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ORIGINAL RESEARCH

The safety and efficacy of aspirin intake in photoselective vaporization laser treatment of benign prostate hyperplasia

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Abstract: Endoscopic surgical treatment has become an option to treat benign prostate hyperplasia. We evaluated the safety and effectiveness of photoselective vaporization of the prostate (PVP) in patients. We evaluated preoperative and perioperative parameters, functional outcomes, and adverse events up to 12 months postoperatively of patients on oral anticoagulation therapy undergoing PVP, and compared the results with patients who did not take anticoagulation therapy. A total of 89 patients who received photoselective vaporization laser for benign prostate hyperplasia from May 2006 to February 2011 in our hospital were enrolled in our study. The patients were divided into two groups based on whether or not they were taking oral aspirin; 23 (25.8%) patients were taking aspirin derivatives (aspirin group), and 66 (74.2%) were not taking aspirin derivatives (control group). The mean prostate volume (58.8 mL vs 51 mL; $P = 0.16$) and mean energy consumption (235,268 J vs 289,793 J; $P = 0.097$) were comparable between the aspirin group and control group. The average postoperative results of hemoglobin were 13.4 mg/dL for the aspirin group versus 13.9 mg/dL for the control group ($P = 0.327$). A significantly higher maximum flow rates and 80% improved post-void residual urine were noted during the followup. Postoperatively all variable showed significant improvement starting at month 1 of followup and remained improved for the 12 month followup. Postoperative complications were low and comparable between groups. PVP was characterized by excellent hemostatic properties and a very low intraoperative complication rate, even in the patients who were taking aspirin. On the basis of our perioperative results, we recommend PVP as a safe and effective procedure for patients with symptomatic benign prostate hyperplasia when taking an aspirin derivative.
Keywords: prostate gland, benign prostatic hyperplasia, laser, elderly, green light laser

Introduction

Endoscopic surgery is one of the treatment options for patients with benign prostate hyperplasia (BPH). Transurethral resection of the prostate (TURP) and open prostatectomy are considered the gold standard,[1–3] however, both procedures are associated with the risk of mortality and morbidity. TURP may lead to intra-operative bleeding, and transurethral resection syndrome occurs in 2% of all patients.[4] On the other hand, open surgery for high-volume glands is associated with morbidity.[3] A great deal of research has been undertaken to reduce the complications and mortality, and as a result several laser-based minimally invasive treatment options have been introduced, including photoselective vaporization of the prostate (PVP).

During the last decade, there has been a continuous decline in the number of TURP procedures performed. In 1999, TURP accounted for 81% of all surgeries for benign prostatic hypertrophy in the USA.[2] However, by 2005, the rate had fallen to 39% due to the combined effect of fewer prostatic operations and a greater number of minimally

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invasive procedures.[2] Among the different laser systems, the GreenLight HPS® laser system (American Medical Systems, Inc, Minnetonka, MN, USA) is one of the most commonly used to treat BPH. For a better coagulation effect with photoselective vaporization, most patients can undergo the surgery without altering their anticoagulant medication regimen.[5,6] If the patients are taking an aspirin derivative during PVP therapy, the amount of hemoglobin absorption will be increased, thereby increasing the effectiveness of total laser energy consumption. We hypothesized that taking aspirin would increase the prostate gland blood flow and make it easier to receive PVP.

Since the standard GreenLight laser system emits a 532 nm laser beam which is mainly absorbed by oxyhemoglobin, a higher performance system was introduced to treat larger prostates to increase the efficiency of vaporization. However, data are lacking on GreenLight vaporization rates for patients who are taking aspirin. Therefore, we investigated the safety and efficacy of whether the prescription of anticoagulant aspirin influenced energy consumption when vaporizing prostate tissue with a GreenLight laser system.

Materials and methods

The study population was comprised of a total of 89 patients who received PVP with the GreenLight HPS® laser system (American Medical Systems, Inc) and a side firing ADD Stat™ laser fiber with a 600 mm core diameter. In most instances the GreenLight HPS laser procedure was begun using a power of only 60 W. The power setting was increased to 100 W and then to 120 W after tissue became more resistant to vaporization. The PVP laser procedure for BPH from May 2006 to February 2011 at our hospital was included retrospectively. Informed consent was obtained from each patient. Their medical charts were reviewed for data including age, aspirin prescription, prostate volume, preoperative blood sample (hemoglobin, prothrombin time [PT], activated partial thromboplastin time [APTT], and platelet count), and preoperative and postoperative uroflow data. The mean prostate size was 53 cc, with a serum prostate specific antigen level of 7.15 ng/mL (ranging from 0.30–38.6 ng/mL).The exclusion criteria included patients who had prostate cancer, urethral stricture or neurogenic bladder either diagnosed before or after the operation, previously received any form of prostate procedure, any other coagulopathy disease, and those who regularly took other oral coagulants.

