

# Prostate laser vaporization is safe and effective in elderly men

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## Abstract

**Introduction:** There are few data on the safety and efficacy of laser photoselective vaporization (LVP) in elderly men. We compared the safety and efficacy of LVP for the treatment of symptomatic benign prostatic hyperplasia (BPH) in men  $\geq 75$  years, who we defined as elderly, to those  $< 75$  years.

**Materials and Methods:** Safety and efficacy outcomes in elderly men undergoing LVP for lower urinary tract symptoms secondary to BPH from 2005 to 2012 were compared with men  $< 75$  years. Differences between-groups in demographics, perioperative outcomes, complications, and postoperative changes in International Prostate Symptom Score (I-PSS) were calculated.

**Results:** Of 202 patients, 49 (24%) were elderly (range: 75-95 years) and 153 (76%) were  $< 75$  years. Preoperatively, elderly men were more likely to have heart disease (35% vs. 20%,  $P = 0.03$ ), gross hematuria (6.1% vs. 0.7%,  $P = 0.05$ ), urinary retention (57% vs. 41%,  $P = 0.07$ ), and take anti-coagulants (61% vs. 35%,  $P = 0.002$ ). Elderly men had a longer median length of stay (1 day vs. 0 day,  $P = 0.001$ ). There were no significant between-group differences in transfusion frequency (4.4% vs. 0.7%,  $P = 0.14$ ) or Clavien III complications (2% vs. 2.6%,  $P = 1.0$ ). One month postsurgery, elderly patients reported smaller median decreases in I-PSS (5.5 vs. 9,  $P = 0.02$ ) and urinary bother (1 point vs. 2,  $P = 0.03$ ) compared with preoperative values. At till 9 months follow-up, there were no significant between-group differences in median I-PSS or urinary bother scores.

**Conclusions:** Despite a higher prevalence of preoperative comorbidity and urinary retention, elderly LVP patients experienced perioperative safety and shorter term efficacy outcomes comparable to younger men.

**Key Words:** Benign prostatic hyperplasia, complications, elderly, lower urinary tract symptoms, outcomes

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## INTRODUCTION

Symptomatic benign prostatic enlargement, more commonly known as symptomatic benign prostatic hyperplasia (BPH), is

one of the most prevalent diseases of elderly men. It is the fifth most prevalent noncancer-related disorder among men aged 50 years and older; globally, an estimated 612 million men will have symptomatic BPH by 2018.<sup>[1]</sup> In the US, symptomatic BPH accounts for the seventh highest 1 year disease-specific medical costs, with estimated direct and indirect treatment costs totaling nearly \$4 billion annually.<sup>[2,3]</sup> Lower urinary tract symptoms (LUTS) associated with symptomatic BPH have been associated with reduced quality of life (QOL), depression, and increased risks of falls and mortality.<sup>[4-8]</sup> Population data also suggest that the incidence and prevalence of symptomatic BPH are increasing: The incidence of urinary

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retention among 3.7 million men presenting to California emergency rooms increased 25% from 2007 to 2010, and from 1998 to 2008, the prevalence of symptomatic BPH with acute renal failure increased more than 400% in a national US hospital sample.<sup>[9,10]</sup>

As the global population ages, the public health burden of symptomatic BPH will likely continue to grow, particularly among elderly men. These trends indicate a need for safe and efficacious minimally invasive surgical therapies in this population. Data suggest that laser photoselective vaporization of the prostate (LVP) is less morbid and more cost effective than transurethral resection of the prostate (TURP),<sup>[11]</sup> safe in the setting of anticoagulation,<sup>[12]</sup> and is efficacious in men with symptomatic BPH.<sup>[13]</sup>

However, there are few data on the safety and efficacy of LVP in elderly men.<sup>[14,15]</sup> Therefore, we compared the safety and efficacy of LVP for the treatment of symptomatic BPH in men  $\geq 75$  years, who we defined as elderly, to those  $< 75$  years.

