Comparison Between Thulium Laser VapoEnucleation and GreenLight Laser Photoselective Vaporization of the Prostate in Real-Life Setting: Propensity Score Analysis

Daniele Castellani, Luca Cindolo, Cosimo De Nunzio, Mirko Di Rosa, Francesco Greco, Luca Gasparri, Vincenzo Maria Altieri, Luigi Schips, Andrea Tubaro, and Marco Dellabella

OBJECTIVE To compare in daily practice efficacy and safety of standard 180-Watt GreenLight laser photoselective vaporization (PVP) and Thulium laser Vaporesection of the prostate (ThuVEP).

MATERIALS AND METHODS All men were evaluated with prostate volume, prostate-specific antigen, International Prostate Symptom Score, and maximum urinary flow. Patient global impression of improvement was evaluated with patient global impression of improvement scale for 6 months. Antiplatelet/anticoagulant therapy, operation time, 24-hour hemoglobin drop , length of catheterization, discharge day, early complications, and reoperation after 30 days were gathered. Differences between interventions were estimated using propensity scores to adjust for different patients characteristics. The propensity scores were estimated by fitting a stepwise logistic regression model with intervention type as the dependent variable and all the covariates.

RESULTS Five hundred five men underwent the surgical procedures (291 PVP and 214 ThuVEP). Mean age was 69.6 years. Mean prostate volume was 54 mL. Median operation time was 55 minutes. Median catheterization time was 2 days in both series. After matching, the postoperative stay was similar in both groups (2 days). Hemoglobin drop for 24 hours was statistically significantly lower in PVP (−0.5 vs −0.8 g/dL, P .002). Most of the complications were mild-to-moderate and comparable among groups. Δ Maximum urinary flow was similar 6-month after surgery before and after matching, whereas PVP group had a better improvement 12-month after surgery. 96.4% of all patients had an improvement of their symptoms, with no difference between groups, before and after matching.

CONCLUSION Our study demonstrated that PVP and ThuVEP are similar in term of complications and outcomes, with high patients' satisfaction. UROLOGY 121: 147−152, 2018. © 2018 Elsevier Inc.

The etiology of lower urinary tract symptoms (LUTS) is multifactorial, and LUTS are common complaints which impair quality of life in adult to elderly men.[1,2] Benign prostatic hyperplasia (BPH) is the most common cause of LUTS in older men, its prevalence increases with age and it induces benign prostatic enlargement, frequently associated with benign prostatic bladder outlet obstruction (BPO).[3,4] The surgical management of BPH/BPO is a therapeutic option and is advised in many situations.[5] Transurethral resection of prostate (TURP) and open simply prostatectomy, depending on gland volume, have been traditionally considered the gold standard surgery; however, both procedures are associated with remarkable and well-known morbidity, mostly in larger prostates.[6,7] Alternative procedures started in the 90s in order to improve hemostasis and postoperative course.[8] Among these, several kinds of lasers are nowadays available and suitable for this purpose.[9] The randomized controlled trial GOLIATH showed that GreenLight-XPS laser photoselective vaporization of the prostate (PVP) is not inferior to TURP in terms of safety and efficacy in patients with small-to-medium sized prostates.[10] PVP is

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From the Department of Urology, IRCCS INRCA, Ancona, Italy; the Department of Urology, S. Pio da Pietralcina Hospital, Vasto, Italy; the Department of Urology, Sant'Andrea Hospital, University of Rome "La Sapienza", Rome, Italy; the Geriatric Pharmacoepidemiology Lab, IRCCS INRCA, Ancona, Italy; and the Department of Urology, Humanitas Gavazzeni, Bergamo, Italy

Address correspondence to: Daniele Castellani, M.D., Urology Department, IRCCS INRCA, via della Montagnola 81, 60127 Ancona, Italy. E-mail: d.castellani@inrca.it