All laser prostatectomy procedures were performed with a GreenLight laser system. We calculated the energy consumption per prostate volume as follows: energy consumption per prostate volume (J/mL^3) = total energy consumption (J)/total prostate volume (mL^3). The patients were divided into two groups based on whether or not they were taking oral aspirin. The patients who were taking aspirin 100 mg/day were informed to take it throughout the procedure without interruption. The total energy consumption and lasing time during the operation were also recorded for each patient and compared between the two groups.

All statistical analyses were performed using SPSS version 17.0 (IBM Corporation, Armonk, NY, USA) to compare the results among the groups concerning aspirin takers and non-aspirin takers. Since the data were not normally distributed, nonparametric tests (Kruskal–Wallis and Mann–Whitney) were applied.

Results

A total of 89 patients who underwent PVP with the GreenLight laser system were included. Among these patients, 23 (the aspirin group) had been regularly taking aspirin with a dose of 100 mg per day for prophylaxis of heart disease. All 23 patients kept taking aspirin throughout the surgery. The other 66 patients (the control group) had not been regularly taking aspirin or any other anticoagulants. The average age of all of the patients was 72 years. None of the patients had received transrectal echo guide prostate needle biopsy before surgery. The preoperative parameters including hemoglobin, PT, APTT, platelet count, and International Prostate Symptom Score (IPSS) are listed in Table 1. The operative data, including lasing time, total energy consumption, and energy consumption per prostate volume, are also listed in Table 1.

All of the parameters were compared with an independent *t*-test, Kruskal–Wallis test, or Mann–Whitney test. There were no significant differences in preoperative parameters including age, prostate volume, serum prostate-specific antigen level, hemoglobin, PT, APTT, platelet count, and IPSS between the aspirin and control groups (Table 1).

The mean total energy consumption in the control group was higher than that in the aspirin group, although the difference did not reach statistical significance (289,793 J versus 235,268 J; $P = 0.097$). The energy consumption per prostate volume in the aspirin group was 4297 J/mL^3, which was significantly lower than the 5807 J/mL^3 in the control group ($P = 0.017$).

All of the 89 patients completed preoperative and postoperative uroflow tests (Table 2). Both groups had a similar preoperative peak flow rate (8.71 mL/second and 7.88 mL/second in the control and aspirin groups, respectively) and postoperative peak flow rate

Table 1 Characteristics of the patients and comparison between non-aspirin group and aspirin group

	Non–aspirin group (mean/range)	Aspirin group (mean/range)	*P*-value
Age (year-old)			
Mean age (range): 72.0 (52–93)	71.7 (52–93)	73.0 (56–86)	0.561
Total prostate volume			
53.0 (25.3–122.1) (cm^3)	51.0 (28.7–90.0)	58.8 (25.3–122.07)	0.160
Serum PSA level			
7.15 (0.30–38.6) (ng/mL)	7.62 (0.42–38.6)	5.79 (0.302–13.32)	0.242
Hemoglobin			
13.7 (8.8–17.3) (mg/dL)	13.9 (9.3–17.3)	13.4 (8.8–16.8)	0.327
PT seconds			
11.3 (9.9–17.7)	11.2 (9.9–17.7)	11.6 (10.0–13.0)	0.115
APTT seconds			
27.3 (20.9–37.2)	27.3 (20.9–37.2)	27.3 (22.9–33.0)	0.979
Platelet count			
205056 (114,000–400,000)	202,742 (114,000–400,000)	211,695 (134,000–332,000)	0.493
IPSS score			
24.9 (15–35)	24.9 (15–35)	25.0 (19–33)	0.883
Lasing time			
54.7 (10.0–135) (minutes)			
Energy consumption			
275,702 (37,278–597,227) (Joule)	289,793 (37,278–597,227)	235,268 (71,864–557,902)	0.097
Energy consumption per prostate volume (Joule/cm^3)			
5412 (1165–15,121)	5801 (1165–15,121)	4297 (1311–10,811)	0.017
Aspirin prescription			
Yes 23			
No 66			

Abbreviations: PSA, prostate-specific antigen; PT, prothrombin time; APTT, activated partial thromboplastin time; IPSS, International Prostate Symptom Score.

