Rezūm Water Vapor Thermal Therapy for Lower Urinary Tract Symptoms Associated With Benign Prostatic Hyperplasia: 4-Year Results From Randomized Controlled Study

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OBJECTIVE To report 4-year outcomes of the randomized controlled trial of water vapor thermal therapy for treatment of moderate to severe lower urinary tract symptoms due to benign prostatic hyperplasia.

MATERIALS AND METHODS Total 188 subjects; 135 men ≥50 years old, International Prostate Symptom Score ≥ 13, maximum flow rate (Qmax) ≤15 mL/s and prostate volume 30 to 80 cc treated with Rezūm System thermal therapy were followed 4 years; subset of 53 men who requalified for crossover from control to active treatment were followed 3 years.

RESULTS Lower urinary tract symptoms were significantly improved within ≤3 months after thermal therapy and remained consistently durable (International Prostate Symptom Score 47%, quality of life 43%, Qmax 50%, Benign Prostatic Hyperplasia Impact Index 52%) throughout 4 years (P <.0001); outcomes were similarly sustained in crossover subjects at 3 years. Surgical retreatment rate was 4.4% over 4 years. No disturbances in sexual function were reported.

CONCLUSION The minimally invasive thermal therapy provides effective symptom relief and improved quality of life that remains durable for over 4 years. It is applicable to all prostate zones with procedures performed under local anesthesia in an office setting. UROLOGY 126: 171–179, 2019. © 2019 The Authors. Published by Elsevier Inc.

By the seventh decade of life approximately 70% of men have histological evidence of histological stromoglandular hyperplasia, namely benign prostatic hyperplasia (BPH). This hyperplasia is commonly associated with progressive development of voiding and storage related lower urinary tract symptoms (LUTS). Several options exist for BPH management with a significant range of invasiveness, efficacy, and cost. The therapy a patient pursues should rely on careful physical evaluation and informed discussion with his provider. Decision making varies according to severity of symptoms, gland size, anatomical features, and efficacy and safety of the different treatments. Minimally invasive surgical treatments (MISTs), both thermal and mechanical expander options, represent alternative intervention before or after any pharmacotherapy.

The newest MIST is water vapor thermal therapy using radiofrequency to create thermal energy (Rezūm System, Boston Scientific, Marlborough, MA) in the form of water vapor. This therapy was specifically developed as a platform technology for transurethral energy transfer using the convective properties of water, releasing large amounts of stored thermal energy (540 calories/mL H_2O) as the vapor contacts prostate tissue and condenses back to water. The steam/vapor travels through cellular interstices to a

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boundary of tissue plane between prostate zones, disrupting cell membranes without discernible temperature gradients within a treatment zone. No thermal effects occur outside the targeted treatment zone.[1,2] This overcomes the limitations of conductive heat transfer used in other forms of thermotherapy: transurethral needle ablation (TUNA) and transurethral microwave thermotherapy (TUMT). Thermodynamically the latter techniques (TUNA, TUMT) require lengthy treatment time lasting up to an hour with considerable energy disposition to achieve tissue destruction. The Rezūm system has been widely adopted into urology practices in the United States and Europe. Its clinical advantage includes rapid and sustained relief of LUTS and enhanced quality of life without accompanying disturbance of sexual function in men with moderate to severe BPH symptoms.[3-6] The Rezūm thermal therapy is also distinguished by the ability to treat all prostate zones without restrictions in morphology. This is crucial as intravesical protrusions are now recognized to predict poor outcomes from most pharmacotherapies, as well as the presence of urodynamic obstruction.[7] We herein present 4-year outcomes of the multicenter, randomized controlled trial (RCT) of water vapor thermal therapy.

MATERIALS AND METHODS

Study Protocol

Men with moderate to severe symptomatic BPH were treated and followed annually for 4 years in a prospective, multicenter, double-blind randomized controlled study of the effectiveness and safety of the Rezūm System water vapor thermal therapy. Subjects were enrolled at 15 centers in the United States (Clinicaltrials.gov: NCT01912339). Ethics committees at each participating center approved the protocol; written informed consent was obtained by all subjects. The complete list of inclusion and exclusion criteria has been published in full.[3] Enrollment was limited to men at least 50 years of age with an International Prostate Symptom Score (IPSS) ≥13, a prostate volume 30 cc to 80 cc, maximum urinary flow rate (Qmax) of ≤15 mL/s and a measured postvoid residual (PVR) urine <250 mL. Excluded from enrollment were men with a PSA >2.5 ng/mL with a free PSA <25% unless prostate cancer was ruled out by biopsy, and those with an active urinary tract infection. TRUS and cystoscopic examinations were conducted before the procedure to determine the prostate size and eligibility for the study. Subjects were first stratified by IPSS severity then randomized 2:1 to thermal therapy with the Rezūm device or sham/control procedure with rigid cystoscopy. Participants were required to undergo a washout and discontinue use of any medications for LUTS/BPH prior to treatment. After unblinding at 3 months, the primary study endpoint, control subjects who elected to proceed were requalified by inclusion criteria and eligible to participate in a crossover study to receive thermal therapy and then followed annually.[5] The thermal procedure was capable of adenoma ablation in all prostate zones those with median lobe or elevated central zone at the bladder neck.

