Surgical Management of Lower Urinary Tract Symptoms Attributed to Benign Prostatic Hyperplasia: AUA Guideline Amendment 2019

Kevin T. McVary, Philipp Dahm, Tobias S. Kohler, Lori B. Lerner, J. Kellogg Parsons, Timothy J. Wilt and Harris E. Foster

From the American Urological Association Education and Research, Inc. Linthicum, Maryland

Purpose: Male lower urinary tract symptoms (LUTS) secondary to benign prostatic hyperplasia (BPH) is common in men and can have negative effects on quality of life (QOL). It is the hope that this Guideline becomes a reference for effective evidence-based surgical management of LUTS/BPH.

Materials and Methods: The evidence team searched Ovid MEDLINE, the Cochrane Library, and the Agency for Healthcare Research and Quality database to identify studies indexed between January 2007- September 2017. Following initial publication, this guideline was amended in 2019 and reflects relevant literature published through January 2019. When sufficient evidence existed, the body of evidence was assigned a strength rating of A (high), B (moderate), or C (low) for support of Strong, Moderate, or Conditional Recommendations. In the absence of sufficient evidence, additional information is provided as Clinical Principles and Expert Opinions (table 1 in supplementary unabridged guideline, https://www.jurology.com).

Results: This Guideline provides evidence-based recommendations regarding management of LUTS/BPH utilizing surgery and minimally invasive surgical therapies (MIST). Additional statements are made regarding diagnostic and preoperative tests. Clinical statements are made in comparison to what is generally accepted as the gold standard (i.e. transurethral resection of the prostate [TURP] monopolar and/or bipolar). This guideline is designed to be used in conjunction with the associated treatment algorithm (see figure).

Conclusions: The prevalence and the severity of LUTS increases as men age and is an important diagnosis in the healthcare of patients and the welfare of society. This document will undergo updating as knowledge regarding treatments and future surgical options continues to expand.

Key Words: transurethral resection of prostate, laser therapy, lower urinary tract symptoms, prostate

BACKGROUND

BPH is a histologic diagnosis that refers to the proliferation of glandular epithelial tissue, smooth muscle, and connection tissue within the prostatic transition zone.\(^1\) BPH is ubiquitous in the aging male with prevalence increasing with age.\(^2\) BPH does not require treatment and is not the target of interventions; however, BPH can lead to an enlargement of the prostate (benign prostatic enlargement [BPE]). The prostate may cause obstruction at the level of the bladder neck (benign prostatic obstruction). Obstruction may also be

Abbreviations and Acronyms

AUA = American Urological Association
BOO = bladder outlet obstruction
BPE = benign prostatic enlargement
BPH = benign prostatic hyperplasia
ED = erectile dysfunction
HoLEP = holmium laser enucleation of the prostate
IPSS = International Prostate Symptom Score
LUTS = lower urinary tract symptoms
LUTS/BPH = lower urinary tract symptoms attributed to benign prostatic hyperplasia
MIST = minimally invasive surgical therapies
PAE = prostate artery embolization
PUL = prostate urethral lift
PVP = photoselective vaporization of the prostate
QoL = quality of life
RCT = randomized control trial
TUIP = transurethral incision of the prostate
ThuLEP = thulium laser enucleation of the prostate
TUNA = transurethral needle ablation
TURP = transurethral resection of the prostate
TUVP = transurethral vaporization of the prostate

Accepted for publication April 29, 2019. The complete unabridged version of the guideline amendment is available at https://www.jurology.com.

This document is being printed as submitted independent of editorial or peer review by the editors of The Journal of Urology®.
caused by other conditions referred to as bladder outlet obstruction (BOO).

Parallel to these anatomical and functional processes, LUTS increase in frequency and severity with age. LUTS may be caused by a variety of conditions, including BPE and benign prostatic obstruction. In this Guideline, the Panel refers to “LUTS attributed to BPH” (LUTS/BPH) to indicate LUTS among men for whom an alternative cause is not apparent.

