ORIGINAL RESEARCH
General Urology

Doi: 10.4274/jus.galenos.2025.2025-6-1
J Urol Surg

Bipolar RF Therapy as a Surgical Alternative for Symptomatic BPH: A Single-center Experience

Nahid Yunusov, Selahattin Bedir, Fahri Yavuz İlki, Turgay Ebiloğlu

University of Health Sciences Türkiye, Gülhane Training and Research Hospital, Department of Urology, Ankara, Türkiye

What's known on the subject? and What does the study add?

Benign prostatic hyperplasia (BPH) is a common condition in aging men and significantly affects quality of life through lower urinary tract symptoms. While transurethral resection of the prostate remains the gold standard surgical treatment, its applicability is limited in elderly patients or those with significant comorbidities due to the risk of perioperative complications. Bipolar radiofrequency (RF) ablation has emerged as a minimally invasive alternative with advantages such as shorter recovery time and a lower complication profile. This study evaluated the short-term outcomes of bipolar RF ablation therapy in patients with BPH who were unresponsive to medical treatment. Significant improvements were observed in both subjective and objective (Q_{max}, post-void residual) parameters following treatment, with no major complications reported. These findings suggest that bipolar RF ablation is a safe and effective therapeutic option, particularly suitable for patients who are poor candidates for conventional surgery.

Abstract

Objective: To evaluate the effect of bipolar radiofrequency (RF) ablation therapy on prostate volume, urinary flow rates, post-void residual urine volume (PVR), and symptom scores in benign prostatic hyperplasia (BPH) patients.

Materials and Methods: A retrospective analysis was conducted on 40 BPH patients who underwent bipolar RF ablation between November 2017 and June 2018 after failed medical treatment. Prostate volume, International Prostate Symptom Score (IPSS), Q_{max}, Q_{ave}, and PVR were assessed before treatment, and at 1, 3 months and 1 year post-treatment.

Results: The mean age was 72.8 years. Prostate volume decreased by 12.6% from 53.06±19.53 mL to 46.34±21.15 mL at 1 year, although this change was not statistically significant (p=0.105). PVR showed a significant reduction from 148.83±103.18 mL to 106.37±100.26 mL (p=0.0018). Maximum urinary flow rate (Q_{max}) increased by 48.3% from 11.03±6.62 to 16.36±6.70 mL/s at 3 months, and remained stable at 16.10±6.12 mL/s at 1 year. The IPSS improved significantly from 21.86±7.61 to 13.30±7.14 at 3 months, and further to 10.40±3.64 at 1 year (p<0.001). No major complications were observed throughout the follow-up period.

Conclusion: Bipolar RF ablation is a safe and effective minimally invasive treatment for BPH, especially in patients with high surgical risk. It significantly improves urinary parameters and symptom scores.

Keywords: Bipolar radiofrequency ablation, benign prostatic hyperplasia, minimally ınvasive surgery, symptomatic BPH treatment, prostate volume reduction

Introduction

Benign prostatic hyperplasia (BPH) is a common condition in men over the age of 40 and is characterized by lower urinary tract symptoms (LUTS). Histopathologically, it is observed in approximately 50% of men in their 60s and up to 80% in those over the age of 80 (1). BPH symptoms include weak urinary stream, increased urinary frequency, nocturia, and a sensation of incomplete bladder emptying, all of which significantly impacts quality of life (QoL) (2).

Correspondence: Fahri Yavuz İlki MD, University of Health Sciences Türkiye, Gülhane Training and Research Hospital, Department of Urology, Ankara, Türkiye
E-mail: yavuzilki@gmail.com **ORCID-ID:** orcid.org/0000-0001-7067-3815
Received: 10.06.2025 **Accepted:** 23.09.2025 **Epub:** 16.03.2026

Cite this article as: Yunusov N, Bedir S, İlki FY, Ebiloğlu T. Bipolar RF therapy as a surgical alternative for symptomatic BPH: a single-center experience. J Urol Surg. [Epub Ahead of Print]

First-line treatment generally involves medical therapies: alpha-blockers and 5-alpha-reductase inhibitors are the most commonly used agents. However, in some patients, surgical intervention becomes necessary due to treatment resistance or complications (3). Transurethral resection of the prostate (TURP) has long been considered the "gold standard". However, due to TURP's perioperative risks and invasive nature, alternative methods are required, particularly for elderly and comorbid patients (4).