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nowadays an adult technique, and, according to European Association of urology (EAU) guidelines, is the best surgical option in men on anticoagulant medication or with a high cardiovascular risk.[5,11] Since, the introduction of holmium laser enucleation of the prostate retrograde transurethral anatomic enucleation has gained a worldwide rapid diffusion, using different sources of energy.[12,13] Resection, enucleation, and vapoenucleation with Thulium laser support have been described and appear effective with a low rate of morbidity.[14] Thulium vapoenucleation of the prostate (ThuVEP) have particularly demonstrated its noninferior efficacy and safety compared with TURP, shorter catheterization and hospital stay and long-term efficacy.[15,16] Despite, growing evidence on efficacy and efficiency regarding these laser treatments, data comparing GreenLight laser PVP and ThuVEP are lacking, and to our best knowledge, there is only 1 direct comparison available in the literature.[17] Prospective, single surgeon, randomized controlled trial, are theoretically the best level of evidence in evidence-based medicine, but this is not always made possible in a "real-life" setting[18];thus, the aim of this study is to compare data on efficacy and safety of patients undergoing in a daily practice standard 180-Watt GreenLight laser PVP as compared to ThuVEP.

MATERIALS AND METHODS

This is a retrospective analysis of prospective, consecutive, and multi-institutional data collection on all patients who underwent BPH/BPO laser surgery in 4 Italian urological departments between 2014 and 2017. Standard PVP was performed in 3 departments (S. Pio da Pietralcina Hospital, ASL Abruzzo 2, Vasto; Sant'Andrea Hospital, University of Rome "La Sapienza"; Humanitas Gavazzeni, Bergamo), whereas ThuVEP in one (National Institute of Health and Science on Aging—I.N.R.C.A., Ancona). Indications for surgery were according to the recommendations of EAU guidelines.[5] Exclusion criteria were neurologic disease, history of prostate cancer or previous urethral stricture or prostate surgery. Men who underwent concomitant surgical procedures (urethrotomy, cystolithotripsy, transurethral resection of incidental bladder tumor, etc.) were also excluded. Suspicious prostate cancer was ruled out preoperatively with prostate biopsy. Preoperative collected data were age, antiplatelet/anticoagulant therapy history, prostate volume (PV) measured with transrectal ultrasound, total prostate-specific antigen (PSA), International Prostate Symptom Score (IPSS), maximum urinary flow (Qmax), indwelling catheter history, and hemoglobin (Hb) levels. Anticoagulation and antiplatelet agents were stopped in preparation to surgery according to neurologic/cardiological consultation and recommendations of ICUD/AUA paper.[19] Surgical time was gathered in all cases, and it was considered from starting firing to catheter insertion. Energy used was not available in most cases, and then was not taken in to account. Postoperative collected data were Hb for 24 hours, blood transfusion, length of catheterization, discharge day, and complications. Follow-up visits were scheduled for 1, 6, and 12 months, recording IPSS, Qmax, and PSA. Patient Global Impression of Improvement was evaluated with patient global impression of improvement scale for 6 months.[20] Complications were recorded during hospital stay and at follow-up visits and were classified as early (within 30 postoperative days), according to the modified Clavien-Dindo classification for TURP.[21] Urinary incontinence was defined as reported incontinence of any degree. Outcomes were measured at 6 and 12 months. Surgery for urethral stenosis, bladder neck contracture, residual adenoma requiring redo surgery, and prostatic fossa sclerosis after 30 days was considered as reoperation. The study followed the ethical principles for medical research involving human beings of the Declaration of Helsinki and has been approved by a local Ethical Board (number DGEN 421/2017). All patients signed an informed consent.

Surgical Procedures

Depending on the center, a 24.5-Ch (Richard Wolf, Knittlingen, Germany) or 26-Ch (Karl Storz, Tuttlingen, Germany) resectoscope with a separate operative channel for the fiber was used. Antibiotic prophylaxis was administered to all patients according to local protocols.