Statistical Methods

Randomization was performed with electronic programming prior to treatment using permuted blocks of random sizes stratified by investigational site for allocation to the thermal treatment and control arms. To maintain balance between the randomized arms at each study site, subjects were first stratified by severity of symptoms, with baseline IPSS 13 to 18 (moderate LUTS) and IPSS ≥19 (severe LUTS) to ensure equal distribution in both arms. The study was powered at 80% with 0.025 1-sided type I error for the primary end point of IPSS reduction at 3 months, using a Student's *t* test on the intent-to-treat populations to compare mean changes in treatment and control arms. Descriptive statistics were used to describe baseline and follow-up values for all variables. Data are presented as the mean ± SD or mean and the percent change and 95% confidence interval. A paired *t* test was used to calculate *P* values for each follow-up evaluation compared to baseline.

Procedures

Water vapor thermal therapy with the Rezūm System utilizes transurethral endoscopic guidance. Details of this technology and device have been previously reported.[3,8,9] The primary goal of the procedure is to create continuous, overlapping ablative lesions running parallel to the natural slope of the prostatic urethra, eliminating the tissue interfering with natural function. Confirmation of the contours of the prostate and planned disbursement of thermal lesions is determined at baseline cystoscopy. The handheld delivery device, housing the retractable treatment needle, is a standard 4 mm 30° rod lens cystoscope allowing the procedure to be performed under direct cystoscopic visualization; a sterile saline flush irrigation enhances visualization and cools the urethral surface. Water vapor (~103°C) is delivered in 9-second injections (each 0.5 mL) via a treatment needle with 12 small emitter holes spaced around its tip to allow circumferential dispersion of vapor or steam to create an approximate 1.5 to 2.0 cm lesion. The needle tip is visually positioned and inserted beginning approximately 1 cm distal to the bladder neck into the transition and central prostatic adenomas. Intravesical prostatic protrusions and median lobe are injected starting 1 cm from the edge of the protrusion. The needle is retracted after each vapor injection and repositioned in 1 cm increments distally from the previous point to the prostatic tissue just proximal to the verumontanum. The total number of vapor treatments in each lobe of the prostate is determined by the length of the prostatic urethra and can be customized to the configuration of the hypertrophied gland, which may include the median lobe or enlarged central zone. The sham/control procedure involved rigid cystoscopy with simulated active treatment sounds and shielded visualization of physician and device.

Study Assessments

After blinded comparison of the active and sham/control groups for the primary efficacy endpoint at 3 months, outcome assessments were performed by an assessor blinded to knowledge of the procedures. The subjects who received water vapor thermal therapy were followed annually for 4 years and assessed for symptom relief (IPSS), quality of life measures (IPSS-QOL, BPH Impact Index), peak urinary flow rate (Qmax), postvoid residual (PVR) volume, voided volume, incontinence (Overactive Bladder Questionnaire-Short Form [OAB-q SF], International Continence Society Male Incontinence Scale questionnaire-Short Form [ICS male IS-SF]), sexual function (International Index of Erectile Function [IIEF-15], Male Sexual Health Questionnaire for Ejaculatory Dysfunction), prostate serum antigen (PSA), and acute and late occurring adverse events. Any subject who received thermal therapy in the initial active treatment arm and