In recent years, bipolar radiofrequency (RF) ablation thermotherapy has emerged among minimally invasive techniques, attracting attention due to its feasibility under local anesthesia, short recovery time, and low complication rates (5,6). Although the efficacy of RF ablation in symptom control and improvement of urinary parameters has been demonstrated, clinical data from Türkiye remain limited.

This study aimed to evaluate the effects of bipolar RF ablation thermotherapy on prostate volume, voiding parameters, and the International Prostate Symptom Score (IPSS) in patients diagnosed with BPH who did not respond to medical treatment.

Materials and Methods

This single-center observational study retrospectively analyzed the data of 40 male patients, diagnosed with BPH and who did not respond to medical treatment between November 2017 and June 2018, at the Urology Clinic of Gülhane Training and Research Hospital, University of Health Sciences. The study was approved by the Health Sciences University Non-Interventional Research Ethics Committee (approval number: 18/175, date: 26.06.2018).

The inclusion criteria for the study were as follows: a confirmed diagnosis of BPH, persistent LUTS despite medical treatment, and the availability of complete follow-up data. Patients who were deemed poor candidates for surgery due to comorbidities [American Society of Anesthesiologists (ASA) 3 or higher], those who were receiving anticoagulant or antiplatelet therapy with a high-risk of complications upon discontinuation, and those who were unwilling to undergo general or spinal anesthesia were included. Exclusion criteria included patients with abnormal findings on digital rectal examination, patients previously diagnosed with prostate cancer, patients with a significant median lobe of the prostate, and patients with a prostatic urethral length either under 20 mm or over 70 mm. Patients who did not show improvement in IPSS scores and uroflowmetry parameters despite at least 6 months of dual drug therapy (alpha blocker + dutasteride) were considered non-responders to medical treatment. This criterion was used as part of the inclusion criteria to identify patients eligible for bipolar RF ablation therapy. The process of patient selection, including inclusion and exclusion criteria, and the final number of patients analyzed are summarized in Figure 1.

Some patients were managed with a urinary catheter prior to the procedure due to significant urinary retention. The reason for preoperative urinary catheterization was to protect the upper urinary tract in patients with markedly elevated post-void residual volumes (PVR). To minimize bias, PVR, Q_{max}, and IPSS values for these patients were recorded one week after catheter removal, allowing sufficient time for bladder function stabilization. This approach was applied consistently to ensure the accuracy and comparability of the preoperative measurements.

The patient was positioned in a supine position. A lubricant gel mixed with 2% lidocaine was applied through the penile urethra. The penis was clamped and held for 5 minutes. A specially designed 16 Fr (5.5 mm) applicator, equipped with 6 electrodes at its tip, was inserted into the bladder via the urethral route. The catheter balloon was inflated with 10 mL of saline to position it at the bladder neck. Subsequently, the other cable of the catheter was connected to the device, providing bipolar RF energy. Patient data were entered into the device system, and the electrode temperature was set to 55 °C. The procedure lasted for 1 hour. The procedure was well tolerated by all patients. After the procedure, the specially designed catheter was removed, and a standard 16 Fr 2-way Foley catheter was placed into the bladder.

Patients were followed up at 1, 3 months, and 1 year post-treatment, with evaluations including prostate volume (measured by a single urologist under transrectal ultrasound guidance), IPSS, and uroflowmetry parameters-specifically maximum urinary flow rate (Q_{max}), average flow rate (Q_{ave}), and PVR. In addition to the short-term follow-up, the study included 1-year post-operative data to evaluate the mid-term outcomes of the procedure. These long-term follow-up assessments included the same parameters (IPSS, Q_{max}, PVR, and prostate volume) as well as QoL scores derived from the IPSS questionnaire.

Statistical Analysis

The collected data were analyzed using SPSS version 22.0 software. The paired samples t-test was used for parametric data, while the Wilcoxon signed-rank test was applied for non-parametric data. A p-value of less than 0.05 was considered statistically significant.