PVP

All the PVP procedures were performed using GreenLight XPS 180W laser (AMS, San Jose), firing with an angled, 750-micron, and single-use fiber (MoXy Fiber, AMS, San Jose), with energy level always at 180 Watts. PVP started with ureteral orifices visualization and carried on with the creation of a working space between 5 and 7-o'clock, and the prostate was vaporized in circumferential manner inside out (from prostatic urethra toward the prostatic accompanied capsule). All the tissue was vaporized, and morcellation was not necessary.[22]

ThuVEP

ThuVEP was performed using a continuous wave Thulium laser (RevoLix DUO 120W, LISA Laser products, Katlenburg, Germany), with energy level always at 90 Watts. Laser energy was transmitted using an 800-micron, reusable, front-firing laser fiber (RigiFib 800, LISA Laser products, Katlenburg, Germany). A two-lobe enucleation technique was developed, in which the median lobe is enucleated first, whereas lateral lobes are dissected and enucleated en-bloc. Once the medial lobe was moved into the bladder lumen, the dissection carried on at 4-o'clock position toward the bladder neck, enucleating the left lobe in an anticlockwise direction. At 12-o'clock dissection kept going beneath the right lobe toward 9-o'clock. Then, an incision was made at 8- o'clock and enucleation was completed in a clockwise direction (toward 9-o'clock position). Enucleation carried out always in a "tension-free" fashion, using laser energy like a knife.[23] Enucleated prostatic tissues were morcellated with a full bladder using Piranha morcellator (Richard Wolf, Knittlingen, Germany), with a dedicated nephroscope (Richard Wolf, Knittlingen, Germany). Morcellated tissue was sent for histopathology in all cases.

Statistical Analysis

Continuous variables were reported as either mean and standard deviation or median and interquartile range on the basis of their distribution (assessed using Shapiro-Wilk test). Comparison of variables between groups was performed by unpaired Student *t* test or Mann-Whitney *U* test according to their distribution. Categorical variables were expressed as absolute number and percentage and analyzed by Chi-square test. Outcome variables (ie, operation time; IPSS reduction after 6 and 12

months; Qmax increases after 6 and 12 months) were dichotomized into under the median or above (or equal to) the median of the variable itself. Differences between the 2 lasers interventions were estimated using logistic regression for all the outcomes, adjusted for age, PV, baseline PSA, baseline IPSS, baseline Qmax, antiplatelet/anticoagulant therapy, indwelling catheter history, and American Society of Anesthesiologists (ASA) score. Analyses on IPSS and Qmax variations were adjusted also for operation time. All analyses were repeated after propensity scores (PS) matching in order to adjust for the bias inherent to the different patient characteristics at baseline. The PS were estimated by fitting a stepwise logistic regression model with intervention type as the dependent variable and all the covariates (with the exception of operation time). Main outcomes were: operation time; IPSS reduction after 6 and 12 months; Qmax increase after 6 and 12 months. A two-tailed *P* value $<.05$ was considered significant. Data were analyzed using STATA version 11.2 Statistical Software Package for Windows (StataCorp, Collge Station, TX). Original data of this study are available at *Mendeley Data* (https://data.mendeley.com/datasets/5hnbsthkgn/2).[24]

RESULTS

Five hundred five patients underwent the surgical procedures in the period study (291 PVP and 214 ThuVEP). Only men with complete follow-up data were included in the study. From this sample, 112 for missing baseline data, 28 for not having completed the 6 months follow-up visit and 114 for not having completed the 12 months follow-up visit were excluded, thus 365 men were available for 6 -months (151 PVP and 214 ThuVEP) and 251 for 12-month (93 PVP and 158 ThuVEP) analysis respectively. Table 1 shows patients' baseline and intraoperative characteristics. Mean age was 69.6 (±8.5 standard deviation) years. PV ranged between 22 and 180 mL (mean value 54 mL). The characteristics of patients (age, PV, baseline PSA, IPSS, indwelling catheter history, Qmax, and surgical time) were similar in the 2 groups. Men on antiplatelet/anticoagulant therapy and with ASA score 3 were predominant in PVP group before propensity score matching. Median operation time was 55 minutes and was not different between groups (60 vs 55 minutes in PVP and ThuVEP, respectively, *P* .218). Median catheterization time was 2 days in both series. After matching, the postoperative stay was similar in both groups (*P* .088). ΔHb for 24 hours was statistically significantly lower in PVP (−0.5 vs −0.8 g/dL, *P* .002), even after matching (*P* .023). Main outcome results for 12 month are shown in Table 2. Overall, 54% of men had a decrease of IPSS more than 20 (ΔIPSS) for 6 months (74% in PVP vs 42.4% in ThuVEP); after PS matching, the difference between 2 groups was confirmed. ΔIPSS was not different 12-month after surgery, but after matching PVP group had a better outcome compared to ThuVEP group (68.9% vs 37.8% respectively, *P* .003).

