Original Article

PI PROSTATE INTERNATIONAL

Prostate Int 2013;1(1):42-45 • http://dx.doi.org/10.12954/PI.12006

Early experience photoselective vaporisation of the prostate using the 180W lithium triborate and comparison with the 120W lithium triborate laser

Nicholas A. Campbell, Amanda S. J. Chung[1], Peter D. Yoon[1], Isaac Thangasamy[1], Henry H. Woo[1]

Department of Urology, Westmead Hospital University of Sydney, Sydney, Australia
[1]Discipline of Surgery, Sydney Adventist Hospital Clinical School, University of Sydney, Sydney, Australia

Purpose: There is a paucity of information on the clinical efficacy and safety of the photoselective vaporization (PVP) of the prostate using the 180W lithium triborate (LBO) laser. We report on initial outcomes of PVP with the 180W laser, comparing the first 50 cases with the last 50 cases performed with the 120W LBO laser.

Methods: All cases performed by a single surgeon (HHW) have been prospectively maintained. The last 50 cases treated with the 120W LBO laser (December 2009 to August 2010) were compared with the first 50 cases treated with the 180W LBO (July 2010 to June 2011). Patient variables were recorded preoperatively and at 3 months postoperatively. Perioperative data was also recorded.

Results: The 180W cases had a larger median transrectal ultrasound prostate volume (68 mL vs. 51 mL, $P<0.05$). For the 180W and 120W LBO lasers, total operating time was 64.2 and 72.5 minutes (not significant [NS] at $P=0.22$), lasering time 49.6 and 54.6 minutes (NS, $P=0.30$) and energy utilisation 477.6 kJ and 377.9 kJ ($P<0.05$) respectively. When compared per gram of prostate tissue lasered, the 180W is quicker at 0.67 min/g vs. 1.0 min/g for the 120W laser. Complications using the Clavien-Dindo classification included 5 grade 1 complications and 3 grade 3b (bladder neck contractures) with the 180W LBO laser. The 120 W LBO laser had 4 grade 1 complications and 1 grade 2.

Conclusions: There is little change in clinical outcomes with the transition from 120W to 180W LBO PVP with an already experienced PVP surgeon. The 180W LBO laser appears to have impacted upon patient selection with significantly increased prostate size and associated with increased energy utilisation. There appears to be a trend toward shorter laser times.

Keywords: Prostatic hyperplasia, Photoselective vaporisation of prostate, Lithium triborate laser, Transurethral resection of prostate

INTRODUCTION

Photoselective vaporisation of the prostate (PVP) has become an established form of treatment for benign prostatic obstruction and to date has demonstrated equivalence to transurethral resection of the prostate in randomised controlled trials [1-4]. Since PVP became commercially available in 2001, there have been two further versions of the technology characterised by increased power and improved laser fibre technology. The 120W lithium triborate (LBO) laser entered clinical use in late 2006 and was followed by the 180W LBO laser in late 2010. With the 50% increase in power, there was a corresponding 50% increase in the diameter of the laser beam resulting in no change in the power density. A significant change, apart from increased power, was the development of a liquid cooled fibre, an automated system to shut down power with overheating of the fibre and new coagulation settings that provide a pulsed rather than quasi-continuous low power mode.

Corresponding author: Henry H. Woo
Discipline of Surgery, Sydney Adventist Hospital Clinical School, University of Sydney, 185 Fox Valley Road, Wahroonga, NSW 2076, Australia
E-mail: hwoo@urologist.net.au / Tel: +62-2-9473-8765 / Fax: +62-2-9473-8969
Submitted: 26 November 2012 / Accepted after revision: 4 February 2013

http://p-international.org/
pISSN: 2287-8882 • eISSN: 2287-903X

There is little data available on the performance of the 180W LBO laser. Published clinical data would suggest that the 180W laser safe and efficacious [5]. The impact of the transition of the new laser to an experienced PVP surgeon has not previously been reported. The objective was to compare the early experience of an experienced PVP surgeon's first 50 cases with the 180W LBO laser with the last 50 cases performed with the 120W LBO laser.

MATERIALS AND METHODS

All PVP cases performed by a single surgeon (HHW) have been prospectively maintained. The last 50 cases treated with the 120W LBO had undergone treatment at the Sydney Adventist Hospital between December 2009 and August 2010. The first 50 cases treated with the 180W LBO laser were performed at the same institution between July 2010 and June 2011. Only 3 cases using the 180W LBO laser were performed in the overlap period between July and August 2010. Subsequent to completing the last 120W LBO laser case in August 2010, no further cases were performed.

The surgical technique was the same for both types of laser and was consistent with the technique previously described by the International Greenlight Users Group [6]. A working channel was created at 80W power setting and this was immediately increased to 120W power once there was sufficient working space created. In the case of 180W LBO laser, the power was increased further from 120W to 180W as soon as there was sufficient space.

The inclusion criteria were all men undergoing PVP for indications consistent with established guidelines for surgery for benign prostatic hyperplasia [7,8]. Men with a history of prostate cancer were excluded from analysis.