Since original publication\(^3\), a subset of the BPH Guideline panel worked on an amendment to the 2018 report given the interest in the newer technologies and to avoid the longer intervals in similar BPH Guideline efforts.\(^4\) The Guideline panel provided the Minnesota Evidence Review Team with identical key questions, interventions, comparators, and outcomes as was the case in the 2018 effort. The review team worked with the panel to refine the scope, key questions, and inclusion/exclusion criteria.
Lower Urinary Tract Symptoms (LUTS)
In assessing the burden of disease, studies reveal a progressive increase in the prevalence of moderate- to-severe LUTS, rising to nearly 50% by the eighth decade of life. Others estimate that 90% of men between 45 and 80 years suffer some type of LUTS. Although LUTS/BPH is not often life-threatening, the impact of LUTS/BPH on QoL can be significant and should not be underestimated.

Index Patient
The Index Patient is a male >45 who is consulting a clinician for his LUTS. He does not have a history suggesting non-BPH causes of LUTS, and his LUTS may or may not be associated with BPE, BOO, or BPH.

Sexual Dysfunction and Surgical Therapy
Given the strong observed relationship between erectile dysfunction (ED) and LUTS/BPH, this group of men is at high risk for sexual dysfunction. Patients should be counselled about the sexual side effects of any surgical intervention and should be made aware that surgical treatment can cause ejaculatory dysfunction and may worsen ED.

Shared Decision Making
Patients should be provided with the risk/benefit profile for all treatment options in light of their circumstances to allow them to make informed decisions regarding their treatments.

GUIDELINE STATEMENTS
Evaluation and Preoperative Testing
1. Clinicians should take a medical history and utilize the AUA-Symptom Index and urinalysis in the initial evaluation of patients presenting with bothersome LUTS possibly attributed to BPH; select patients may also require post-void residual, uroflowmetry, or pressure flow studies. (Clinical Principle).
2. Clinicians should consider assessment of prostate size and shape via abdominal or transrectal ultrasound, or cystoscopy, or by preexisting cross-sectional imaging (i.e. magnetic resonance imaging/computed tomography) prior to surgical intervention for LUTS/BPH. (Clinical Principle).
3. Clinicians should perform a post-void residual assessment prior to surgical intervention for LUTS/BPH. (Clinical Principle).
4. Clinicians should consider uroflowmetry prior to surgical intervention for LUTS/BPH. (Clinical Principle).
5. Clinicians should consider pressure flow studies prior to surgical intervention for LUTS/BPH when diagnostic uncertainty exists. (Expert Opinion).

Surgical Therapy
6. Surgery is recommended for patients who have renal insufficiency secondary to BPH, refractory urinary retention secondary to BPH, recurrent urinary tract infections, recurrent bladder stones or gross hematuria due to BPH, and/or with LUTS/BPH refractory to and/or unwilling to use other therapies. (Clinical Principle).
7. Clinicians should not perform surgery solely for the presence of an asymptomatic bladder diverticulum; however, evaluation for the presence of BOO should be considered. (Clinical Principle).

Transurethral Resection of the Prostate (TURP)
8. TURP should be offered as a treatment option for men with LUTS/BPH. (Moderate Recommendation; Evidence Level: Grade B).
9. Clinicians may use a monopolar or bipolar approach to TURP, depending on their expertise with these techniques. (Expert Opinion).

Simple Prostatectomy
10. Clinicians should consider open, laparoscopic or robotic assisted prostatectomy, depending on their expertise with these techniques, for patients with large prostates. (Moderate Recommendation; Evidence Level: Grade C).

The Panel recognizes that “large” is a relative term as some providers have excellent results utilizing transurethral approaches (e.g., bipolar TURP, Holmium Laser Enucleation of the Prostate [HoLEP]) in prostates >60g. However, not all providers have access to or are using bipolar TURP or HoLEP technology, and may not wish to address large glands transurethrally.

Alternatively, larger prostates have been treated with open simple prostatectomy. In recent years, alternative techniques have been developed that include laparoscopic and robot-assisted laparoscopic approaches.

Transurethral Incision of the Prostate (TUIP)
11. TUIP should be offered as an option for patients with prostates ≤30g for the treatment of LUTS/BPH. (Moderate Recommendation; Evidence Level: Grade B).

Transurethral Vaporization of the Prostate (TUVP)
12. Bipolar TUVP may be offered to patients for the treatment of LUTS/BPH. (Conditional Recommendation; Evidence Level: Grade B).