Table 1. Patients' preoperative and intraoperative characteristics

	Before Propensity Score Matching				After Propensity Score Matching			
	Overall (n = 251)	PVP (n = 93)	ThuVEP (n = 158)	*P* Value	Overall (n = 90)	PVP (n = 45)	ThuVEP (n = 45)	*P* Value
Preoperative variables								
Age (years)	69.6 ± 8.5	68.9 ± 8.5	70.0 ± 8.5	.320	69.2 ± 8.0	68.6 ± 8.8	69.8 ± 7.2	.466
Prostate volume (TRUS) (mL)	54(26)	58(25)	52.5(26)	.086	53(26)	50(25)	56(25)	.389
Baseline PSA (ng/mL)	2.7(2.3)	2.7(2.9)	2.7(2)	.951	2.6(2.2)	2.7(2.5)	2.6(1.8)	.729
Baseline IPSS	25(5)	25(9)	25.5(4)	.094	25(5)	25(9)	26(3)	.412
Baseline Q max (mL/sec)	8.3 ± 2.9	8.0 ± 2.8	8.4 ± 2.9	.380	8(3)	8(3)	8.3(3.2)	.762
Antiplatelet/ Anticoagulant therapy	49(19.5%)	36(38.7%)	13(8.2%)	.000	15(16.7%)	7(15.6%)	8(17.8%)	.777
Indwelling catheter history	37(14.7%)	9(9.7%)	28(17.7%)	.083	10(11.1%)	5(11.1%)	5(11.1%)	1.000
ASA score				.000				.824
1–2	123(49.0%)	24(25.8%)	99(62.7%)		31(34.4%)	15(33.3%)	16(35.6%)	
3	128(51.0%)	69(74.2%)	59(37.4%)		59(65.6%)	30(66.7%)	29(64.4%)	
Intraoperative variables								
Surgical time (min)	55(25)	60(35)	55(25)	.218	55(15)	55(20)	55(20)	.981
ΔHb (24 h)*	-0.8(0.9)	-0.5(1.3)	-0.8(0.8)	.002	-0.7(0.8)	-0.5(1.2)	-0.8(0.6)	.023
Postoperative variables								
Catherization time (day)	2(1)	2(2)	2(1)	.041	2(2)	2(2)	2(1)	.120
Postoperative stay (day)	3(1)	2(3)	3(1)	.129	3(1)	2(3)	3(1)	.088
Clavien-Dindo classification of early complications				.000				.000
0	165(65.7%)	31(33.3%)	134(84.8%)		51(56.7%)	13(28.9%)	38(84.4%)	
I	72(28.7%)	59(63.4%)	13(8.2%)		34(37.8%)	31(68.9%)	3(6.7%)	
II	8(3.2%)	1(1.1%)	7(4.4%)		1(1.1%)	0(0.0%)	1(2.2%)	
IIIa	5(2.0%)	1(1.1%)	4(2.5%)		4(4.4%)	1(2.2%)	3(6.7%)	
IIIb	0(0.0%)	0(0.0%)	0(0.0%)		0(0.0%)	0(0.0%)	0(0.0%)	
IVa	1(0.4%)	1(1.1%)	0(0.0%)		0(0.0%)	0(0.0%)	0(0.0%)	
V	0(0.0%)	0(0.0%)	0(0.0%)		0(0.0%)	0(0.0%)	0(0.0%)	

IPSS, International Prostate Symptoms Score; PSA, prostate specific antigen; TRUS, transrectal ultrasonography.
Values are presented as n (%) or mean ± SD or median (IQR).
* Sixteen missing before propensity score matching; 6 missing after propensity score matching.

