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Ejaculatory Hood-Sparing Vaporization of the Prostate and its Impact on Erectile, Ejaculatory, and Sexual Function

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Abstract

Objective: To assess the impact of Ejaculatory Hood (EH)-sparing TUVP on sexual function, with a specific focus on erectile and ejaculatory function.

Methods: We studied 25 patients who underwent EH-sparing Photo Selective Vaporization of the Prostate using the Greenlight Laser (PVP) or Bipolar Button Plasma Vaporization of the Prostate (BPVP) from August 2016 – March 2018. All patients were sexually active with anterograde ejaculation prior to treatment. Patients completed the Male Sexual Health Questionnaire (MSHQ) and AUA Symptom Score pre- and post-operatively. We compared pre-procedure sexual function with post-procedure sexual function at 1- and 3-month intervals. A logistic regression model was used to identify predictors of improvement in sexual function.

Results: 25 patients underwent EH-sparing TUVP from August 2016 – March 2018. At 3-months postoperatively, patients had significant improvement in erection score (12 vs. 9, $p=0.04$) and erection bother score (5 vs. 3.5, $p<0.01$) compared to baseline. They also had improvement in ejaculation score (26 vs. 23, $p=0.03$), ejaculation bother score (5 vs. 4, $p=0.01$), and total MSHQ score (87.5 vs. 73, $p=0.01$). Anterograde ejaculation was preserved in 80.0% of patients. Logistic regression identified higher AUA score severity as an independent predictor of MSHQ score improvement (1.32, CI: 1.03 – 1.69, $p=0.03$).

Conclusion: At 3 months post-operatively, the majority of men who underwent EH-sparing TUVP had preserved anterograde ejaculation and improved overall sexual function based on MSHQ survey. This validates EH-sparing TUVP in men with BPH who wish to maintain sexual function.

Introduction:

Benign prostatic hyperplasia (BPH) is the fourth most common disorder in aging men, reported in more than 97% of men by 70 years of age.¹ The gold standard of surgical treatment for lower urinary tract symptoms (LUTS) secondary to BPH is transurethral resection of the prostate (TURP).² However, with the development of transurethral techniques that reduce the associated ejaculatory and erectile dysfunction, standard TURP has declined in usage over the past decade in favor of these modified approaches.³⁻⁵

One of these modified techniques is ejaculatory hood (EH)-sparing transurethral vaporization of the prostate (TUVP). EH-sparing TUVP is accomplished by surface vaporization of the prostate and avoidance of the ejaculatory hood (the apical paracollicular and supracollicular tissue proximal to the verumontanum), the ejaculatory ducts, and genital sphincter.⁶ Preservation of these anatomic structures allows for conservation of anterograde ejaculation. The reported rates of ejaculation preservation using the EH-sparing technique range from 80 – 96%.⁶⁻¹⁰

While there is strong evidence that EH-sparing TUVP is an effective modality for preserving anterograde ejaculation, there is less evidence on the outcomes of erectile function and overall sexual function, which we define to include erectile function, ejaculatory function, sexual desire, and sexual satisfaction. We sought to bridge this gap by examining these parameters after EH-sparing TUVP. We hypothesized that these parameters would be unchanged after EH-sparing TUVP.

Materials and Methods:**Study Population**

We enrolled 27 male patients with BPH to undergo TUVP at a single center from August 2016 to March 2018. The prospective cohort was created in conjunction with a study to compare photovaporization of the prostate (PVP) vs. button plasma vaporization of the prostate (BPVP). Patients were selected to undergo either PVP with greenlight laser or BPVP with bipolar electrocautery using block randomization with a fixed block size of two. Pre-operative work-up included history and physical, International Prostate Symptom Score (IPSS), AUA symptom score, free flow urometry, transrectal ultrasound (TRUS), post-void residual (PVR), complete blood count, basic metabolic panel, and prostate specific antigen. Inclusion criteria for the study were sexually active men with lower urinary tract symptoms secondary to BPH, IPSS greater than 12, and Qmax less than 15 mL/s. Exclusion criteria were patient reported diagnosis of chronic prostatitis, chronic pelvic pain syndrome, urethral stricture, or bladder neck contracture within the past five years.

