# Update On Minimally Invasive Therapies for Benign Prostatic Hyperplasia

*George A. Turini III, MD, and Gyan Pareek, MD*

**Benign prostatic hyperplasia (BPH)** is, and will remain, increasingly common with aging. Histologically it has been identified in 50% of patients by age 50, and in 80% of 80 year olds.[1] The excessive growth of prostatic stromal and epithelial cells causes **benign prostatic enlargement (BPE).** With continued growth, however, BPE can evolve into **benign prostatic obstruction (BPO),** a condition often associated with bothersome **lower urinary tract symptoms (LUTS)** that worsen an individual's quality of life.[2] **Transurethral resection of the prostate (TURP)** has been considered the gold standard for treating patients with significant urinary symptoms related to BPH.[3] Unfortunately, along with this technique come the risks of undergoing an invasive surgical procedure necessitating general anesthesia. To this end, new and more **minimally invasive techniques (MIT)** have been developed. This review examines some of the minimally invasive options available for treating BPH and the criteria used to determine which are used.

In general, minimally invasive therapies for BPH produce symptomatic and objective results more slowly compared to surgical procedures.[3] Whereas surgery can definitively eliminate obstructing tissue as a source of the problem, MIT require a longer process wherein prostatic tissue damaged by energy breaks down and reabsorbs naturally over time. Often, such a compromise in recovery speed is acceptable to men with mild LUTS as an alternative to hospitalization and/or more serious complications related to surgery. In addition to this figurative "refractory" period in which therapeutic results are not immediately apparent, MIT generally share similar side-effect profiles including: urgency, irritation, and post-procedural swelling[2,3]. Retention secondary to swelling can be avoided with catheterization or alpha-blocker therapy. Occasionally, volume of ejaculate may be decreased following MIT, particularly when the bladder neck is intruded upon during the intervention.

## Watchful Waiting

Many men elect not to pursue medical or surgical therapy for their BPH, instead opting for a strategy termed "watchful waiting." This is the least invasive management strategy available for this condition and a reasonable approach in patients with minimal prostatic enlargement and mild LUTS.[4] It has been suggested that "active surveillance" is a more accurate phrase for this option than "watchful waiting" because the latter connotes a passive absence of intervention. In reality, patients are evaluated each year with **a digital rectal examination (DRE),** assessment of symptoms, and a PSA level. Uroflow and PVR volumes may be beneficial as well.[2] Additionally, behavioral modifications such as timed-voiding and limiting intake of caffeinated and alcoholic beverages have been shown to reduce the effects of LUTS in patients with BPH.[5] Watchful waiting has emerged as a recommended therapeutic option for patients with minimal impairment in quality of life secondary to their symptoms.[6]

## Transurethral Microwave Thermotherapy

This form of minimally invasive surgery can be completed with local or oral pain medication in an outpatient setting. During the procedure, a catheter with an antenna is placed in the prostate gland and microwave energy is subsequently delivered to heat and destroy the overgrown prostate tissue via coagulation necrosis. The body then reabsorbs that tissue, thereby returning the gland to a more normal size. In guidelines published in 2004, the AUA states four transurethral microwave heat treatment devices (CoreTherm®, Targis®, Prostatron®, TherMatrx®) are effective options for managing LUTS associated with BPH. Despite individual variations in level of energy delivered, cooling mechanism and method of temperature reporting, the AUA panel did not find a significant difference in outcome among the devices. The FDA, however, did report complications in patients treated using cooled thermotherapy appliances, emphasizing the need for physicians to be present and adherent to safety protocols.[6] The pooled mean urinary symptom score following TUMT decreases less dramatically compared to TURP (65% v 77%). The incidence of retrograde ejaculation, TUR syndrome, blood transfusions, hematuria and strictures requiring intervention was less among patients undergoing TUMT compared to TURP, but transurethral resection was associated with fewer cases of urinary retention, dysuria and re-operation.[7] It has been reported that small prostate size, advanced age, low levels of total energy delivered and mild obstruction scores can serve as predictive factors to identify poor responders to TUMT.[8] In other investigations, however, using different devices, predictive factors were not concordant thus making attempts to create a uniform and generalized set of outcome predictors a difficult task.[9] Recently, studies have sought to evaluate the durability of 30 minute TUMT treatment compared to 60 minute treatment.[10,11,12] Although length of time and type of device used have been inconsistent in the literature, there appears to be a slight increase in the need for retreatment among patient undergoing the 30 minute protocol compared to 60 minutes.[11] Ultimately, among minimally invasive therapies for BPH, TUMT has been studied more than the alternatives and has proven itself to be a reasonable option for patients seeking to avoid surgery or for whom pharmacotherapy has failed.[5,11]

## Transurethral Radiofrequency Needle Ablation

Other minimally invasive therapies include needle ablation of the prostate using radiofrequency technology. A light anesthetic is employed for patient comfort and a catheter equipped with multiple needles is placed directly into the urethra. Segments of prostatic tissue are then heated via low frequency radio energy transmitted through the needles.