Table 2. Main outcome results

	Before Propensity Score Matching				After Propensity Score Matching			
	Overall (n = 251)	PVP (n = 93)	ThuVEP (n = 158)	*P* Value	Overall (n = 90)	PVP (n = 45)	ThuVEP (n = 45)	*P* Value
Δ IPSS (6 mo) ≥ −20	136(54.2%)	69(74.2%)	67(42.4%)	.000	46(51.1%)	33(73.3%)	13(28.9%)	.000
Δ Q max (6 mo) ≥ 10.5	126(50.2%)	49(52.7%)	77(48.7%)	.545	50(55.6%)	26(57.8%)	24(53.3%)	.671
Δ IPSS (12 mo) ≥ -21	139(55.4%)	58(62.4%)	81(51.3%)	.088	48(53.3%)	31(68.9%)	17(37.8%)	.003
Δ Q max (12 mo) ≥ 12	127(50.6%)	56(60.2%)	71(44.9%)	.019	44(48.9%)	29(64.4%)	15(33.3%)	.003
Surgical time ≥ 55 mins	146(58.2%)	61(65.6%)	85(53.8%)	.067	54(60.0%)	27(60.0%)	27(60.0%)	1.000
Patients Perception of Improvement (PPI)	242(96.4%)	88(94.6%)	154(97.5%)	.242	86(95.6%)	42(93.3%)	44(97.8%)	.306
Reoperation after 30 d	19(7.6%)	8(8.6%)	11(7.0%)	.635	7(7.8%)	3(6.7%)	4(8.9%)	.694

IPSS, International Prostate Symptoms Score.
Values are presented as n (%).

ΔQmax was similar 6-month after surgery before and after matching, whereas PVP group had a better Qmax improvement for 12 months. Patients' perception of improvement was analyzed as a binomial variable, yes or no (YES = very improved, improved, slightly improved; NO = unchanged, worse). Overall, 96.4% of all patients had an improvement of their symptoms after surgery, with no difference between groups, before (94.6 % in PVP vs 97.5% in ThuVEP) and after matching (93.3% in PVP vs 97.8% in ThuVEP). Overall, 65.7% of patients had no complications (33.3% in PVP vs. 84.4% in ThuVEP). Most of the complications were mild-to-moderate in both groups, with grade I lower in ThuVEP before (8.2% vs 63.4%) and after PS (6.7% vs 68.9%); grade II, III, and IV were comparable among groups (Table 1). Transfusion rate was similar between 2 groups; only 1/45 (2.2%) patients required blood transfusion after each procedure. Both men were under antiplatelet/anticoagulant therapy. Due to the limited number of patients on antiplatelet/anticoagulation in both groups after PS, a direct comparison was not possible. Reoperation rate after 30 days was similar and less than 8% after matching in both groups. Urinary incontinence was present after PS in 3 men in ThuVEP group (6.6%) and in 4 in PVP group (8.8%). After adjustment for age, PV, baseline IPSS, Qmax, PSA, indwelling catheter, ASA score, antiplatelet/anticoagulant therapy, and operation time, logistic regression shows a statistically significant difference in favor of PVP only in ΔIPSS for 6 and 12 months and ΔQmax for 12 months (Table 3), also after PS adjustment (Table 4). In multivariable proportional odds regression model, surgical technique was not predictive of patients satisfaction and reoperation after 30 days, also after PS matching. We performed a supplemental analysis with 6-month data in order to increase patients' population (365 men before and 148 men after PS). Results were the same as the 12-month analysis. Data are available as supplemental materials (Tables S1, S2, S3, and S4).