Baseline variables are summarised in Table 1. Men in urinary retention had all failed trial of voids and could not have baseline flow data and symptoms scores recorded. Preoperative and postoperative parameters at 3 months compared included the International Prostate Symptom Score (IPSS), quality of life (QoL) index, peak urinary flow (Qmax), post void residual (PVR) urine as measured by transabdominal ultrasound.

Statistical analyses were performed using the Statistical Online Computational Resource (http://www.socr.ucla.edu). Paired analysis was performed using the Student *t*-test and for non-parametric analyses, the Mann-Whitney test was used. Statistical significance was defined at the level of $P<0.05$.

Table 1. Baseline patient variables

Variable	First 50–180W	Last 50–120W	*P*-value
Age (yr)	66.5 (60–71.8)	68 (60–73.8)	0.216
TRUS volume (mL)	68 (45.5–94.0)	51 (37.8–72.3)	0.017
ASA score	2.0 (2.0–2.0)	2.0 (2.0–2.0)	0.791
Prostate specific antigen	3.55 (1.7–7.3)	3.40 (1.7–4.9)	0.132
Acute urinary retention	7	6	

Values are presented as median (interquartile range).
TRUS, transrectal ultrasound; ASA, American Society of Anesthesiologists.

RESULTS

Perioperative data is summarised in Table 2. There was similar utilisation of power relative to prostate volume between the two laser powers. The laser and operating time relative to the total transrectal ultrasound measured prostate volume was significantly decreased.

Not all patients attended follow-up at 3 months. In total 5 patients in the 180W group did not attend because they either missed their appointment, did not live in the area and one patient died from an unrelated cause. The 120W had 8 patients who did not attend follow-up (3 missed appointment, 3 did not live within the area and 2 did not want further follow-up).

Changes in functional parameters such as the IPSS, QoL, Qmax and PVR are summarised in Table 3 where paired analysis has been performed for those men who were able to attend follow-up and were not in urinary retention prior to surgery. These values did not result in statistical significance. For men in urinary retention, 3 of the 6 (including 2 lost to follow-up) and 7 of 7 of men treated with the 120W and 180W LBO laser respectively were able to successfully void following removal of their catheters. The postoperative IPSS, QL, Qmax and PVR respectively was not different between those

Table 2. Perioperative parameters

Parameter	First 50–180W	Last 50–120W	%	*P*-value
Total operation time (min)	56 (46–78.5)	65 (49.5–92)	-13.8	0.193
Laser time (min)	45 (33–63)	50 (35–72.5)	-10	0.332
Laser time per gram prostate (min/mL)	0.67 (0.52–0.79)	1.0 (0.73–1.19)	-33	<0.001
Laser energy (kJ)	400 (301.8–601)	343 (220.8–512.5)	+17	0.031
Laser energy per gram prostate (kJ/g)	6.1 (4.8–7.6)	6.4 (4.97–7.97)	-5	0.537
Duration IDC (hr)	12 (11–14.8)	14 (12–16)	-14	0.072
Post operation stay (hr)	18 (16.3–20.8)	19 (16–20.5)	-5	0.403

Values are presented as median (interquartile range).
IDC, indwelling catheter.

Table 3. Paired analysis of results

Parameter	First 50–180W			Last 50–120W		
	Before	3 mo	%	Before	3 mo	%
PSA (ng/mL)	3.55 (1.7–7.3)	1.4 (0.82–2.70)	-61	3.40 (1.7–4.9)	1.13 (0.78–1.89)	-67
IPSS	20 (14–25)	7 (4–14)	-65	21 (17–26)	9 (5–12)	-57
Quality of life	4 (4–5)	2 (1,3)	+50	4 (4–5)	2 (1–2)	+50
Qmax (mL/sec)	9 (6.2–12.2)	26 (20.2–36)	+189	9 (7–11)	24 (16.5–32.45)	+167
Post void residual (mL)	143 (63–260)	32 (0–60)	-78	110 (74.5–195.5)	15 (0–60)	-86
IIEF	21.5 (16–24.8)	19 (15–24)	-12	19 (10.8–22.3)	18 (8–21.5)	-5
Acute urinary retention	7	7 Voiding		6	3 Voiding	

Values are presented as median (interquartile range).
PSA, prostate specific antigen; IPSS, International Prostate Symptom Score; Qmax, peak urinary flow; IIEF, index of erectile function.

Table 4. Complications

First 50–180W	Clavien Dindo	Last 50–120W	Clavien Dindo
Clot retention×2	1	Urinary tract infection×2	1
Febrile	1	Intermittent self catheterisation×2	1
Retention	1	Blood transfusion (1 unit)	2
Capsular perforation	3b		
Bladder neck contracture×2	3b		
Urethral stricture	3b		

treated with either the 120W or 180W LBO laser.

Complications did differ between the two lasers as outlined in Table 4 below. These are summarised using the Clavien-Dindo classification for surgical complications.

DISCUSSION

Men treated with the 120W or 180W LBO laser have similar post operative outcomes with this early experience.