Photoselective Vaporization of the Prostate (PVP)
13. Clinicians should consider PVP as an option using 120W or 180W platforms for patients for the treatment of LUTS/BPH. (Moderate Recommendation; Evidence Level: Grade B).
In a single center study comparing M-TURP, B-TURP and 120W PVP through 36 months supports the above insofar as there is similar change in International Prostate Symptom Score (IPSS) and IPSS-QOL between PVP and the TURP cohorts.\textsuperscript{8,9}

Prostatic Urethral Lift (PUL)

14. Clinicians should consider PUL as an option for patients with LUTS/BPH provided prostate volume <80g and verified absence of an obstructive middle lobe; however, patients should be informed that symptom reduction and flow rate improvement is less significant compared to TURP. (Moderate Recommendation; Evidence Level: Grade C).

There was a study of PUL that purposely treated men with obstruction including a middle lobe (a cystoscopic exclusion from previous randomized control trial [RCT]). We reviewed and excluded this study by Rukstalis et al. because it is not a randomized trial.\textsuperscript{10} The study is a “nonrandomized cohort” that used criteria identical to the LIFT trial except for some defined variables. It is essentially a case series with pre-post outcomes. For this reason the statement above in which PUL must “verify absence of an obstructive middle lobe” remains unchanged in this update.

15. PUL may be offered to eligible patients concerned with erectile and ejaculatory function for the treatment of with LUTS/BPH. (Conditional Recommendation; Evidence Level: Grade C).

Transurethral Microwave Therapy (TUMT)

16. TUMT may be offered to patients with LUTS/BPH; however, patients should be informed that surgical retreatment rates are higher compared to TURP. (Conditional Recommendation; Evidence Level: Grade C).

Water Vapor Thermal Therapy

17. Water vapor thermal therapy may be offered to patients with LUTS/BPH provided prostate volume <80g; however, patients should be informed that evidence of efficacy, including long-term retreatment rates, remains limited. (Conditional Recommendation; Evidence Level: Grade C).

Three-year results showed sustained improvements for the IPSS IPSS-QoL and Qmax, with scores remaining significantly improved from baseline; Qmax improvement was >50% from 3 to 24 months and 39% at 36 months.\textsuperscript{11} At 36 months in the intent-to-treat population of the original 136 participants, mean change from baseline in IPSS was -11.0 points and the mean score was 10.4 points, representing a 50% improvement from baseline. Mean IPSS-QoL was improved from baseline by 49% at 3 years. Because this additional paper demonstrating durable outcomes out to three years was not a second cohort the Conditional Recommendation and Evidence Level: Grade C from the 2018 AUA Guideline remain unchanged.

18. Water vapor thermal therapy may be offered to eligible patients who desire preservation of erectile and ejaculatory function. (Conditional Recommendation; Evidence Level: Grade C).

In the RCT comparing water vapor thermal therapy to sham, the original 136 patients randomized to water vapor thermal therapy are expected to be followed for five years.\textsuperscript{12} At 36 months, no de novo ED was reported but dysuria was reported by 1% of participants.\textsuperscript{12–14} No significant changes in IIEF-EF scores were observed compared to baseline. Bother and function scores associated with ejaculation, assessed by the MSHQ-EjD, were significantly improved at 12 and 36 months following treatment, P=.006 and P=.003 respectively.

Transurethral Needle Ablation (TUNA)

19. TUNA is not recommended for the treatment of LUTS/BPH. (Expert Opinion).

The lack of peer-reviewed publication in the literature review timeframe meeting the inclusion criteria and the decreasing clinical relevance resulted in a lack of enthusiasm by the Panel to recommend TUNA for the treatment of LUTS attributed to BPH.

Laser Enucleation

20. Clinicians should consider HoLEP or thulium laser enucleation of the prostate (ThuLEP), depending on their expertise with either technique, as prostate size-independent suitable options for the treatment of LUTS/BPH. (Moderate Recommendation; Evidence Level: Grade B).

Aquablation

21. Aquablation may be offered to patients with LUTS attributed to BPH provided prostate volume >30/<80g, however, patients should be informed that evidence of efficacy, including longer-term retreatment rates, remains limited. (Conditional Recommendation; Evidence Level: Grade C).

Aquablation surgery utilizes a robotic handpiece, console and conformal planning unit (CPU). The technique is not in the MIST category as patients must undergo general anesthesia. The resection of the prostate is performed using a water jet from a transurethrally placed robotic handpiece. After completion of the resection, electro-cautery via a standard cystoscope/resectoscope or traction from a 3 way catheter balloon are used to obtain hemostasis.