DISCUSSION

In the current EAU guidelines, TURP and open simply prostatectomy are still the standard first surgical choice in BPH, but laser technologies are recommended as alternative procedures.[5] The decision for an endoscopic approach to BPH is mainly related to surgeon's expertise, patient's comorbidity, and laser devices availability and there are nowadays no clear algorithms. ThuVEP and Green Light PVP have been demonstrated as safe and effective procedures in large series.[25,26] In fact, Gross et al published the largest series on ThuVEP and showed excellent outcomes (tissue reduction, and symptoms and Qmax improvement) with low perioperative morbidity.[25]

Table 3. Logistic regressions of comparison (ThuVEP *vs* PVP) of the main outcomes before propensity score matching—OR (95%CI)

Outcomes	Surgical Time ≥ 55 mins	ΔIPSS (6 mo) ≥ −20	ΔQmax (6 mo) ≥ 10.5	ΔIPSS (12 mo) ≥ −21	ΔQmax (12 mo) ≥ 12
Intervention (reference ThuVEP)					
PVP	1.22(0.60-2.46)	11.85(4.60-30.50)	1.27(0.67-2.40)	3.03(1.23-7.44)	2.54(1.31-4.90)
Age	1.03(0.99-1.06)	1.04(1.00-1.08)	0.96(0.93-0.99)	1.02(0.98-1.07)	0.97(0.94-1.01)
Prostate volume	1.05(1.03-1.07)	1.00(0.98-1.01)	1.00(0.99-1.01)	0.99(0.97-1.00)	0.99(0.98-1.01)
Baseline PSA	1.12(0.97-1.29)	0.97(0.86-1.09)	0.93(0.85-1.02)	0.99(0.86-1.13)	1.02(0.92-1.13)
Baseline IPSS	1.01(0.95-1.08)	0.70(0.63-0.78)	1.05(0.99-1.11)	0.61(0.54-0.70)	1.06(1.00-1.12)
Baseline Q max	0.93(0.84-1.02)	0.96(0.86-1.08)	0.95(0.87-1.04)	0.98(0.87-1.11)	0.94(0.86-1.03)
Antiplatelet/ Anticoagulant therapy	1.42(0.63-3.22)	0.72(0.27-1.92)	0.55(0.27-1.13)	0.81(0.30-2.21)	0.50(0.24-1.05)
Indwelling catheter history	0.64(0.27-1.54)	1.10(0.45-2.64)	0.61(0.29-1.32)	1.69(0.66-4.32)	1.12(0.52-2.42)
ASA score	1.16(0.62-2.16)	0.33(0.16-0.67)	1.33(0.76-2.33)	0.26(0.13-0.55)	0.93(0.53-1.63)
Surgical time	-	1.00(0.98-1.01)	1.01(1.00-1.03)	1.01(0.99-1.03)	1.01(1.00-1.03)

Note: n = 251; analyses on PPI and intervention after 30 days were not statistically significant (Likelihood Ratio test $P > .05$).

Table 4. Logistic regressions of comparison (ThuVEP *vs* PVP) of the main outcomes after propensity score matching—OR (95%CI)

OUTCOMES	Surgical Time ≥ 55 mins	ΔIPSS (6 mo) ≥ −20	ΔIPSS (12 mo) ≥ −21	ΔQmax (12 mo) ≥ 12
Intervention (reference ThuVEP)				
PVP	1.28(0.48-3.40)	21.31(4.20-108.17)	6.59(1.77-24.57)	4.46(1.61-12.37)
Age	1.02(0.95-1.09)	1.03(0.95-1.12)	0.97(0.90-1.06)	0.99(0.92-1.06)
Prostate volume	1.07(1.03-1.11)	1.00(0.96-1.05)	1.00(0.96-1.04)	0.96(0.93-1.00)
Baseline PSA	0.99(0.82-1.20)	1.10(0.94-1.29)	0.98(0.77-1.25)	1.13(0.88-1.46)
Baseline IPSS	1.04(0.93-1.17)	0.61(0.48-0.78)	0.62(0.49-0.78)	1.10(0.97-1.24)
Baseline Q max	0.85(0.69-1.05)	1.13(0.87-1.46)	0.94(0.73-1.23)	0.82(0.65-1.02)
Antiplatelet/Anticoagulant therapy	1.72(0.41-7.13)	0.62(0.11-3.58)	1.41(0.25-7.93)	0.18(0.04-0.92)
Indwelling catheter history	0.35(0.05-2.46)	5.82(0.64-53.38)	4.64(0.50-43.33)	0.16(0.02-1.25)
ASA score	1.06(0.36-3.14)	0.23(0.05-0.94)	0.27(0.07-1.04)	0.87(0.29-2.58)
Surgical time	-	1.01(0.97-1.05)	1.01(0.97-1.06)	1.01(0.98-1.05)