This technique results in a coagulation necrosis and subsequent tissue ablation at temperatures between 80 and 100°C.[13] Immediately following the procedure, swelling of the prostate is commonplace but a catheter can be placed to avoid retention. After a short time, the swelling rescinds and the prostate shrinks, alleviating the LUTS ascribed to the BPH. Unlike TUMT, patients undergoing TUNA frequently require a greater degree of anesthetic, whether that be pelvic block, spinal or light general anesthesia.[6] Improvement of LUTS for patients undergoing TUNA has been shown to remain stable over time with 53% improvement 3 months after treatment and 51% at 5 years.[14,15] TUNA requires less anesthetic and the odds ratio of experiencing a post-procedural adverse effect after needle ablative therapy is 0.14 (95% CI 0.05-0.41) compared to surgery.[14] Further review of comparative trials, though, suggests surgical intervention results in more profound improvement in patients' quality of life, maximum flow rate, postvoid residual volume and maximum flow detrusor pressure[14,16] Incidence of re-treatment rate following TUNA has been inconsistent. A report by Bouza et al indicates a re-treatment rate of 19.1% and early data from the EAU database suggest a rate of 12%.[15] In 2007, Rosario and colleagues studied 71 men for whom medical therapy had failed and underwent TUNA while awaiting transurethral resection. Initial outcomes based on symptoms and uroflowmetry were promising after a year, but 83% of their population experienced failure of treatment after a mean of 20 months, as defined by worsening lower urinary tract symptoms requiring additional intervention or deteriorating quality of life and only twelve percent of patients remained symptom free without any additional therapy 10 years after ablative therapy.[17] In summary, TUNA has been demonstrated to produce improvement in quality of life and lower urinary tract symptoms, particularly in the short-term. While there is an increased risk of re-treatment compared to transurethral resection, TUNA offers a lower anesthetic burden and side effect profile compared to open surgery.

## Water-Induced Thermotherapy

**Water-induced thermotherapy** (WIT) is another heat-based therapy for symptomatic BPH whereby hot water is used to induce coagulation necrosis of the obstructing tissue. Treatment can be completed in 45 minutes and topical anesthetic has been shown to be sufficient for patient comfort. Few studies have evaluated this therapeutic option, but a 2003 multi-center, prospective, non-controlled study showed IPSS score and quality of life score improvements and re-treatment incidence similar to those seen following TUMT.[18,19] Predictive factors for successful outcome and contraindications have not yet clearly been established, as further evaluation of this technique, particularly in comparison to TURP, are warranted. At this time, the AUA and EAU consider WIT to be an investigational therapeutic option.[5,6]

**The newer, minimally invasive therapeutic options have not yet been shown to outperform transurethral resection in terms of efficacy or retreatment requirements, but have provided the benefits of decreased anesthesia burden and fewer side effects...**

## Transurethral Ethanol Ablation

**Transurethral ethanol ablation of the prostate** (TEAP) relies on hemorrhagic coagulation necrosis as a mechanism of prostate tissue ablation. As ethanol is injected, arterioles and venules undergo thrombotic occlusion, thereby creating a necrotic environment which ultimately eliminates hyperplastic overgrowth. TEAP has been shown to be a viable technique that can be performed safely with minimal anesthetic and that significantly improves maximum urinary flow rates, quality of life and IPSS ?scores.[20] Long-term durability has not been evaluated frequently. A 2004 report by Goya and colleagues demonstrated stable IPSS and urinary flow after three years, but 41% of their population ultimately required some form of re-intervention after 36 months.[21] Initial reports of TEAP reveal a promising outpatient based MIT, but further comparative studies, particularly with TURP, are required.

## Conclusion

Transurethral resection of the prostate has been considered the gold standard for treatment of BPH. Along with the introduction of new interventional techniques such as TUMT, TUNA and TEAP comes the optimism of effectively treating BPH while avoiding potential adverse outcomes and morbidities associated with invasive operations. The newer, minimally invasive therapeutic options have not yet been shown to outperform transurethral resection in terms of efficacy or retreatment requirements, but have provided the benefits of decreased anesthesia burden and fewer side effects amidst reasonable therapeutic outcomes.