One low risk of bias RCT (n = 181) assessing Aquablation was evaluable by the panel.\textsuperscript{15–17} The trial utilized standard inclusion/exclusion criteria limiting participants to prostate sizes between 30-80 grams. Treatment response through 12 months, defined as at least a 5-point improvement in International Prostate Symptom Score (IPSS), was similar for Aquablation and TURP (Quality of Evidence: Moderate). Mean improvement in lower urinary tract symptoms was 11.2 points compared to 7.2 points with TURP.
symptoms (LUTS) based on the IPSS through 12 months was similar for Aquablation and TURP (Quality of Evidence: Moderate).\textsuperscript{15,17} Mean improvement in quality of life based on the IPSS-QoL through 12 months was similar for Aquablation and TURP (Quality of Evidence: Moderate). Need for blood transfusion and reoperation was similar for Aquablation and TURP (Quality of Evidence: Very low) with blood transfusion reported for one Aquablation participant and none receiving TURP (RR 1.69 [95% CI 0.70 to 4.10]). At follow-up (12 months), maximum flow rates increased similarly in the Aquablation group compared to TURP, 10.3 vs 10.6 mL/s (P = .86), respectively.

At 3 months, Aquablation resulted in smaller harms classified as Clavien-Dindo grade \( \geq 2 \) compared to TURP, 26% versus 42%, \( P = .015 \).\textsuperscript{15,16} Additionally, rates of retrograde ejaculation were higher (\( P = .002 \)) with TURP (23%) compared to Aquablation (6%). Other harms occurring at similar rates in both groups, and classified as Clavien-Dindo grades 1-4, included bladder spasms, bleeding, dysuria, pain, and urethral damage. No deaths were reported. Also at 3 months, reduction in prostate volume was significantly less with Aquablation (31%) compared to TURP (44%) (\( P = .007 \)).\textsuperscript{15,16} Among a non-random subset of sexually active men, the proportion of subjects who reported worsening sexual function through 6 months on the IIEF-5 (6-point decrease) or the Male Sexual Health Questionnaire (MSHQ-EjD) (2-point decrease) was 33% in the Aquablation group compared with 56% in TURP group (\( P = .03 \)).\textsuperscript{15,16}

**Prostate Artery Embolization (PAE)**

22. PAE is not recommended for the treatment of LUTS/BPH outside the context of a clinical trial. (Expert Opinion).

PAE is a newer, largely unproven MIST for BPH. High level evidence remains sparse, and the overall quality of the studies is uniformly low. Some of the deficiencies of the included trials include 1. A lack of randomization, 2. High levels of susceptibility to selection, detection, attrition, and reporting biases, 3. The common inclusion of a preoperative status of medically complicated patients, and 4. The absence of standard inclusion/exclusion criteria for a LUTS/BPH RCT.

Three RCTs (\( n = 247 \)) were identified comparing PAE to TURP; however, there was substantial heterogeneity between the two trials (\( I^2 = 90\% \)).\textsuperscript{18-20} One trial reported outcomes up to 2 years, one up to 12 months, and the other only through 12 weeks. There was substantial heterogeneity between trials and pooled results must therefore be interpreted with caution. Definitions of and outcomes for subjective symptom response varied substantially between trials. One trial reported the proportion of responders, defined as achieving an IPSS score \( \leq 8 \) points and/or a QoL \( \leq 3 \) points, was similar between the PAE and TURP groups (RR 0.9 [95% CI 0.7 to 1.1]; low quality of evidence).\textsuperscript{18} Success through 12 months was reported for 87% of the PAE participants compared with 100% in the TURP group. Overall, results at intermediate term follow-up (>3 to \( \leq 12 \) months) were similar between groups (WMD 4.8 points [95% CI -2.9 to 12.5]; very low quality of evidence).\textsuperscript{18,19} The smallest trial (\( n = 30 \)) reported substantially greater improvement in symptoms with TURP compared with PAE (MD 9 points [95% CI 4.6 to 13.1])\textsuperscript{18} and the other (\( n = 107 \)) reported no significant difference between the groups at 3 and 12 months.\textsuperscript{19}