## MATERIALS AND METHODS

In this IRB-approved study, we collected prospective data on patients undergoing LVP for symptomatic BPH using the potassium-titanyl-phosphate (KTP) 80-120 W photoselective laser, the KTP 80-180 W laser, or a high intensity CO<sub>2</sub> diode laser ( $< 10\%$  of cases) from June 2005 to March 2012 by one of three surgeons at a single institution. All patients underwent the minimum preoperative evaluation recommended by the American Urological Association (AUA) Clinical Guidelines (<http://www.auanet.org>), including medical history and physical examination with digital rectal exam, International Prostate Symptom Score (I-PSS) and urinalysis. Per the AUA Guidelines, additional diagnostic testing supplemented this initial evaluation based on clinician preference and as indicated.

Patients received a preoperative dose of antibiotics (fluoroquinolone or cephalosporin) if they had a negative urine culture. Patients with a positive preoperative urine culture were treated with culture specific antibiotics beginning at least 24 h before the procedure. Continued postoperative pharmacotherapy with an alpha-blocker and/or a 5-alpha reductase inhibitor varied and depended on individual surgeon preference.

We collected data on demographics, comorbid medical conditions, length of stay (LOS), perioperative complications, transfusions, postoperative catheterization use, and I-PSS and QOL scores at baseline and at 1, 3, 6, and 9 months after surgery.

The primary outcomes of this study were changes in I-PSS score and QOL score over time, and also, safety as measured

by rates of Clavien graded complications. Secondary outcomes included LOS and transfusion frequency. Low-grade complications (Clavien grade I/II) included adverse events that did not result in a permanent loss in function or the need for surgery. High-grade complications (Clavien grade III) included those resulting in operative intervention and/or a permanent decrement in patient function.

We applied independent *t*-tests, Mann–Whitney U-test, Chi-squared test and Fisher’s exact test, as appropriate, using SPSS, version 17.0 (SPSS Inc., Chicago, IL, USA).

## RESULTS

### Patient characteristics

Of 202 patients, 153 (76%) were  $< 75$  years and 49 (24%) were  $\geq 75$  years. At baseline, men  $\geq 75$  years were more likely to have heart disease, gross hematuria, present with urinary retention prior to surgery, and take anticoagulants (primarily aspirin). There were no significant between-group differences in mean body mass index, median prostate specific antigen, the prevalence of other medical conditions, or the prevalence of prostate cancer [Table 1]. Median (interquartile range [IQR]) preoperative I-PSS for older and younger men were 19 (14-24) and 23 (17-27), respectively ( $P = 0.08$ ). Median preoperative QOL scores for older and younger men were both 4 ( $P = 0.140$ ).

### PERIOPERATIVE OUTCOMES

Elderly men had a longer median LOS (1 day vs. 0 day,  $P = 0.001$ ). There were no significant between-group

**Table 1: Demographic of patients undergoing prostate laser vaporization at single institution stratified by age, 2005-2012**