(13.64 mL/second and 13.54 mL/second in the control and aspirin groups, respectively). The mean prostate volume of the aspirin group was comparable with the control group (58.8 mL vs 51 mL; $P = 0.16$). The average postoperative decrease in hemoglobin was 13.4 mg/dL in the aspirin group versus 13.9 mg/dL in the control group ($P = 0.327$). At 1 year followup the IPSS decreased to 80%, average maximal urinary flow rate improved to 60%–80% and postvoid residual urine volume decreased to 80%. Postoperative complications were low and comparable between groups.

Table 2 Results of uroflow data

(mL/second)	Non-aspirin group (mean)	Aspirin group (mean/range)	*P*-value
Preoperative peak flow rate	8.71	7.88	0.681
Postoperative peak flow rate	13.64	13.54	0.967
Preoperative average flow rate	3.76	3.62	0.869
Postoperative average flow rate	6.42	6.57	0.896

Discussion

Aspirin, a common anticoagulant also known as acetylsalicylic acid, can be prescribed for a long period of time at low doses to help prevent heart attacks, strokes, and blood clot formation in people at high risk of developing coagulopathy.[7]

The primary mechanism by which aspirin impairs hemostasis is through irreversible acetylation of enzyme cyclooxygenase (COX)-1. Because platelets have no nuclei and therefore retain only a limited capacity to synthesize new proteins, a single small dose of aspirin (40–100 mg) or as little as 10 mg taken daily for 1 week can completely inhibit Thromboxane A2 production and impair the function of platelets for their circulating life span. Aspirin also acetylates the isoform of cyclooxygenase, COX-2, which blocks synthesis of prostacyclin, a strong inhibitor of platelet function.[8,9] Due to the high probability of bleeding, TURP is rarely performed in patients using anticoagulants, and most patients are requested to stop taking the anticoagulants for at least 7 days before surgery. However, with the application of laser systems, endoscopic prostatectomy can be performed with a better hemostatic effect. The GreenLight laser system, also known as the potassium-titanyl-phosphate (KTP) laser, produces a green visible light beam of 532 nm by passing a beam produced by neodymium-doped yttrium-aluminum-garnet through a KTP crystal that doubles its frequency. Due to its shorter wavelength, it is selectively absorbed by oxyhemoglobin.[5] The actual ablation of prostate tissue involves PVP tissue rather than coagulation with earlier lasers.[6] Laser radiation is delivered into the tissue using a side-firing fiber. In general, this type of laser achieves good results in pure vaporization techniques, although enucleation procedures have recently been reported.[10–15] The GreenLight laser system had been reported to be a safe and effective surgery for those taking aspirin. Sohn et al reported that a 120 W HPS GreenLight laser system was considered to be an effective and safe surgical method for those taking anticoagulant medications for the treatment or prevention of cardiac or cerebral diseases without ceasing medication.[16] Chung et al also reported that PVP using a 532 nm KTP laser can be safe and effective in patients at high risk of anticoagulation, even those taking two or more anticoagulation agents and with a large prostate requiring a lengthy operative time.[17]

Our results showed that both those taking and not taking aspirin had a similar age, prostate volume, preoperative IPSS score, serum prostate-specific antigen, and hemoglobin levels. In addition, there were no significant differences in the relevant coagulant factors such as PT, APTT, and platelet count between the groups. However, the aspirin group required significantly less energy to complete the laser prostatectomy for each gram of prostate volume than the control group (4297 J/cm^3 vs 5801 J/cm^3, respectively; $P = 0.017$). We hypothesized that this may be because during the laser prostatectomy, micro-hemorrhaging continuously occurred in the rough surface of the prostate that was being vaporized by the laser. In the aspirin group, due to the anticoagulant effect, this micro-hemorrhaging may have been more obvious than in the non-aspirin group. This means that in the aspirin group, the hemoglobin density around the surgical surface of the laser prostatectomy was higher than the control group. The wavelength of the GreenLight laser is 532 nm and is mainly absorbed by oxyhemoglobin, which is a chromophobe. Therefore, the more oxyhemoglobin appearing in the vaporized surface or the higher the hemoglobin density, the more energy would be absorbed.

In the non-aspirin group, the energy that was not absorbed by the hemoglobin located in the surgical surface may have penetrated deeper to the layer below, where coagulation rather than vaporization occurred due to a lower energy concentration. In other words, more effective energy utilization for vaporization may be achieved in the aspirin group. This could possibly explain why the aspirin group needed less energy during laser prostatectomy with the GreenLight system to achieve a similar improvement in uroflow tests in our study. Further studies with a larger number of patients are required to elucidate these findings. In addition, more complete evaluation methods such as postoperative IPSS questionnaires may be needed. On the other hand, we should also consider how long the aspirin has been prescribed.