Surgical Procedure

Patients received preoperative antibiotic prophylaxis and general or spinal anesthesia. Both BPVP and PVP commenced at the prostatic apex with removal of apical tissue to protect the verumontanum and the external sphincter. Tissue up to 0.5 cm above the verumontanum was removed laterally and proximally, preserving the ejaculatory hood to provide a backstop for ejaculation. The procedure resulted in a cavity lined by capsular fibers with preservation of the

ejaculatory hood (Figure 1). At the end of the procedure, the bladder was filled with irrigation solution and the cystoscope was removed. A 20Fr Foley catheter was inserted in all patients and left to gravity drainage.

Assessment

Patients completed the Male Sexual Health Questionnaire (MSHQ) and AUA Symptom Score at baseline, 1 month, and 3 months post-operatively. The MSHQ is a 25-question survey covering subjects of erection, ejaculation, sexual desire, and sexual satisfaction. Each question is answered on a scale from 1 to 5, with a higher score indicating better function. The AUA Symptom Score is a 7-question survey to assess LUTS. Each question is answered on a scale from 1 to 5, with a higher score indicating higher severity of symptoms.

Statistical Analysis

25 of the 27 patients completed all pre- and post-operative surveys and were included in the final analysis. Comparisons between the PVP and BPVP groups were made using the unpaired t-test. All data were tested for normality using the Shapiro-Wilk test. Comparisons between MSHQ scores at 1 and 3 months vs. baseline were assessed using paired t-test and Wilcoxon rank test for normal and non-normally distributed data, respectively. Comparisons between patients with improved vs. worsened MSHQ scores were made using unpaired t-test for normally distributed continuous data, Wilcoxon rank test for non-normally distributed continuous data, and chi-square test for categorical data. For all comparisons, a two-sided p-value of <0.05 was considered statistically significant. A multivariate logistic regression model was created using

stepwise selection with a cutoff of $p < 0.15$ for entry and removal from the model. Entry variables included age, procedure type, prostate volume, Qmax, pre-operative AUA score, and post-operative AUA score.

Results:

We studied 25 patients who underwent EH-sparing TUVP at our institution from August 2016 to March 2018; 12 patients underwent PVP, and 13 patients underwent BPVP. The median age of the cohort was 64 years. Patients had median prostate volume of 50 mL (Interquartile range (IQR): 41 – 76 mL), median AUA symptom score of 18 (IQR: 15.5 – 22), and median Qmax of 9.4 mL/s (IQR: 5.9 – 11.3 mL/s) (Table 1). The median preoperative MSHQ erection score was 9 out of 15 (IQR: 5.75 – 11.25), median ejaculation score was 23 out of 35 (IQR: 8 – 27), and median overall MSHQ score was 73 out of 125 (IQR: 52.5 – 87.5). There were no significant differences in baseline characteristics between PVP and BPVP patients.

Compared to baseline, there was no significant change in MSHQ erection score (8.5 vs. 9, $p=0.44$) nor in erection bother score (4 vs. 3.5, $p=0.44$) at 1 month post-operatively. Similarly, ejaculation score (20 vs. 23, $p=0.41$) and ejaculation bother score (3 vs. 4, $p=0.33$) were not significantly changed at 1 month compared to baseline. At 3 months post-operatively, both erection score (12 vs. 9, $p=0.04$) and erection bother score (5 vs. 3.5, $p < 0.01$) were significantly improved from baseline. Ejaculation score (26 vs. 23, $p=0.03$), ejaculation bother score (5 vs. 4, $p=0.01$), and total MSHQ score (87.5 vs. 73, $p=0.01$) were also significantly improved at 3 months post-operatively (Table 2, Figure 2). At 3 months, both erection score and ejaculation score were improved in 13

(52.0%) patients. Overall MSHQ score was improved in 18 (72.0%) patients, and anterograde ejaculation was preserved in 20 (80.0%) patients.