| Patient characteristics                       | Age $<75$<br>(n=153) (%) | Age $\geq75$<br>(n=49) (%) | P     |
|---|--------------------------|----------------------------|-------|
| Mean ( $\pm$ SD) BMI, kg/m <sup>2</sup>       | 27.3 $\pm$ 5.2           | 26.3 $\pm$ 4.8             | 0.26  |
| Gross hematuria                               | 1 (0.7)                  | 3 (6.1)                    | 0.05  |
| Medical conditions                            |                          |                            |       |
| Diabetes                                      | 27 (17.6)                | 8 (16.3)                   | 1.0   |
| Hypertension                                  | 49 (32)                  | 22 (44.9)                  | 0.12  |
| Heart disease                                 | 30 (19.6)                | 17 (34.7)                  | 0.03  |
| Neurological disorder                         | 7 (4.6)                  | 4 (8.2)                    | 0.47  |
| Lung disease                                  | 9 (5.9)                  | 4 (8.2)                    | 0.52  |
| Chronic renal insufficiency                   | 8 (5.2)                  | 3 (6.1)                    | 0.73  |
| Liver disease                                 | 13 (8.5)                 | 2 (4.1)                    | 0.53  |
| Transplant                                    | 4 (2.6)                  | 0                          | 0.57  |
| Prostate cancer                               | 5 (3.3)                  | 2 (4.1)                    | 0.68  |
| All malignancy                                | 19 (12.4)                | 8 (16.3)                   | 0.48  |
| Urinary retention                             | 63 (41.2)                | 28 (57.1)                  | 0.07  |
| Anti-coagulant use                            | 53 (35.1)                | 30 (61.2)                  | 0.002 |
| Aspirin                                       | 42 (27.8)                | 25 (51)                    | 0.005 |
| Coumadin                                      | 7 (4.6)                  | 3 (6.1)                    | 0.71  |
| Plavix  | 12 (7.9)                 | 7 (14.3)                   | 0.26  |
| Naprosyn                                      | 4 (2.6)                  | 1 (2)                      | 1.0   |
| Median prostate-specific antigen (IQR), ng/mL | 2.3 (1.4-4)              | 3 (1.4-5.7)                | 0.23  |

SD: Standard deviation, BMI: Body mass index, IQR: Interquartile range

differences in the frequency of transfusions (4.4% vs. 0.7%,  $P = 0.14$  comparing older to younger men) or other complications. The most common complications were postoperative dysuria, urinary tract infections, and hematuria [Table 2].

**Postoperative outcomes: International prostate symptom score and the urinary quality of life**

Median (IQR) lengths of postoperative follow-up for older and younger men were 12 and 11 months, respectively ( $P = 0.96$ ).

At follow-up 1 month after surgery, both older and younger men reported decreases in median I-PSS (from 19 to 16 in older and 23 to 10 in younger men,  $P = 0.01$  and  $P < 0.001$ , respectively) and median QOL score (from 4 to 3 in older and 4 to 2 in younger men,  $P = 0.06$  and  $P < 0.001$ , respectively). However, elderly men reported a higher median I-PSS ( $P = 0.01$ ) and QOL score ( $P = 0.01$ ) and smaller median decreases in I-PSS ( $P = 0.02$ ) and QOL ( $P = 0.03$ ) compared with preoperative values [Figures 1 and 2]; they were also less likely to report an improvement in I-PSS of  $\geq 4$  points (58% vs. 80%,  $P = 0.06$ ).

At follow-up 3, 6, and 9 months after surgery, there were no significant differences in median I-PSS or QOL scores between elderly and younger men [Figures 1 and 2].

**Postoperative outcomes: Urinary retention**

Among patients with preoperative urinary retention ( $n = 91$ ), 89% of elderly and 95% of younger men, respectively, were catheter-free at last follow-up ( $P = 0.37$ ).

**Table 2: Perioperative complications of patients undergoing prostate laser vaporization at a single institution stratified by age, 2005-2012**

| Complications                                  | Age<75<br>(n=153) (%) | Age≥75<br>(n=49) (%) | P    |
|--|-----------------------|----------------------|------|
| Overall complications                          | 45 (29.6)             | 16 (32.7)            | 0.72 |
| Low-grade (Clavien I or II)                    | 41 (27)               | 15 (30.6)            | 0.71 |
| Dysuria persisting up to 1 month after surgery | 22 (14.5)             | 5 (10.2)             | 0.63 |
| UTI (culture confirmed)                        | 9 (5.9)               | 5 (10.2)             | 0.34 |
| Hematuria, mild*                               | 7 (4.6)               | 5 (10.2)             | 0.17 |
| Hematuria, moderate**                          | 2 (1.3)               | 1 (2)                | 0.57 |
| Pulmonary edema                                | 1 (0.7)               | 0                    | 1.0  |
| Small bowel obstruction                        | 1 (0.7)               | 0                    | 1.0  |
| Epididymitis                                   | 1 (0.7)               | 0                    | 1.0  |
| Hematuria after discharge                      | 1 (1.3)               | 0                    | 1.0  |
| Cellulitis                                     | 1 (0.7)               | 0                    | 1.0  |
| High-grade (Clavien III)                       | 4 (2.6)               | 1 (2)                | 1.0  |
| Bladder neck contracture                       | 2 (1.3)               | 0                    | 1.0  |
| Epididymitis***                                | 1 (0.7)               | 1 (2)                | 0.43 |
| Clot retention                                 | 1 (0.7)               | 0                    | 1.0  |
| Fossa navicularis stricture                    | 1 (0.7)               | 0                    | 1.0  |