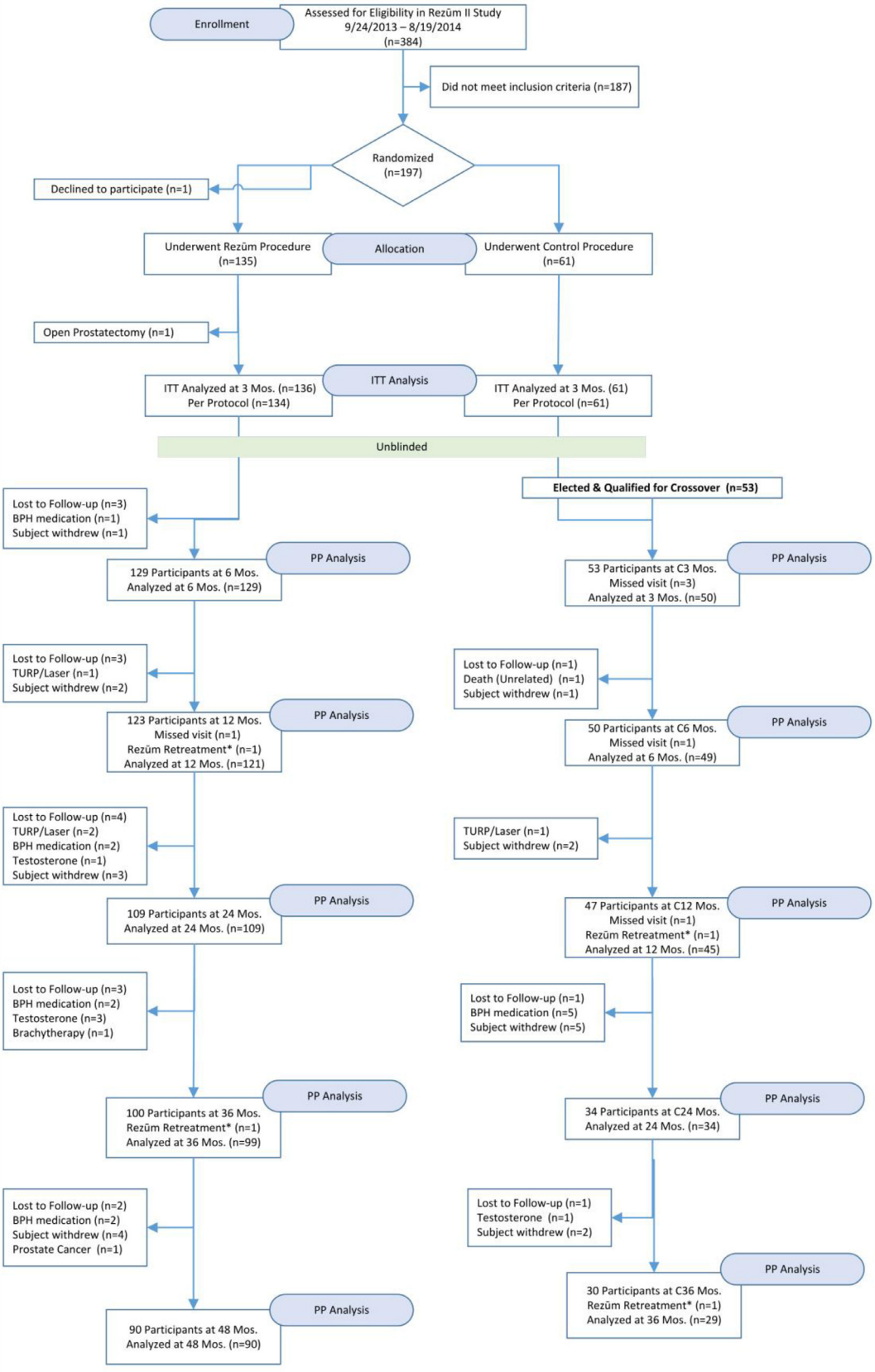

Figure 1. CONSORT (Consolidated Standards of Reporting Trials) diagram of subject disposition in Rezūm water vapor thermal therapy study including the thermal therapy, control and crossover (C) groups. *Subjects retreated with Rezūm procedures were excluded from analysis. ITT, intent to treat analysis; PP, per protocol analysis; TURP, transurethral resection of prostate. (Color version available online.)

Table 1. Paired outcomes measures after water vapor thermal therapy from baseline through 48 months