For the surgeon, there are significantly noticeable changes with the transition to the 180W LBO laser. The cystoscope hardware and video camera set up is unchanged but the cooled irrigated laser fiber associated with the 180W machine is larger in diameter at 750 microns compared to the diameter of the 120W laser fiber which has a diameter of 600 microns. This slightly reduces the endoscopic field of view and the cross sectional area of the cystoscope continuous flow channel available for irrigation. The power density is proportional to the power of the laser and inversely proportional to the cross sectional area of the laser beam. The 50% increase in laser beam diameter and the 50% increase in power maintain the same power density compared to the 120W laser fiber but is associated with a larger quantity of vaporization bubbles being produced which can potentially impact upon visibility. Whilst initial familiarity with these changes was necessary, it did not impact upon the ability to adapt to the new laser. Further investigation is required to determine the impact of a surgeon without prior experience with lower powered PVP dealing with these issues. Anecdotal experience from colleagues adopting PVP using the 180W LBO laser for the first time does not appear to be associated with reported problems.

All men were treated within a 12-month period of time. The laser technique was consistent throughout the 12 months and compared the last 50 120W cases with the first 180W with a surgeon who had already substantial PVP experience. This transition provides a meaningful comparison for the experienced surgeon with the 120W LBO laser considering the transition to the higher powered laser. This study suggests that this transition is possible without significant change in outcomes and unlikely concerns associated with relearning PVP with a new laser.

One major complication of capsular perforation occurred using the 180W LBO laser. This had not previously been observed in the 120W LBO experience. It is a technically related complication due to the failure to recognise excessive depth of vaporisation, particularly at the region of the bladder neck. A much larger experience from a broad number of centers with large volume experience will be necessary to determine it this occurring in increased numbers compared to historical published experience with the 120W LBO laser. On the basis that the power density is unchanged, the 180W LBO laser will not vaporise deeper than the 120W LBO laser in the equivalent duration of application of laser energy to tissue. It is our belief from this early experience, that this is a sporadic occurrence little different to what has been reported with the 120W LBO laser.

There is little surprise that clinical outcomes are similar between the two lasers. The differences could be compared to the analogy of using a paintbrush to paint a wall and switching to paintbrush that is 50% wider and thereby reducing

http://dx.doi.org/10.12954/PI.12006

the time taken. In clinical practice, a reduction in operating time may not occur. It is our belief that this improvement in operating time may be compensated by the use of a greater amount of energy to treat the same prostate gland volume and therefore enabling a greater and more efficient removal of tissue. Our early results reflect this behaviour where the laser time per gram of prostate is reduced by 33% and the total laser time is reduced by 5 minutes and overall operating by 8 minutes. This relative modest improvement in time may be due to the learning curve of the 180W laser and may still improve with further case experience. It is our opinion that this effect may potentially be more likely observed with larger prostates where fibre degradation and surgeon fatigue could potentially lead to limitation of the amount of energy utilised to treat a large gland.

In conclusion, this study demonstrates that there is little change in clinical outcomes with the transition from 120W to 180W LBO PVP with an already experienced PVP surgeon. The introduction of the more powerful 180W LBO laser appears to have impacted upon patient selection with significantly increased prostate size and associated with increased energy utilisation. There is a trend toward shorter laser times.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Burke N, Whelan JP, Goeree L, Hopkins RB, Campbell K, Goeree R, et al. Systematic review and meta-analysis of transurethral resection of the prostate versus minimally invasive procedures for the treatment of benign prostatic obstruction. Urology 2010;75:1015-22.
2. Al-Ansari A, Younes N, Sampige VP, Al-Rumaihi K, Ghafouri A, Gul T, 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;58:349-55.
3. Malek RS, Kuntzman RS, Barrett DM. Photoselective potassium-titanyl-phosphate laser vaporization of the benign obstructive prostate: observations on long-term outcomes. J Urol 2005;174:1344-8.
4. Woo HH, Hossack TA. Photoselective vaporization for prostatic obstruction with the 120-W lithium triborate laser: 1-year clinical outcomes. Int J Urol 2011;18:162-5.
5. Chung AS, Chabert C, Yap HW, Lam J, Awad N, Nuwayhid F, et al. Photoselective vaporization of the prostate using the 180W lithium triborate laser. ANZ J Surg 2012;82:334-7.
6. Muir G, Gomez-Sancha F, Bachmann A, Choi B, Collins E, de la Rosette J, et al. Techniques and training with GreenLight HPS 120-W laser therapy of the prostate: position paper. Eur Urol Suppl 2008;7:370-7.
7. American Urological Association. Clinical practice guideline: management of BPH (revised 2010) [Internet]. Linthicum: American Urological Association; 2010 [cited 2012 Jun 12]. Available from: http://www.auanet.org/content/clinical-practice-guidelines/clinical-guidelines.cfm?sub=bph.
8. Woo HH, Gillman MP, Gardiner R, Marshall V, Lynch WJ. A practical approach to the management of lower urinary tract symptoms among men. Med J Aust 2011;195:34-9.