At 1 month postoperatively, median AUA score was not significantly changed from baseline (14 vs. 18, $p=0.09$). At 3 months post-operatively, AUA score was significantly improved from baseline (7 vs 18, $p<0.01$). There were no significant differences in 3-month post-operative AUA score, erection score, ejaculation score, and ejaculation bother score between PVP and BPVP groups (supplementary table 1).

Of the 25 patients, 18 (72.0%) had improved 3-month MSHQ scores and 7 (28.0%) had worsened scores. Patients with improved MSHQ scores had significantly higher pre-operative AUA score than patients with worsened MSHQ scores (20.5 vs. 15, $p = 0.02$) (supplementary table 2). There were no significant differences between age, prostate volume, or post-operative AUA score between the two groups. A multivariate binomial logistic regression model identified higher pre-operative AUA score severity as an independent predictor of MSHQ improvement (1.32, CI: 1.03 – 1.69, $p=0.03$) (supplementary table 3).

Discussion:

In this prospective study of 25 men who underwent EH-sparing TUVP, the majority of patients reported preserved ejaculatory function with improved erectile function and overall sexual function at 3 months post-operatively. This indicates that not only is EH-sparing PVP a good option in men who wish to preserve anterograde ejaculation, but that in select patients, it may result in

improved erectile and overall sexual function as well. On logistic regression, we found that AUA severity was associated with MSHQ improvement, indicating that perhaps patients with more severe LUTS are more likely to have improvement of sexual function after EH-sparing TUVP.

Prior studies have established the efficacy of the EH-sparing technique in preserving ejaculatory function. In a systematic review of 6 prospective studies of 405 patients, Lebdaï et al showed that 66 – 91% of patients had preserved anterograde ejaculation after modified TURP and 87 – 96% patients had preserved ejaculation after modified PVP.¹¹ These rates fall in line with our cohort, in which 80% of patients had preserved anterograde ejaculation.

Several studies have also examined the effect of EH-sparing TUVP on erectile function. Ouyang et al studied 80 patients who underwent EH-sparing PVP and found that International Index of Erectile Function (IIEF-5) scores were not significantly changed at 6 months compared to baseline.¹² Similarly, in a randomized trial comparing standard PVP to EH-sparing PVP, Abolazm et al found that there was no significant decline in post-operative IIEF-15 scores in 25 patients who underwent EH-sparing PVP.⁷ Our study used the MSHQ, a 25 question survey that assesses erection, ejaculation, sexual desire, and sexual satisfaction, and in our opinion assesses overall male sexual function in more depth than the IIEF. We found an aggregate improvement in total MSHQ score after EH-sparing TUVP, an observation that has not previously been reported.

An association between BPH and erectile dysfunction has been established,¹³ with evidence that increased LUTS are associated with increased sexual dysfunction.¹⁴ Both disorders respond to the

phosphodiesterase 5 inhibitor tadalafil, which lends further credence to a shared pathophysiologic mechanism.^{15, 16} While the pathophysiology is not clearly understood, metabolic syndrome is commonly associated with both disorders,¹⁷ and microvascular dysfunction of the penis and lower urinary tract has been proposed as a unifying mechanism.¹⁸ We found that patients with more severe LUTS were more likely to experience improvement in MSHQ scores after EH-sparing TUVP, which has not previously been described. Further investigation into this observation may shed more light onto the pathophysiologic connection of LUTS and sexual dysfunction.

This study is limited by its smaller sample size and the fact that all procedures were performed at a single institution with a patient cohort that may differ from the general population. Two providers performed all procedures, and the reproducibility of their EH-sparing technique is unknown. The duration of follow-up was limited to 3 months. A longer period of follow-up is needed to ascertain whether the improvements experienced by this cohort are durable. Future multi-institutional studies that prospectively examine the effect of EH-sparing TUVP on sexual function are needed to validate our results and elicit which patient characteristics are associated with improvements in sexual function.

