Tammela TLJ. SR-PGA urospiral compared to suprapubic catheter and indwelling catheter in the treatment of postoperative urinary retention after VLAP. *J Urol* 1996;155:1581.
- Barnes DG, Butterworth PC, Yakubu A, Flynn JT. Catheter-free endoscopic laser ablation of the prostate (ELAP). *J Urol* 1996;155:1581-2.
- Cowles RS. One year follow-up of 80 patients undergoing visual laser ablation of the prostate. In: *Application of Newer Forms of Therapeutic Energy in Urology*. Oxford: International Society of Urology Reports, 1995:169-77.
- Gillatt D, Timoney A, Whitfield H, Muschter R, de la Rosette J. Results of a European multicentre study evaluating the efficacy of an interstitial laser coagulation device. *Br J Urol* 1996;77:124.
- Boon TA, Lepor H, Muschter R, McCullough DL. Laser treatment of benign prostatic hyperplasia (BPH): workshop in benign prostatic hyperplasia. In: Kurth K, Newling DWW, eds. *Benign prostatic hyperplasia—recent progress in clinical research and practice*. New York: Wiley-Liss, 1994:535-44.