## References


1. Roehrborn CG, McConnel JD. Etiology, pathophysiology, epidemiology, and natural history of BPH. In: *Campbell's Urology.* Edited by Walsh PC, Retik AB, et al. Philadelphia: W.B Saunders Co, 2002.
2. Burnett AL, Wein AJ. Benign prostatic hyperplasia in primary care. *J Urol* 2006; 175:S19-24.
3. d'Ancona F. Nonablative minimally invasive thermal therapies in the treatment of symptomatic benign prostatic hyperplasia. *Curr Opin Urol* 2008; 18:21-7.
4. Roerhborn CG. Focus on lower urinary tract symptoms. *Rev Urol* 2001; 3:139-45.
5. Madersbacher S, Alivizatos G, et al. EAU 2004 guidelines on assessment, therapy and follow-up of men with lower urinary tract symptoms suggestive of benign prostatic obstruction (BPH Guidelines). *Eur Uro* 2004; 46:547-54.
6. Kaplan SA. Update on the American Urological Associate guidelines for the treatment of benign prostatic hyperplasia. *Rev Urol* 2006; 8:S4.
7. Hoffman RM, Monga M, et al. Microwave thermotherapy for benign prostatic hyperplasia (review). *Cochrane Database of Systematic Reviews* 2007; Issue 4. Art. No.: CD004135. DOI: 10.1002/14651858.CD004135.pub2.
8. D'Ancona FCH, Francisca EAE, et al. High energy transurethral thermotherapy in the treatment of benign prostatic hyperplasia. *Prostate Ca Prostatic Dis* 1999; 2:98-105.

9 Ferakis N, Skolarikos A, et al. Treatment characteristics and inherent prostatic features do not predict patient outcome after high-energy transurethral thermotherapy. *J Endourol* 2006; 20:1075–81.
10. Yokoyama T, Tsugawa M, et al. High energy transurethral microwave thermotherapy in patients with benign prostatic hyperplasia:. *Acta Med Okayama* 2004; 58:151-6.
11. d'Ancona FCH. Nonablative minimally invasive thermal therapies in the treatment of symptomatic benign prostatic hyperplasia. *Curr Opin Urol* 2008; 18:21-7.
12. de la Rosette JJMCH, Fransica EA, et al. Clinical efficacy of a new 30-min algorithm for transurethral microwave thermotherapy. *BJU Int* 2000; 86:47-51.
13. Ponholzer A, Marszalek M, Madersbacher S. Minimally invasive treatment of BPH. *EAU Update* Series 2 2004; 24–33.
14. Tubaro A, Nunzio CD, Miano R. Transurethral needle ablation of the prostate. *Curr Opin Uro* 2007; 17:7-11.
15. Bouza C, Lopez T, et al. Systematic review and meta-analysis of transurethral needle ablation in symptomatic benign prostatic hyperplasia. *BMC Urol* 2006; 6: 14.
16. Hill B, Belville W, et al. Transurethral needle ablation versus transurethral resection of the prostate for the treatment of symptomatic benign prostatic hyperplasia. *J Urol* 2004; 171:2336-40.
17. Rosario DJ, Phillips JT, Chapple CR. Durability and cost-effectiveness of transurethral needle ablation of the prostate as an alternative to transurethral resection of the prostate when a-adrenergic antagonist therapy fails. *J Urol* 2007; 177:1047-51.
18. Muschter R. Conductive heat: hot water-induced thermotherapy for ablation of prostatic tissue. *J Endourol* 2003;17:609-16.
19. Muschter R, Schorsch I, et al. Transurethral water-induced thermotherapy for the treatment of benign prostatic hyperplasia. *J Urol* 2000; 16:1565-9.
20. Plante MK, Marks LS, et al. Phase I/II examination of transurethral ethanol ablation of the prostate for the treatment of symptomatic benign prostatic hyperplasia. *J Urol* 2007;177:1030-5.
21. Goya N, Ishikawa N, et al. Transurethral ethanol injection therapy for prostatic obstruction. *J Urol* 2004; 172: 1017-20.

*George A. Turini, III, MD, is a Resident in Urology, Warren Alpert Medical School of Brown University.*

*Gyan Pareek, MD, is Director, Section of Minimally Invasive Urologic Surgery and Assistant Professor of Surgery, Warren Alpert Medical School of Brown University.*

### Disclosure of Financial Interests

The authors have no financial interests to disclose.

### Correspondence

Gyan Pareek, MD
Division of Urology
2 Dudley Street, Suite 185
Providence RI, 02905
Phone: (401) 444.8570
e-mail:Gyan_pareek@brown.edu