The need for reoperation was reported for 7 participants in the PAE group compared with 2 in the TURP group (RR 2.9; CI: 0.7, 11.9; very low quality of evidence). Two trials found incidences of sexual dysfunction to be higher with TURP compared with PAE.\textsuperscript{18,20} One trial reported all 15 TURP participants experienced retrograde ejaculation while no cases were reported among PAE participants.\textsuperscript{18} The short-term trial found incidence of ejaculatory dysfunction was lower with PAE (56%) compared with TURP (84%) after 12 weeks (RR 0.67 [95%CI 0.45 to 0.98]).\textsuperscript{20} One trial reported a higher incidence of acute urinary retention requiring re-catheterization in the PAE group (26%) versus the TURP group 6%, \( P = .004 \).

Given the heterogeneity in the literature—and concerns regarding radiation exposure, post-embolization syndrome, vascular access, technical feasibility, and quality control at lower volume centers—it is the opinion of the Panel that PAE should only be performed in the context of a clinical trial until sufficient evidence from rigorously performed studies is available to indicate definitive clinical benefit. The Panel recommends trials involve multi-disciplinary teams of urologists and radiologists; and that, as with other MIST therapies, RCTs comparing PAE to sham be considered to account for significant placebo effects.

**Medically Complicated Patients**

23. HoLEP, PVP, and ThuLEP should be considered in patients who are at higher risk of bleeding, such as those on anti-coagulation drugs. (Expert Opinion).

In support of the concept of 120W PVP use in anticoagulated patients, recent publications report that the need for a blood transfusion was lower for photoselective vaporization prostatectomy 120W compared to TURP.\textsuperscript{9,19}

**FUTURE DIRECTIONS**

There are enormous gaps in knowledge and, therefore, ensuing opportunities for discovery. These include but are not limited to many unanswered
questions related to the role of inflammation, metabolic dysfunction, obesity, and environmental factors in etiology, as well as the role of behavior modification, self-management, and evolving therapeutic algorithms in both the prevention and progression of disease.

**DISCLAIMER**

This document was written by the Benign Prostatic Hyperplasia Guideline Panel of the American Urological Association Education and Research, Inc., which was created in 2016. This amended Benign Prostatic Hyperplasia Guideline was drafted in 2019 by a subset of the original panel. This amendment updates the original guideline document to reflect literature released following original publication.

The Practice Guidelines Committee (PGC) of the AUA selected the committee chair. Panel members were selected by the chair. Membership of the Panel included specialists in urology and primary care with specific expertise on this disorder. The mission of the panel was to develop recommendations that are analysis-based or consensus-based, depending on panel processes and available data, for optimal clinical practices in the surgical treatment of benign prostatic hyperplasia.

Funding of the panel was provided by the AUA. Panel members received no remuneration for their work. Each member of the panel provides an ongoing conflict of interest disclosure to the AUA.

While these guidelines do not necessarily establish the standard of care, AUA seeks to recommend and to encourage compliance by practitioners with current best practices related to the condition being treated. As medical knowledge expands and technology advances, the guidelines will change. Today these evidence-based guidelines statements represent not absolute mandates but provisional proposals for treatment under the specific conditions described in each document. For all these reasons, the guidelines do not pre-empt physician judgment in individual cases.

Treating physicians must take into account variations in resources, and patient tolerances, needs, and preferences. Conformance with any clinical guideline does not guarantee a successful outcome. The guideline text may include information or recommendations about certain drug uses (‘off label’) that are not approved by the Food and Drug Administration (FDA), or about medications or substances not subject to the FDA approval process. AUA urges strict compliance with all government regulations and protocols for prescription and use of these substances. The physician is encouraged to carefully follow all available prescribing information about indications, contraindications, precautions and warnings. These guidelines and best practice statements are not intended to provide legal advice about use and misuse of these substances.

Although guidelines are intended to encourage best practices and potentially encompass available technologies with sufficient data as of close of the literature review, they are necessarily time-limited. Guidelines cannot include evaluation of all data on emerging technologies or management, including those that are FDA-approved, which may immediately come to represent accepted clinical practices.

For this reason, the AUA does not regard technologies or management which are too new to be addressed by this guideline as necessarily experimental or investigational.

**CONFLICT OF INTEREST DISCLOSURES**

REFERENCES