Outcome Measure	Baseline	12 Mos	24 Mos	36 Mos	48 Mos
IPSS*					
N (paired values)	135	121	109	99	90
Baseline	22.0 ± 4.8	21.8 ± 4.8	21.4 ± 4.5	21.4 ± 4.6	21.4 ± 4.4
Follow-up		10.3 ± 6.7	10.2 ± 6.2	10.5 ± 6.1	11.4 ± 7.4
Change		−11.6 ± 7.3	−11.2 ± 7.3	−11.0 ± 7.1	−10.1 ± 7.6
% Change		−52.2	−50.7	−49.7	−46.7
P value		<.0001	<.0001	<.0001	<.0001
IPSS QoL*					
N (paired values)	135	121	109	99	90
Baseline	4.4 ± 1.1	4.4 ± 1.1	4.3 ± 1.0	4.3 ± 1.0	4.3 ± 1.0
Follow-up		2.1 ± 1.5	2.1 ± 1.4	2.1 ± 1.3	2.3 ± 1.5
Change		−2.2 ± 1.6	−2.2 ± 1.5	−2.2 ± 1.6	−2.0 ± 1.7
% Change		−50.1	−49.9	−48.5	−42.9
P value		<.0001	<.0001	<.0001	<.0001
Qmax (mL/s)‡ [voided volume ≥125 mL]					
N (paired values)	135	112	99	82	81
Baseline	9.9 ± 2.2	10.0 ± 2.2	10.0 ± 2.2	9.7 ± 2.1	9.5 ± 2.2
Follow-up		15.5 ± 6.7	14.7 ± 6.1	13.2 ± 4.8	13.7 ± 5.7
Change		5.5 ± 6.4	4.8 ± 6.1	3.5 ± 4.6	4.2 ± 5.7
% Change		58.5	52.5	39.7	49.5
P value		<.0001	<.0001	<.0001	<.0001
PVR volume (mL)*					
N (paired values)	135	118	106	93	89
Baseline	82.4 ± 51.5	82.5 ± 51.2	84.9 ± 54.0	82.7 ± 54.3	84.4 ± 55.3
Follow-up		78.6 ± 79.9	84.6 ± 92.0	54.5 ± 61.8	75.2 ± 69.7
Change		−3.9 ± 82.7	−0.3 ± 85.3	−28.2 ± 65.8	−9.2 ± 72.2
% Change		50.7	8.6	−21.5	38.0
P value		.6070	.9697	<.0001	.2319
Voided volume (mL)‡					
N (paired values)	135	119	107	97	89
Baseline	236.6 ± 85.6	237.4 ± 87.2	236.2 ± 81.3	237.0 ± 82.0	238.7 ± 83.9
Follow-up		266.3 ± 138.9	267.7 ± 123.0	230.6 ± 123.3	285.2 ± 173.4
Change		28.9 ± 132.7	31.5 ± 132.3	−6.4 ± 132.9	46.5 ± 159.5
% Change		17.6	20.9	2.8	21.6
P value		.0190	.0155	.6370	.0073
BPHII*					
N (paired values)	135	121	109	99	90
Baseline	6.3 ± 2.8	6.2 ± 2.8	6.1 ± 2.8	6.1 ± 2.9	6.1 ± 2.9
Follow-up		2.3 ± 3.0	2.3 ± 2.7	2.4 ± 2.8	2.6 ± 2.9
Change		−3.9 ± 3.3	−3.8 ± 3.1	−3.7 ± 3.3	−3.5 ± 3.4
% Change		−60.5	−61.1	−57.3	−52.2
P value		<.0001	<.0001	<.0001	<.0001
IIEF-EF‡					
N (paired values)	91	77	71	63	58
Baseline	22.7 ± 7.4	23.3 ± 6.9	22.9 ± 7.3	23.1 ± 7.3	23.2 ± 7.0
Follow-up		23.0 ± 8.4	21.8 ± 8.7	21.1 ± 9.2	20.8 ± 9.6
Change		−0.3 ± 7.5	−1.2 ± 7.6	−2.0 ± 8.2	−2.5 ± 8.7
% Change		3.5	−1.0	−4.1	−7.6
P value		.7054	.2019	.0602	.0333
MSHQ Function†					
N (paired values)	91	78	70	64	56
Baseline	9.3 ± 3.1	9.6 ± 3.0	9.6 ± 3.0	9.8 ± 3.0	10.0 ± 3.0
Follow-up		9.3 ± 4.0	9.1 ± 4.4	8.4 ± 4.5	8.2 ± 4.6
Change		−0.3 ± 3.5	−0.5 ± 4.2	−1.4 ± 3.8	−1.8 ± 4.4
% Change		0.4	0.3	−13.6	−14.2
P value		.4338	.3601	.0046	.0038
MSHQ Bother*					
N (paired values)	91	79	70	64	56
Baseline	2.2 ± 1.7	2.2 ± 1.6	2.2 ± 1.6	2.1 ± 1.6	2.1 ± 1.6
Follow-up		1.5 ± 1.5	1.7 ± 1.7	1.6 ± 1.5	2.0 ± 1.7
Change		−0.7 ± 1.8	−0.5 ± 1.7	−0.5 ± 1.6	−0.1 ± 1.8
% Change		−18.4	−25.4	−18.8	−5.7
P value		.0017	.0118	.0153	.6495