Note: n = 90; analyses on ΔQmax (6 months), PPI and intervention after 30 days were not statistically significant (likelihood ratio test $P > .05$).

Cindolo et al. showed similar clinical outcomes, high patients' satisfaction, and a low rate of complications after anatomic and standard PVP.[26] To date, there are only 2 randomized trials comparing ThuVEP to other transurethral technique.[15,27] Chang et al compared ThuVEP to monopolar TURP and showed similar complications and improvement in Qmax and symptoms one year after surgery in a small series of patient.[15] Netsch et al highlighted that both ThuVEP and holmium laser enucleation of the prostatehad comparable and minimal complications, with excellent short-term outcomes.[27] Despite this lack, all Thulium-based endoscopic techniques are considered as equally efficient to the rest of well-established approaches.[28] Comparisons between real life different surgical techniques may be of interest in this scenario. To date, there is only a comparative study of PVP and ThuVEP. In this study, Bach et al compared 2648 men treated in everyday practice with TURP, PVP or ThuVEP.[17] They showed that PVP and ThuVEP had a shorter hospital stay compared to TURP (2, 3, and 4, respectively). Our results are in line with theirs (2 days in PVP and 3 days in ThuVEP). The excellent hemostasis of both laser procedures is evidenced by minimal ΔHb for 24 hours (not significant between 2 populations) and the low rate of transfusion rate (2.2%). Regarding early complications, PVP had a lower rate of Clavien grades 2 and 3 in our study, before (2.1% in PVP vs 6.9% in ThuVEP) and after PS matching (2.2% in PVP vs 8.8% in ThuVEP). Bach reported the same trend of Clavien grades 2 and 3 complications between PVP and ThUVEP (2.3% vs 12.5%, respectively).[17] Regarding outcomes, our study shows excellent results 12 months surgery: more than 90% of men had an improvement of their symptoms after surgery in both groups, before and after PS matching. This means that PVP and ThuVEP are equally effective in medium-term, even if PVP demonstrated better Qmax and IPSS improvement compared to ThuVEP. The late reoperation rate was low in both groups (less than 8%) and in line with the literature.[11,14,28] Our analysis is not devoid of limitations. First, the retrospective and not-randomized design. Second, different surgical experience and different operator involvement could not be controlled in the analytical phase, but all procedures were performed following 2 standardized approaches, depicting a real-life setting.[22,23] Third, preoperative and postoperative patients' management was not standardized. Fourth, the complications assessment and management (as reintervention) may vary according the different centers. Fifth, data regarding energy delivered were unfortunately not available in most cases; this may be another limitation since the energy delivered is a crucial information to compare different procedures realized from different surgeons at different institution and gives indirect information about the amount of tissue removed/ablated and the completeness of the procedure. Finally, the length and heterogeneity of follow-up limited the possibility to observe long terms complication. Nevertheless, the adoption of PS match allowed us to adjust for the bias inherent to the different patient characteristics at baseline, and to demonstrate that both techniques are similar in term of complications and outcomes in daily practice.

CONCLUSION

In this large real-life multicenter comparison of PVP and ThuVEP for the treatment of benign prostatic enlargement/BPO LUTS, both techniques showed to be equally effective and safe, maintaining the previously described short hospital stay, catheterization time, and net benefits of each procedure in patients with small-to-medium sized prostates. Due to the variable energy settings available for laser sources and the higher efficiency and supposed different performances of different surgical techniques, large-sample, long-term RCTs should be designed to verify superiority of one intervention over the others.

SUPPLEMENTARY DATA

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.urology.2018.09.007.

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