Conclusion:

At 3 months post-operatively, the majority of men who underwent EH-sparing TUVP maintained anterograde ejaculatory function and had improved overall sexual function. These results further validate EH-sparing TUVP as a treatment modality for sexually active men with BPH, and show that in select patients, EH-sparing technique may even improve erectile and overall sexual function.

References:

1. Taylor BC, Wilt TJ, Fink HA, et al. Prevalence, severity, and health correlates of lower urinary tract symptoms among older men: the MrOS study. *Urology* 2006;68:804-9.
2. Litwin MS, Saigal CS, editors. *Urologic Diseases in America*. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. Washington, DC: US Government Printing Office, 2012; NIH Publication No. 12-7865 [pp. 46 – 72].
3. Malaeb BS, Yu X, McBean AM, and Elliott SP. “National Trends in Surgical Therapy for Benign Prostatic Hyperplasia in the United States (2000-2008).” *Urology*, vol. 79, no. 5, 2012, pp. 1111–1117., doi:10.1016/j.urology.2011.11.084.
4. Patel RM and Bariol S. “National Trends in Surgical Therapy for Benign Prostatic Hyperplasia in Australia.” *ANZ Journal of Surgery*, vol. 89, no. 4, 2019, pp. 345–349., doi:10.1111/ans.15016.
5. Chughtai B, Simma-Chiang V, Lee R, et al. “Trends and Utilization of Laser Prostatectomy in Ambulatory Surgical Procedures for the Treatment of Benign Prostatic Hyperplasia in New York State (2000–2011).” *Journal of Endourology*, vol. 29, no. 6, 2015, pp. 700–706., doi:10.1089/end.2014.0692.
6. Leonardi R. The LEST technique: Treatment of prostatic obstruction preserving antegrade ejaculation in patients with benign prostatic hyperplasia. *Arch Ital Urol Androl* 2019;91:35-42.
7. Abolazm AE, El-Hefnawy AS, Laymon M, Shehab-El-Din AB, and Elshal AM. Ejaculatory Hood Sparing vs. Standard Laser Photoselective Vaporization of the Prostate: Sexual and Urodynamic Assessment Through a Double Blinded, Randomized Trial. *J Urol* 2019:101097JU00000000000000685.
8. Leonardi R. Preliminary results on selective light vaporization with the side-firing 980 nm diode laser in benign prostatic hyperplasia: an ejaculation sparing technique. *Prostate Cancer Prostatic Dis* 2009;12:277-80.
9. Talab SS, Bachmann A, Choi B, Muir G, Woo H, and Tabatabaei S. V403 The impact of ejaculation-preserving photo-selective vaporization of the prostate (EP-PVP) on lower urinary tract symptoms and ejaculatory function: results of a multicenter study. *J Urol* 2013;189:e164.