Results

The mean age of the 40 patients included in the study was 72.8±7.4 years. These patients had LUTS, but were considered poor candidates for conventional surgery due to comorbidities (ASA 3 or higher), the risk of discontinuing anticoagulant or

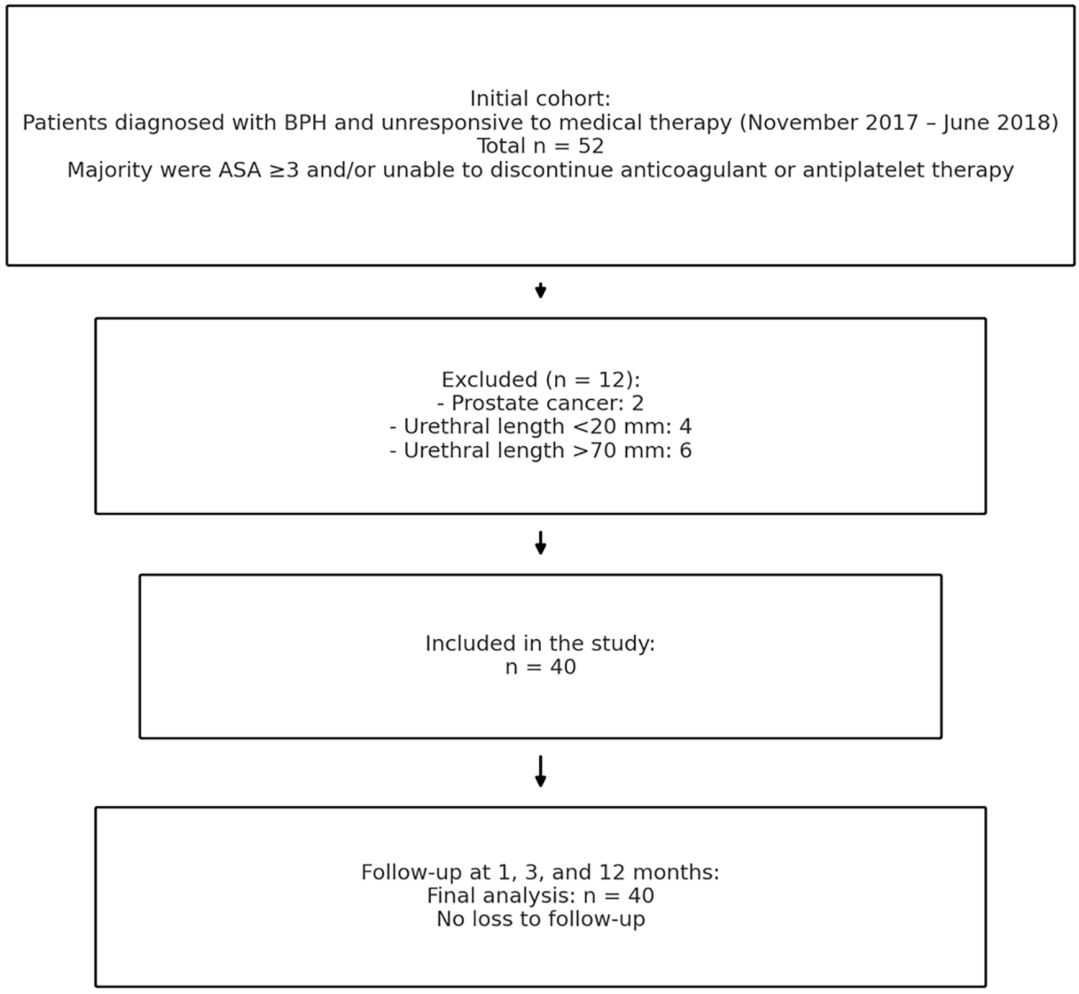

Figure 1. Flow diagram of patient selection and follow-up in the study. From the initial 52 patients diagnosed with BPH and unresponsive to medical therapy, 12 were excluded based on predefined criteria, resulting in 40 patients included in the final analysis with no loss to follow-up

BPH: Benign prostatic hyperplasia, ASA: American Society of Anesthesiologists

antiplatelet medications, or a preference against general or spinal anesthesia. Among the 40 patients, 32 were classified as ASA 3 or higher, indicating high surgical risk. Additionally, 28 patients were using acetylsalicylic acid, and 12 of these 28 patients were also using new-generation anti-aggregants. After consultations with cardiology and neurology, the discontinuation of medications was not allowed. This treatment protocol was implemented, considering the potential complications associated with conventional treatments and after discussing with the patients. Follow-up evaluations were conducted at the first, third months, and first year post-treatment.