Continued

Table 1. Continued

Outcome Measure	Baseline	12 Mos	24 Mos	36 Mos	48 Mos
ICS male score*					
N (paired values)	135	120	109	99	89
Baseline	4.5 ± 2.9	4.3 ± 2.7	4.2 ± 2.4	4.2 ± 2.4	4.2 ± 2.3
Follow-up		3.0 ± 2.8	3.0 ± 2.6	3.1 ± 2.8	3.2 ± 2.8
Change		−1.2 ± 2.5	−1.2 ± 2.6	−1.1 ± 2.6	−0.9 ± 2.8
% Change		−23.5	−19.3	−17.9	−15.0
P value		<.0001	<.0001	.0001	.0024
OAB HRQL Score‡					
N (paired values)	134	120	106	97	88
Baseline	64.3 ± 19.9	65.8 ± 18.9	66.6 ± 18.3	66.6 ± 18.3	67.3 ± 17.9
Follow-up		83.7 ± 18.2	85.6 ± 15.1	84.8 ± 15.3	83.0 ± 17.5
Change		17.9 ± 18.6	18.9 ± 16.9	18.1 ± 17.5	15.7 ± 19.3
% Change		48.0	51.3	53.5	39.9
P value		<.0001	<.0001	<.0001	<.0001
OAB symptom score*					
N (paired values)	135	121	109	99	90
Baseline	39.6 ± 17.9	39.0 ± 17.5	38.2 ± 17.2	37.9 ± 16.9	37.9 ± 17.0
Follow-up		20.6 ± 18.4	20.9 ± 16.6	22.1 ± 16.3	23.3 ± 18.1
Change		−18.4 ± 17.8	−17.2 ± 14.3	−15.8 ± 16.4	−14.6 ± 19.3
% Change		−44.7	−44.9	−39.1	−29.8
P value		<.0001	<.0001	<.0001	<.0001
PSA*					
N (paired values)	135	120	109	98	86
Baseline	2.1 ± 1.5	2.1 ± 1.6	2.1 ± 1.6	2.0 ± 1.6	1.9 ± 1.6
Follow-up		1.9 ± 1.6	1.8 ± 1.6	1.8 ± 1.7	1.9 ± 1.8
Change		−0.3 ± 1.0	−0.3 ± 1.1	−0.2 ± 1.1	−0.1 ± 1.1
% Change		−8.5	−9.4	−1.3	2.5
P value		.0023	.0041	.0911	.6248

EjD, ejaculatory dysfunction; HRQL, health related quality of life; ICS, International Continence Society; IIEF-15, International Index of Erectile Function; IPSS, International Prostate Symptom Score; LUTS, lower urinary tract symptoms; MSHQ-EjD, Male Sexual Health Questionnaire for EjD; OAB, overactive bladder; Qmax, peak urinary flow; QOL, quality of life; PVR, postvoid residual urine volume.
Analysis population includes all treatment arm subjects who underwent treatment with Rezūm System procedure. Only subjects who were sexually active are included for IIEF-EF, MSHQ-EjD Function and Bother evaluations. Data presented as mean ± SD and compared with baseline using paired Student *t* test.
* Decrease indicates improvement.
† Decrease indicates a decline in function.
‡ Increase indicates improvement.

crossover study is included in annual follow-up evaluations for 5 years. Independent data monitoring and clinical events committees reviewed safety and adjudicated adverse events.

RESULTS

A total of 384 men were assessed and 197 eligible by inclusion criteria were enrolled. Randomization assigned 136 subjects to water vapor thermal therapy and 61 to sham/control procedure (Fig. 1). Baseline characteristics (mean ± SD) of the active treatment cohort include age of 63 ± 7.1 years, prostate volume 45.8 ± 13 cc, IPSS of 22.0 ± 4.8, QOL of 4.4 ± 1.1 and Qmax 9.9 ± 2.2. The mean baseline IPSS and QOL of men with moderate LUTS (IPSS 13-18; $n = 37$) was 16.3 ± 1.6 and 3.9 ±1.1; for those with severe LUTS (IPSS 19-35; $n = 98$) was 24.1 ± 3.7 and 4.6 ± 1.0, respectively. The control and crossover subjects had similar characteristics.[3,5] All procedures were successfully performed in an office or ambulatory surgery center and completed without perioperative device or procedure-related adverse events. Management of pain and anxiety was based on investigator discretion. Anesthesia was variable: 69% received oral sedation only; 21% had prostate block and 10% intravenous sedation.[3] The total number of vapor injections was a mean 4.7 ± 1.7 and 1.6 ± 0.7 to the median lobe when present. Thermal therapy procedures were performed on the median lobe/enlarged central zone in 58 of 188 (30.9%) subjects treated in the RCT and crossover studies.

Non-serious adverse events included anticipated events that may develop after rigid cystoscopy; they were infrequent and mild to moderate in severity. The most common included dysuria (16.9%), hematuria (11.8%), frequency and urgency (5.9%), acute urinary retention (3.7%) and urinary tract infection suspected (3.7%); all were treated routinely or resolved without treatment within 3 weeks. One subject had a bladder neck contracture and bladder calculi reported 6 months after the procedure. A second subject had urosepsis after follow up cystoscopy.[5] No late occurring related adverse events or de novo erectile dysfunction were reported.