10. Miyauchi T YH, Kanzaki M. V3-06 ejaculation-sparing photoselective vaporization of the prostate: evaluation of the ejaculatory function and the lower urinary tract symptoms. *J Urol* 2016;195:e468.
11. Lebdai S, Chevrot A, Doizi S et al. "Do Patients Have to Choose between Ejaculation and Miction? A Systematic Review about Ejaculation Preservation Technics for Benign Prostatic Obstruction Surgical Treatment." *World Journal of Urology*, vol. 37, no. 2, 2018, pp. 299–308., doi:10.1007/s00345-018-2368-6.
12. Ouyang Y, Liu C, Guan W, Zhao Y, Xu Y, and Wu Y. "Impact of 160 W Greenlight Laser Vaporization of the Prostate on Erectile Function: A Prospective Randomized Controlled Trial with 1-Year Follow-Up." *Photomedicine and Laser Surgery*, vol. 32, no. 8, 2014, pp. 463–467., doi:10.1089/pho.2014.3727.
13. Baniel J, Israilov S, Shmueli J, Segenreich E, and Livne E. "Sexual Function in 131 Patients with Benign Prostatic Hyperplasia before Prostatectomy." *European Urology*, vol. 38, no. 1, 2000, pp. 53–58., doi:10.1159/000020252.
14. Namasivayam S, Minhas S, Brooke J, Joyce AD, Prescott S, and Eardley I. "The Evaluation of Sexual Function in Men Presenting with Symptomatic Benign Prostatic Hyperplasia." *BJU International*, vol. 82, no. 6, 1998, pp. 842–846., doi:10.1046/j.1464-410x.1998.00868.x.
15. McVary KT, Roehrborn CG, Kaminetsky JC, et al. Tadalafil relieves lower urinary tract symptoms secondary to benign prostatic hyperplasia. *J Urol*. 2007;177(4):1401–7.
16. Roehrborn CG, McVary KT, Elion-Mboussa A, and Viktrup L. Tadalafil administered once daily for lower urinary tract symptoms secondary to benign prostatic hyperplasia: a dose finding study. *J Urol*. 2008;180(4):1228–34.
17. Nunzio, Cosimo De, Roehrborn CG, Andersson KE, and McVary KT. "Erectile Dysfunction and Lower Urinary Tract Symptoms." *European Urology Focus*, vol. 3, no. 4-5, 2017, pp. 352–363., doi:10.1016/j.euf.2017.11.004.
18. Celtek S, Cameron NE, Cotter MA, Fry CH, and Ilo D. "Microvascular Dysfunction and Efficacy of PDE5 Inhibitors in BPH–LUTS." *Nature Reviews Urology*, vol. 11, no. 4, 2014, pp. 231–241., doi:10.1038/nrurol.2014.53.

Figure Legends:

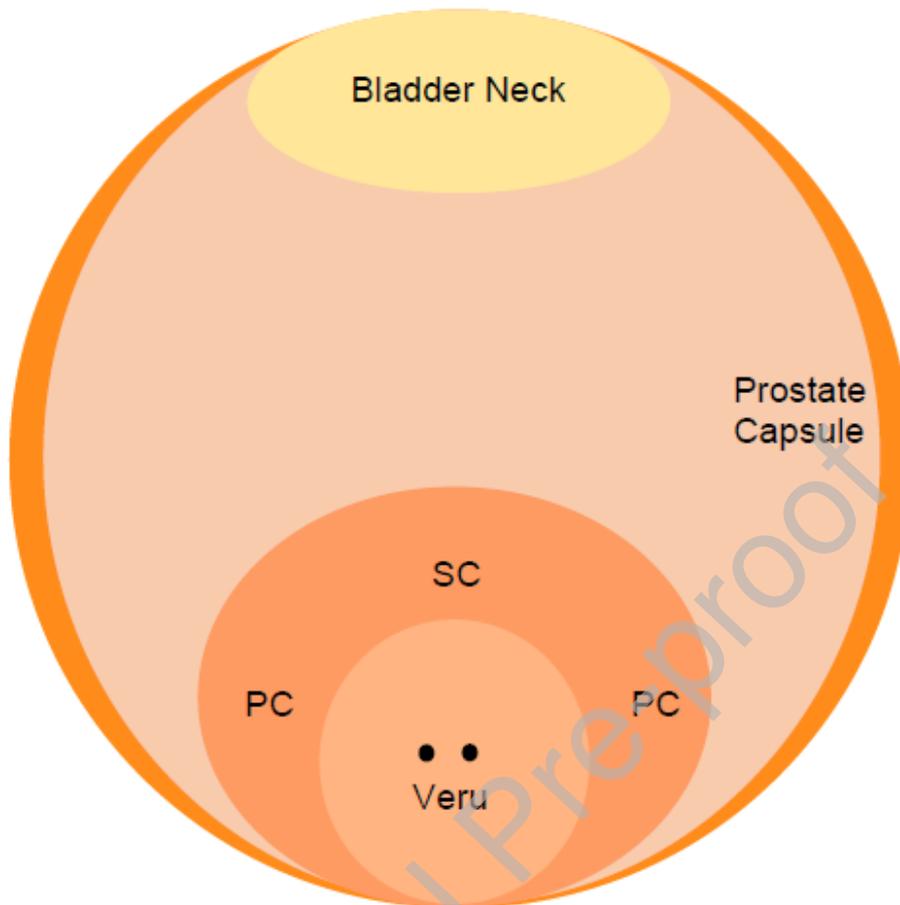


Figure 1: Visual depiction of ejaculatory hood-sparing transurethral vaporization of prostate. Ejaculatory hood consisting of supracollicular (SC) and paracollicular (PC) tissue is left intact.