The mean prostate volume was 53.06±11.9 mL before treatment, which decreased to 49.03±10.7 mL at the 1st month, and 47.53±10.2 mL at the 3rd month. Although the reduction in volume was 7.6% and 10.4%, respectively, this change was not statistically significant (p=0.53). Prostate volume decreased from 53.06±19.53 mL to 46.34±21.15 mL at 1 year; however, this reduction did not reach statistical significance (p=0.105) (Table 1).

The mean PVR was 148.8±41.6 mL preoperatively, 120.5±38.4 mL at the first month, and 118.4±37.9 mL at the third month. A significant reduction was observed between the preoperative and 3rd-month values (p=0.005). PVR decreased from a preoperative value of 148.83±103.18 mL to 106.37±100.26 mL at 1 year, and this change was also statistically significant (p=0.0018).

The maximum urinary flow rate (Q_{max}) increased from 11.03±3.1 mL/s pre-treatment to 14.76±3.8 mL/s at the 1st month and 16.36±3.9 mL/s at the third month. The increase in the third month was statistically significant (p=0.005). Q_{max} remained stable at 16.10±6.12 mL/s, reflecting maintained improvement in urinary flow at one year (p<0.001). The average urinary flow rate (Q_{ave}) was measured as 6.12±1.8 mL/s preoperatively, 7.43±2.1 mL/s in the 1st month, and 7.81±2.0 mL/s in the 3rd

Table 1. Clinical outcomes after RF ablation therapy				
Time	**Prostate volume (mL)**	**PVR (mL)**	**Q_{max} (mL/s)**	**IPSS**
Preoperative	53.06±19.53	148.83±103.18	11.03±6.62	21.86±7.61
1st month	49.03±20.27	120.54±103.56	14.76±8.05	15.60±6.71
3rd month	47.53±23.05	118.37±120.06	16.36±6.70	13.30±7.14
1st year	46.34±21.15	106.37±100.26	16.10±6.12	10.40±3.64
P-value (3 month vs. preoperative)	0.53	0.005	0.005	0.005
P-value (1 yr vs. preoperative)	0.105	0.0018	<0.001	<0.001

All values are expressed as mean ± standard deviation. Paired t-tests were used to compare 1-year values with preoperative values, n=40, RF: Radiofrequency, PVR: Post-void residual

month. However, the increase in this parameter did not reach statistical significance (p=0.06).

There was a significant improvement in IPSS scores, decreasing from a preoperative mean of 21.86±7.61 to 13.30±7.14 at 3 months post-treatment (p=0.005). The mean IPSS decreased from 13.30±7.14 at 3 months to 10.40±3.64 at 1 year, and this difference was found to be statistically significant (p<0.001), indicating sustained symptomatic improvement.

The QoL score, as part of the IPSS questionnaire, was assessed both preoperatively and during post-treatment follow-up. In addition to the 3-month results, 1-year QoL scores have also been evaluated and added to the manuscript. These findings further support the sustained symptomatic relief and improved patient satisfaction achieved with bipolar RF ablation therapy.

The QoL score, assessed as part of the IPSS questionnaire, decreased from a preoperative mean of 4.7±1.2 to 2.6±1.1 at 3 months and 2.1±1.0 at 1 year post-treatment. This progressive improvement indicates a significant and sustained enhancement in patient-reported QoL (p<0.05).

The continued improvement in QoL scores observed at the 1-year follow-up suggests that bipolar RF ablation provides not only short-term but also mid-term symptomatic relief and contributes meaningfully to overall QoL.

Among the 14 patients with indwelling urethral catheters prior to the procedure, 5 (35.7%) were successfully transitioned to catheter-free follow-up after treatment. No serious complications were observed following the procedure. Temporary urinary retention occurred in 7 patients (17.5%) during the early postoperative period, all of whom were successfully managed with an additional one-week catheterization. Dysuria complaints were noted in 6 patients (15%) but resolved spontaneously within a few days. No cases of urinary tract infection, urethral stricture, incontinence, or hemorrhage were encountered. All patients discontinued medical treatment.