The primary and secondary endpoints for the study were met. After unblinding at 3 months IPSS was reduced by 50% compared with 20% for the controls, $P < .0001$. Details of all outcome measures for the blinded segment of the RCT were previously reported.[3] Following randomized comparison through 3 months, water vapor thermal therapy showed significant and durable improvements throughout 4 years of follow up (Table 1). The mean IPSS improvements from baseline remained consistent from the early response at 3 months (49.9%) to years 1 (52.2%), 2 (50.7%), 3 (49.7%) and 4 (46.7%). Flowrate improvements were sustained relative to baseline, remaining significant, although

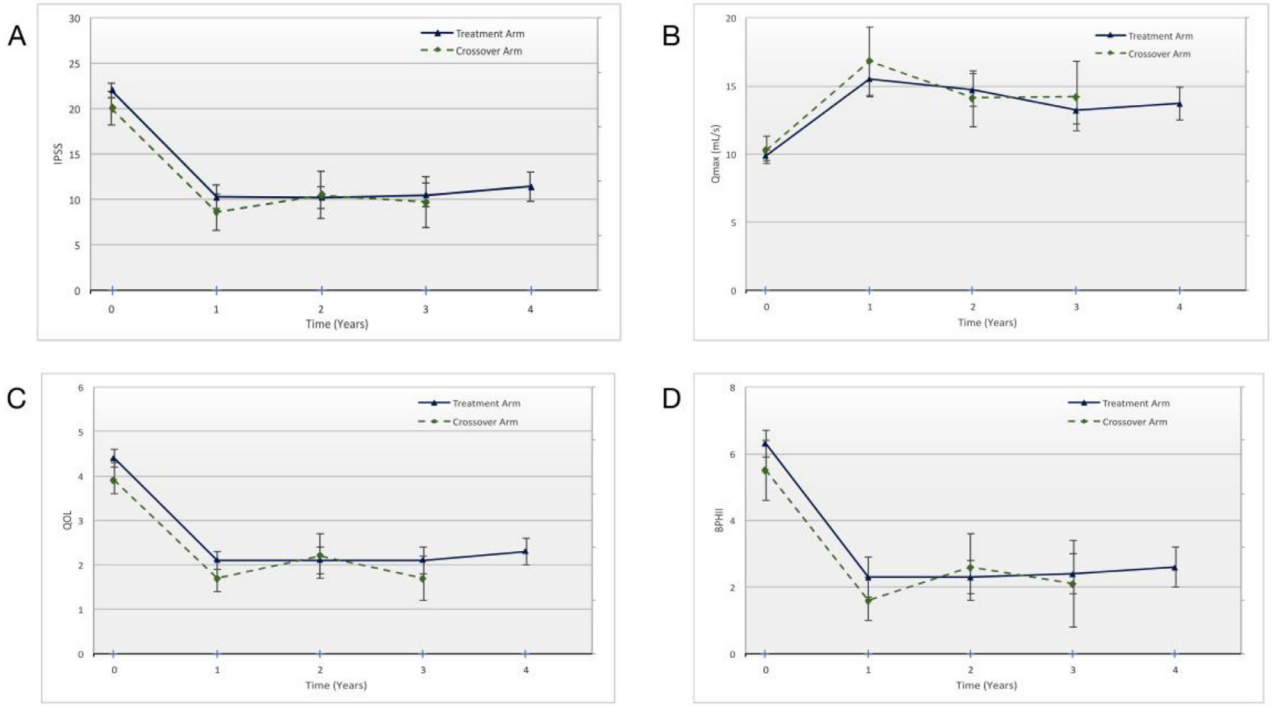

Figure 2. Outcomes for water vapor thermal therapy over 4 years for the initial active treatment arm in the RCT and over 3 years for the crossover study subjects including IPSS (**A**), Qmax (**B**), QOL (**C**) and BPH Impact Index (**D**) Values are means and error bars represent 95% CI. Changes relative to baseline are significant at all time points, $P < .0001$. BPHII, BPH Impact Index; CI, confidence interval; IPSS, International Prostate Symptom Score; Qmax, peak urinary flow rate; QOL, quality of life; RCT, randomized controlled trial.

slightly attenuated, with an increase of 5.5 ± 6.4 mL/s at 1 year to a mean 4.2 ± 5.7 mL/s at 4 years. Subjects with treated median lobe enlargement had objective and subjective improvements similar to those subjects without an identified median lobe. Baseline severity of symptoms is known to influence treatment outcomes. Men with moderate and severe LUTS had symptomatic relief with similar IPSS improvements at 4 years of 46.1% and 46.9% and Qmax of 45% and 51.3%, respectively. QOL and BPH Impact Index remained improved, $P < .0001$. The profile of improvements in crossover subjects over 3 years of follow-up replicates that of the initial RCT thermal therapy group (Fig. 2).