Conclusion

Photoselective vaporization is effective for lower urinary tract symptoms due to BPH. From our treatment of BPH with vaporization, our subjective functional results, such as IPSS and quality of life after GreenLight HPS management for BPH, were comparable between the patients who took aspirin and those who did not take aspirin. However, the early objective functional results (maximum flow rate and post-void residual) of PVP appear to be similar. By using PVP with GreenLight laser, the group prescribed with aspirin required less energy to achieve similar therapeutic effect than the patients not taking aspirin.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Rassweiler J, Teber D, Kuntz R, Hofmann R. Complications of transurethral resection of the prostate (TURP) – incidence, management, and prevention. *Eur Urol*. 2006;50(5):969–979.
2. Yu X, Elliott SP, Wilt TJ, McBean AM. Practice patterns in benign prostatic hyperplasia surgical therapy: the dramatic increase in minimally invasive technologies. *J Urol*. 2008;180(1):241–245.
3. Miano R, De Nunzio C, Asimakopoulos AD, Germani S, Tubaro A. Treatment options for benign prostatic hyperplasia in older men. *Med Sci Monit*. 2008;14(7):RA94–RA102.
4. Mebust WK, Holtgrewe HL, Cockett AT, Peters PC. Transurethral prostatectomy: Immediate and postoperative complications. A cooperative study of thirteen participating institutions evaluating 3,885 patients. *J Urol*. 1989;141(2):243–247.
5. Milam DF. Physical properties of laser energy. In: Smith JJ, Stein B, Benson RJ, editors. *Physical Principles of Laser Energy*. St Louis: Mosby; 1994:1–9.
6. Reich O, Bachmann A, Schneede P, Zaak D, Sulser T, Hofstetter A. Experimental comparison of high power (80 W) potassium-titanyl-phosphate (KTP) laser vaporization and transurethral resection of the prostate. *J Urol*. 2004;171(6 Pt 1):2502–2504.
7. Lewis HD Jr, Davis JW, Archibald DG, et al. Protective effects of aspirin against acute myocardial infarction and death in men with unstable angina. Results of a Veterans Administration Cooperative Study. *N Engl J Med*. 1983;309(7):396–403.
8. Cipollone F, Rocca B, Patrono C. Cyclooxygenase-2 expression and inhibition in atherothrombosis. *Arterioscler Thromb Vasc Biol*. 2004;24(2):246–255.
9. Weiss HJ, Aledort LM. Impaired platelet-connective-tissue reaction in man after aspirin ingestion. *Lancet*. 1967;2(7514):495–497.
10. Bach T, Huck N, Wezel F, Häcker A, Gross AJ, Michel MS. 70 vs 120 W thulium:yttrium-aluminium-garnet 2 microm continuous-wave laser for the treatment of benign prostatic hyperplasia: a systematic ex-vivo evaluation. *BJU Int*. 2010;106(3):368–372.

11. Seitz M, Bayer T, Ruszat R, et al. Preliminary evaluation of a novel side-fire diode laser emitting light at 940 nm, for the potential treatment of benign prostatic hyperplasia: ex-vivo and in-vivo investigations. *BJU Int*. 2009;103(6):770–775.
12. Malek RS. GreenLightTM HPS laser therapy for BPH: clinical outcomes and surgical recommendations from the International GreenLight User (IGLU) Group. *Eur Urol Suppl*. 2008;7(4):361–392.
13. Kang HW, Jebens D, Malek RS, Mitchell G, Koullick E. Laser vaporization of bovine prostate: a quantitative comparison of potassiumtitanyl- phosphate and lithium triborate lasers. *J Urol*. 2008;180(6):2675–2680.
14. Hillmen P, Young NS, Schubert J, et al. The complement inhibitor eculizumab in paroxysmal nocturnal hemoglobinuria. *N Engl J Med*. 2006;355(12):1233–1243.
15. Patrono C, Coller B, Dalen JE, et al. Platelet-active drugs: The relationships among dose, effectiveness, and side effects. *Chest*. 2001;119(Suppl 1):39S–63S.
16. Sohn JH, Choi YS, Kim SJ, et al. Effectiveness and Safety of Photoselective Vaporization of the Prostate with the 120 W HPS Greenlight Laser in Benign Prostatic Hyperplasia Patients Taking Oral Anticoagulants. *Korean J Urol*. 2011;52(3):178–183.
17. Chung DE, Wysock JS, Lee RK, Melamed SR, Kaplan SA, Te AE. Outcomes and complications after 532 nm laser prostatectomy in anticoagulated patients with benign prostatic hyperplasia. *J Urol*. 2011;186(3):977–981.

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