The incidence of retrograde ejaculation post-procedure was observed in 8 out of 40 patients. However, the use of alpha-blockers should not be overlooked, as it may influence the outcome prior to surgery. The difference between pre-operative and post-operative 3-month IIEF-5 scores was evaluated through comparative statistical analysis. The pre-operative IIEF-5 score was found to be 14.8±3.9, while the post-operative 3-month IIEF-5 score averaged 12.6±3.5. A paired t-test was performed, and the difference between the pre-operative and post-operative 3-month scores was not statistically significant (p=0.258).

Discussion

BPH is a condition that increases in prevalence with age and significantly affects QoL by causing LUTS. Although conventional surgical treatments are highly effective, they are associated with limitations in elderly or comorbid patients due to the risk of complications, hospitalization requirements, and postoperative recovery period (7).

In this study, we evaluated the short-term efficacy and safety of bipolar RF ablation thermotherapy in patients with BPH unresponsive to medical treatment. Our findings demonstrated significant improvements in clinical parameters such as Q_{max}, IPSS, and PVR following treatment, with no major complications observed postoperatively.

RF ablation is a technique that delivers controlled thermal energy to prostatic tissue to induce coagulative necrosis, thereby reducing obstructive symptoms. While long-term data remain limited, Cowan et al. (8) reported in a 5-year follow-up study that over 70% of patients maintained symptomatic improvement after RF therapy, with a low need for subsequent surgical intervention. Similarly, Gilling et al. (9) found a persistent decrease in IPSS and increased patient satisfaction following RF ablation.

In our study, we observed a 39% reduction in IPSS, a 48% increase in Q_{max}, and a significant decrease in PVR, indicating that RF ablation yields both subjective and objective benefits in the short-term. These findings are consistent with those reported in earlier clinical studies. The increase in Q_{max} suggests a substantial improvement in voiding dynamics by alleviating

the obstructive component of BPH. In fact, this degree of improvement is considered comparable to that achieved with TURP in the literature (10). The reduction in PVR indicates more effective bladder emptying and suggests that RF ablation can be safely used even in patients predisposed to urinary retention. Supporting bladder function is particularly important in elderly or comorbid patients and contributes critically to treatment success (11).

The reduction in IPSS confirms that patients experienced marked symptomatic relief, implying that RF ablation positively affects not only physiological parameters, but also overall QoL. Decreases in IPSS of similar magnitude have been reported following conventional surgical procedures (7). McNicholas et al. (12) emphasized that RF therapy is an effective symptomatic treatment for patients with moderate prostate volumes who may not tolerate invasive surgery.

RF ablation has also been considered a suitable option for patients on anticoagulant therapy or with contraindications to general anesthesia. Chughtai et al. (13) highlighted that minimally invasive therapies can be safely administered in this population, and that RF ablation has significantly lower rates of hematuria, infection, and retrograde ejaculation compared to TURP.

Although our study found an approximate 10% reduction in prostate volume, this difference did not reach statistical significance. This supports the notion that the primary therapeutic effect of RF ablation is not volume reduction per se, but rather the alleviation of obstruction and symptomatic relief. Furthermore, changes in prostate volume may become statistically significant over longer follow-up periods (14). Even though the reduction was not statistically significant, previous studies have suggested that a modest volume reduction may still contribute to meaningful symptom relief (15). The principal mechanism of RF ablation is likely the reduction of tissue resistance in the periurethral zone, rather than global prostate shrinkage.

Recent studies have further supported the clinical utility of RF ablation in patients with BPH, particularly in those with storage symptoms and high surgical risk. A 2024 comparative study demonstrated that bipolar RF thermotherapy led to significant reductions in overactive bladder symptom scores at both 3 and 6 months, outperforming TURP in terms of symptom relief and with comparable improvements in Q_{max} and PVR (16). Similarly, a 2023 randomized controlled trial reported that RF ablation was 2.35 times more effective than TURP in alleviating storage symptoms, while maintaining satisfactory urinary flow outcomes and symptom durability over 6 months (17).

Moreover, recent reviews have positioned RF ablation among the most promising minimally invasive surgical therapies, alongside modalities like Rezūm and Aquablation. These reviews emphasize RF ablation's suitability for patients on anticoagulants and those who are poor candidates for general or spinal anesthesia, highlighting its favorable safety profile and low complication rates (18).

These recent findings are consistent with our results and further support the use of bipolar RF ablation as an effective and safe therapeutic option in the modern management of BPH, particularly for patients with increased perioperative risk. RF ablation represents a clinically meaningful alternative to more invasive surgical procedures such as TURP, especially in elderly patients or those at high surgical risk (8,19,20).