Throughout 4 years, urinary incontinence scores decreased significantly (Table 1). Sexual function throughout 2 years after treatment shows that erectile function (IIEF) and ejaculatory function (MSHQ-EjD) scores remained unchanged. The ejaculatory bother score improved relative to baseline over 3 years, $P \leq .05$.

At 4 years 90 of 135 (66.7%) subjects were included in the effectiveness analysis per protocol. No study withdrawals were due to procedure or device-related adverse events. Thirty-one of the 45 subjects not included in the analysis had a ≥7 point (range 7-27) improvement in IPSS at the time of study exit. Of the 45 subjects excluded from analysis, 15 were lost to follow-up, 12 withdrew consent (2 with a cancer diagnosis), 7 were censored for use of BPH medications and 4 for use of testosterone at follow-up, 1 missed clinic visit, and 6 underwent a secondary treatment for LUTS (1 open prostatectomy, 3 plasma-button transurethral vaporization of the prostate, and 2 retreated with the Rezūm procedure). At 4 years, surgical intervention was performed in 6 of 135 subjects (4.4%) including 4 subjects in whom a median lobe was identified but not treated. Additionally 7 subjects (5.2%) initiated use of alpha blockers within 4 years of follow up. No other drugs were used such as anticholinergics, mirabegron, or 5-alpha reductase inhibitors.

COMMENT

This 4-year follow-up of a randomized controlled study using water vapor thermal therapy for BPH demonstrates significant durable outcomes for such a minimal invasive procedure. It is noted that subjects with severe urinary symptoms (IPSS 19-35) made up 72.5% of the trial enrollment and that group had an average 50% improvement in both subjective and objective variables. Men with moderate and severe LUTS reported no negative changes in sexual function scores and no de novo erectile dysfunction. The targeted prostate tissue ablation may be applied to all zones of the prostate including an enlarged central zone and median lobe. Patients who underwent a treated median lobe had similar significant improvements to those with no median lobe.

Retreatment rate is an important evaluation factor of durability. The 4-year surgical retreatment rate was 4.4% after water vapor thermal therapy. However, in the early phase use of this technology some investigators failed to treat an identified median lobe or elevated central zone in 4 subjects leading to subsequent surgeries. This retreatment could possibly have been avoided reducing the retreatment rate to 2.2%. Nevertheless, the 4.4% rate compares

favorably at less than half the rate reported for all other MISTs. Thermal ablation devices using conductive heat delivery report surgical retreatment rates of 19.1% for TUNA at 3 years[10] and 14%-51% at 5 years;[11-13] TUMT at 5 years is 8.9%-21%.[14-17] The prostatic urethral lift procedure has a reported surgical retreatment of 10.6% at 3 years and 13.6% at 5 years.[18,19] The comparison retreatment rate for TURP ranges from 3% to 14.5% after 5 years.[20] Initiation of BPH oral medication after a minimally invasive procedure also serves as an indication of durability. Following Rezūm thermal therapy at 1, 2, 3, and 4 years, the patients that initiated use of the incidence of pharmacotherapy with alpha blockers was 0.7%, 2.2%, 3.7%, and 5.2% of subjects. This compares favorably to other MISTs.[15-17,19]

The shared experiences with water vapor thermal therapy from community urology practices describe intraoperative techniques that may guide clinicians new to this efficient and versatile MIST and present outcomes after treating older patients and those with larger prostates.[8,21] One pitfall of proceeding to treatment without urodynamic study involves ignorance of bladder function, including degree of obstruction, underactive, or overactive bladder contractility—major contributors to the total LUTS complex.

Symptomatic men with moderate to severe LUTS could consider water vapor thermal therapy as a low-risk, first-line treatment option in lieu of a commitment to lifetime pharmacological management with attendant undesirable side effects and less than sufficient relief of LUTS. The advantage of a one-time only procedure using thermal therapy was assessed after 3 years in comparison to continuous daily monotherapy with 2 drug classes (alpha blocker and 5-alpha reductase inhibitor) and combination drug therapy in cohorts from the Medical Therapy of Prostatic Symptoms study matched for prostate volume and IPSS severity.[22] Symptom improvement was significantly greater with thermal therapy than monotherapy but similar to outcomes with a combination drug therapy. Rates of BPH clinical progression over 3 years were nearly 5 times greater under medical therapy vs a single thermal procedure. All drug treatments typically had significant negative impact on sexual function in contrast to preservation of libido, erectile, and ejaculatory function after thermal therapy.[23]