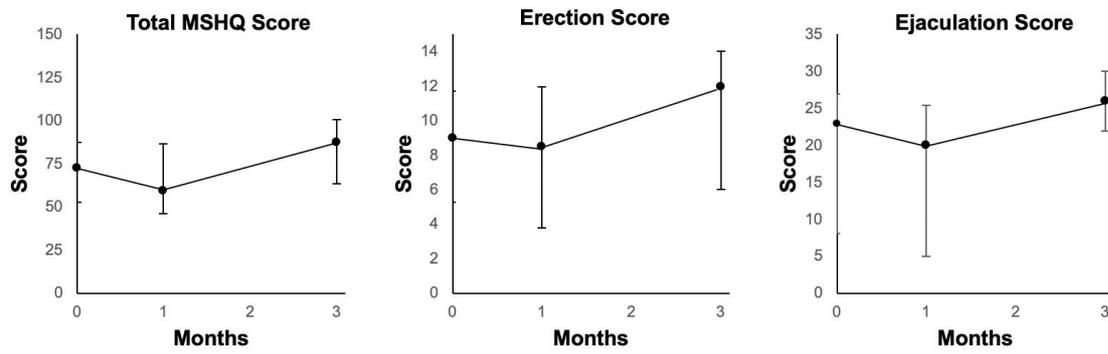


Figure 2: MSHQ score median and interquartile range at 0, 1, and 3 months.

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Table 1: Baseline characteristics of the entire cohort (median with IQR in parentheses), divided into PVP and BPVP patients. Comparisons were made between PVP and BPVP patients using unpaired t-test.

	All Patients (n = 25)	PVP (n = 12)	BPVP (n = 13)	p-value
Age (years)	64 (60.5 - 70.5)	64 (60 - 68)	64.5 (61 - 71.5)	0.77
Prostate Volume (mL)	50 (41 - 76)	50 (41 - 57)	69.5 (42.75 - 83)	0.07
PVR (mL)	25 (7.5 - 107)	16 (3 - 95)	31.5 (10 - 107.25)	0.76
Qmax (mL/s)	9.4 (5.9 - 11.3)	8.5 (5.6 - 15.4)	9.2 (7.3 - 9.7)	0.36
AUA Symptom Score	18 (15.5 - 22)	18 (16 - 23)	18 (15.25 - 20.75)	0.87

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Table 2: MSHQ and AUA scores (median score with interquartile range) at baseline, 1 month, and 3 months. Comparisons were made between baseline vs. 1 month and baseline vs. 3 month using paired t-test for normally distributed data (total MSHQ) and Wilcoxon rank test for non-normally distributed data (erection, erection bother, ejaculation, ejaculation bother, total AUA).

	Baseline Score	1 month Score	p-value	3 month Score	p-value
Total MSHQ	73 (52.5 - 87.5)	59.5 (45.75-86.5)	0.31	87.5 (63.75-101)	0.01
Erection	9 (5.25-11.75)	8.5 (3.75-12)	0.44	12 (6-14)	0.04
Erection Bother	3.5 (2-5)	4 (3-4.5)	0.44	5 (3.25-5)	<0.01
Ejaculation	23 (8-27)	20 (5-25.5)	0.41	26 (22-30)	0.03
Ejaculation Bother	4 (2-5)	3 (2.75-4)	0.33	5 (3.5-5)	0.01
Total AUA	18 (15.5 - 22)	14 (4 - 23)	0.09	6 (4 - 9.5)	<0.01