\*Requiring continuous bladder irrigation only, \*\*Requiring non-operative clot evacuation, \*\*\*Resulted in scrotal exploration. UTI=Urinary tract infections

**DISCUSSION**

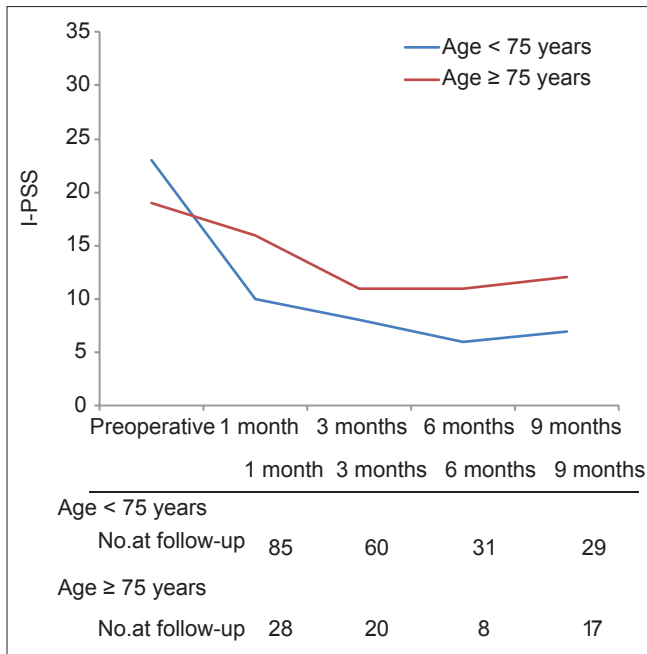
This study is the largest analysis to date to compare the effectiveness and safety of LVP for the treatment of symptomatic BPH in elderly and younger men. Despite a higher preoperative prevalence of heart disease (35%), gross hematuria (6%), urinary retention (57%), and anticoagulant use (61%), elderly men experienced low frequencies of transfusions (<5%) and serious complications (<3%) that were comparable to those of younger men, as well as robust shorter term improvements in urinary symptoms, QOL, and resolution of urinary retention. These data suggest that LVP is a safe and effective therapy for symptomatic BPH in elderly men.

The median LOS for elderly men (1 day) was slightly longer than that of younger men (0 day) most likely because comorbid conditions in the older men more often necessitated routine overnight observation. In addition, despite the fact that elderly men reported significant improvements in I-PSS and the urinary QOL 1 month after surgery, these changes were initially not as pronounced as those for younger men: It was not until 3 months after surgery that differences between the two groups became nonsignificant because LUTS and QOL among the elderly group continued to improve over time [Figures 1 and 2].