There are multiple options for treating LUTS/BPH within the armamentarium of treatments including pharmaceutical agents, surgery, and the newer minimally invasive procedures. As value and quality-based reimbursement programs continue to evolve, cost-effectiveness becomes paramount. The advantages of the Rezūm water vapor thermal therapy compare favorably with other options, and can achieve cost equivalence to combination medical therapy within a few years.[24,25] Relative to reimbursement for this procedure, the AMA/CPT Coding Committee announced that Rezūm meets all the stringent requirements for a unique Category I CPT Code. CPT 53854 became effective in January 2019. The Rezūm procedure effects rapid and durable symptom relief, has a good safety profile with preservation of sexual function, and accessibility as an office-based procedure such that it will have appeal and provide benefit to physicians and patients. Of great importance is that this procedure can substantially enhance the QOL in men with moderate to severe LUTS.

CONCLUSION

Water vapor thermal therapy represents a new technological approach for thermal ablative reduction of benign prostate adenomas. It provides effective symptom relief and improved QOL that remained durable throughout 4 years. The procedure has a minimal physician learning curve and early intervention with this thermal therapy rather than use of pharmaceutical agents or invasive surgery may be an ideal option for men with moderate to severe LUTS at risk for BPH progression.

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SUPPLEMENTARY MATERIALS

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EDITORIAL COMMENT

This study provides additional evidence of the durability of the Rezūm procedure. The fact that this can be performed on an outpatient basis, in an ambulatory surgery center or office surgery setting, comports with other procedures that have evolved over the past decade (laser, transurethral microwave thermotherapy, transurethral needle ablation, etc.).

The main advantages of Rezūm are not only it is continued durability for many patients out to 4 years as demonstrated in this study, but also the limited impact on sexual and ejaculatory function. This new data along with previous reports examining water vapor thermal therapy suggests it can be offered to wide variety of patients.[1]

Patient informed consent is critical to both outcomes and compliance with any selected mode of BPH/lower urinary tract symptoms treatment. The advantages of modern therapy for BPH/LUTS are the options open to most patients. Information on drug costs and other alternative procedures must be included and documented, along with their advantages and disadvantages, with particular focus not only on urinary function, but sexual function as well. Some studies from European centers have suggested that out of pocket costs at 5 years with continuous medical therapy will exceed that of early surgery.[2]

Rezūm therapy for BPH has been shown to achieve cost equivalence in the United States within a few years as the authors have noted and referenced. Traditional clinical factors related to patient age, gland size, compliance, comorbidity and surgeon skill set also factor into recommendations for treatment of individual patients.[3] When compared to other alternative minimally invasive procedures such as UroLift, Rezūm was shown to be less costly and to have fewer side effects.[4]

German studies indicate that Rezūm results in quick resolution of LUTS while maintaining sexual function, both erectile

and ejaculatory. The technique is applicable to varying gland sizes and morphologies, including intravesical lobes and bladder neck obstruction. This report also reasserts Rezūm as an option to multi drug therapy, again confirming the need for clear patient understanding of all options with their respective benefits and harms.[5]

Patients who are sexually active and considering pharmacotherapy need a full disclosure of risks of sexual side effects. It is to be remembered that alpha-blockers have effects on erectile function and libido that are similar to placebo yet have more effect on ejaculation. 5-alpha-reductase inhibitors increase the risk of erectile, libido, and ejaculatory dysfunction compared to placebo. Combination therapy triples the incidence for ejaculatory dysfunction. Dosage reductions, using alternative drug options or opting for procedural intervention should all be strongly considered if sexual side effects occur. Men being evaluated for BPH symptoms must have careful consideration given to comorbidities such as diabetes and hypertension to make sure that these are adequately treated while therapy is being initiated. Continuing cost considerations for long term medical therapy must also be made in light of the current insurance climate with rising copays and deductibles for many patients.[6]

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AUTHOR REPLY

The authors appreciate the positive comments concerning this technology and our report of the 4-year Rezūm water vapor thermal therapy data. We agree with his assessments noting that targeted thermal ablation of tissue can be applied to all obstructing areas of the prostate, symptomatic and quality of life improvements are durable from the earliest time frames throughout 4 years and sexual function remains intact. Most importantly the surgical retreatment rate is very low. In addition, we feel that the 4-year study reported herein validates the effectiveness of the technique, but more importantly compares favorably with all other minimally invasive surgical treatments by providing significant clinical improvements that deliver an impactful and durable response for patient and urologist.

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