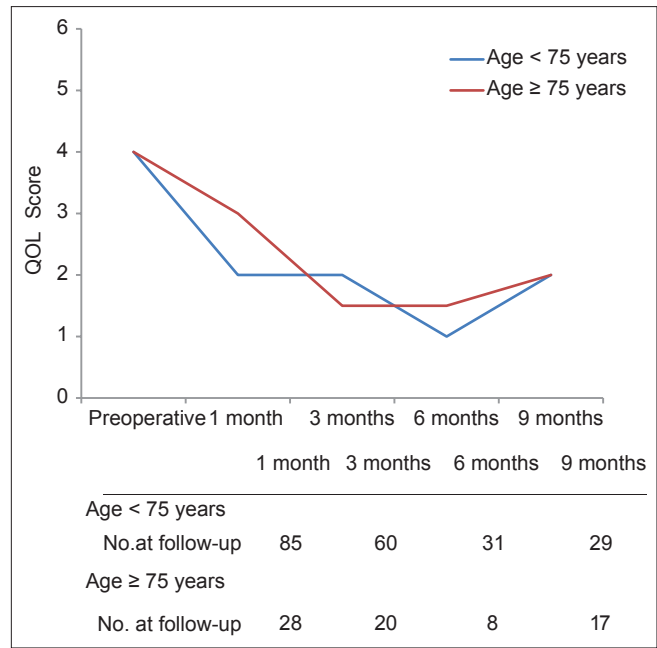
These trends-which could reflect delayed recovery among older individuals, the lower preoperative I-PSS values among older men, or both-differ from those reported in prior studies. In one comparative analysis, Gu *et al.* previously reported that elderly men (defined as age > 70 years) had similar preoperative and postoperative I-PSS compared to younger men and no differences in the rate of improvement of postoperative LUTS.<sup>[15]</sup> Similarly, in a noncomparative case series of octogenarians, Elshal *et al.* observed that improvements in I-PSS and QOL scores stabilized 1 month after LVP and did not further improve thereafter.<sup>[14]</sup>

These data are important because they confirm the safety and efficacy of surgical therapy for the treatment of symptomatic BPH in a population with differentially high morbidity and high frequency of anticoagulant use. Despite the high prevalence of preoperative morbidity (47% with urinary retention, 35% taking either anticoagulants or antiplatelet agents, and 8% with diabetes) in the previously reported octogenarian cohort, the prevalence of operative complications was low and clinical outcomes were robust.<sup>[14]</sup> Similarly, in comparing older men to younger men, Gu *et al.* noted a low frequency of adverse events and comparable clinical outcomes.<sup>[15]</sup>

Despite recent rapid growth in its overall utilization, LVP remains relatively underutilized in the elderly and those with multiple medical conditions.<sup>[16-18]</sup> The initial diffusion



**Figure 1:** Median preoperative and postoperative International Prostate Symptom Score, stratified by age



**Figure 2:** Median preoperative and postoperative International Prostate Symptom Score and quality of life domain scores, stratified by age

of LVP in outpatient or ambulatory surgery centers, in which patients are generally younger and healthier, potentially explains this observation.<sup>[16]</sup> Our data support the consideration of LVP in elderly men who require bladder outlet reduction surgery. Prior studies of LVP have suggested several advantages of LVP over TURP germane to an elderly population, including a lower risk of bleeding and the capacity to continue anti-coagulation through the perioperative period-salient characteristics given the higher frequencies of heart disease and anti-coagulation use among elderly patients.<sup>[12,19-22]</sup>

Strengths of this study include its large sample size and comparative study design. One potential limitation is that, because practice patterns varied between providers, preoperative and postoperative uroflow and postvoid residual measurements were not consistently available. However, this variability is completely consistent with the published AUA Clinical Guidelines for BPH and supports the generalizability of these results to the community, in which practice patterns will differ from one provider to another. A second potential limitation is that three different types of lasers were utilized over the course of the study (the KTP 80–120 W, the KTP 80–180 W, and-in a small minority of cases-the CO<sub>2</sub> diode). Again, though, this heterogeneity potentially increases the generalizability of these results. In addition, potential biases introduced by variations in laser type would have been nondifferential: Occurring with equal likelihood among elderly and younger men. Nondifferential biases are noninformative with respect to study results.

## CONCLUSION

In summary, despite a higher prevalence of preoperative comorbidity, elderly LVP patients experienced safety and efficacy outcomes comparable to younger men. These data support the use of LVP for the surgical treatment of symptomatic BPH in elderly men.

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