Study Limitations

Despite the promising outcomes, this study has several limitations. The relatively small sample size and short follow-up period (1 year) may limit the generalizability of the findings and prevent robust conclusions regarding long-term efficacy and safety. Additionally, the absence of a control or comparison group (e.g., TURP or sham procedure) restricts direct comparisons with other treatment modalities. Future prospective, multicenter, randomized controlled trials with longer follow-up are necessary to better evaluate the durability of clinical benefits, recurrence rates, and the role of bipolar RF ablation relative to standard interventions.

Conclusion

This study demonstrated that bipolar RF ablation thermotherapy is a safe and effective minimally invasive treatment option for BPH patients who are unresponsive to medical therapy. Significant improvements were observed in IPSS, Q_{max}, and PVR following treatment, with no major complications reported. These findings support the potential integration of bipolar RF ablation into standard BPH treatment algorithms for appropriately selected patients.

Ethics

Ethics Committee Approval: The study was approved by the Health Sciences University Non-Interventional Research Ethics Committee (approval number: 18/175, date: 26.06.2018).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: S.B., T.E., Concept: N.Y., Design: N.Y., T.E., Data Collection or Processing: F.Y.İ., Analysis or Interpretation: F.Y.İ., Literature Search: F.Y.İ., Writing: F.Y.İ.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Berry SJ, Coffey DS, Walsh PC, Ewing LL. The development of human benign prostatic hyperplasia with age. J Urol. 1984;132:474-479. [Crossref]
2. Roehrborn CG. Benign prostatic hyperplasia: an overview. Rev Urol. 2005;7 (Suppl 9):S3-S14. [Crossref]
3. Oelke M, Bachmann A, Descazeaud A, Emberton M, Gravas S, Michel MC, N'dow J, Nordling J, de la Rosette JJ; European Association of Urology. EAU guidelines on the treatment and follow-up of non-neurogenic male lower urinary tract symptoms including benign prostatic obstruction. Eur Urol. 2013;64:118-140. [Crossref]
4. Reich O, Gratzke C, Bachmann A, Seitz M, Schlenker B, Hermanek P, Lack N, Stief CG; Urology Section of the Bavarian Working Group for Quality Assurance. Morbidity, mortality and early outcome of transurethral resection of the prostate: a prospective multicenter evaluation of 10,654 patients. J Urol. 2008;180:246-249. [Crossref]
5. Dmochowski RR, Roehrborn CG. Evidence-based evaluation and management of benign prostatic hyperplasia. Urol Clin North Am. 2016;43:365-375. [Crossref]
6. Elterman DS, Barkin J, Kaplan SA. Management of lower urinary tract symptoms in men: treating the bladder and prostate. Can Urol Assoc J. 2020;14:182-186. [Crossref]
7. Gratzke C, Bachmann A, Descazeaud A, Drake MJ, Madersbacher S, Mamoulakis C, Oelke M, Tikkinen KAO, Gravas S. EAU guidelines on the assessment of non-neurogenic male lower urinary tract symptoms including benign prostatic obstruction. Eur Urol. 2015;67:1099-1109. [Crossref]
8. Cowan BE, McNicholas TA, Harris CR. Radiofrequency thermotherapy for symptomatic benign prostatic hyperplasia: long-term follow-up. BJU Int. 2011;107:592-599. [Crossref]
9. Gilling PJ, Kennett KM, Fraundorfer MR. Long-term outcomes of radiofrequency thermal therapy for benign prostatic hyperplasia. J Endourol. 2012;26:1457-1462. [Crossref]
10. Bachmann A, Müringer R. Surgical treatment of benign prostatic hyperplasia in the elderly. Curr Opin Urol. 2009;19:55-59. [Crossref]
11. Mebust WK, Holtgrewe HL, Cockett AT, Peters PC. Transurethral prostatectomy: immediate and postoperative complications. A cooperative study of 13 participating institutions evaluating 3,885 patients. J Urol. 1989;141:243-247. [Crossref]
12. McNicholas TA, Tubaro A, De Nunzio C. Minimally invasive procedures for lower urinary tract symptoms in men: what is the evidence? BJU Int. 2010;105:1406-1415. [Crossref]
13. Chughtai B, Kaplan SA, Te AE. Safety and efficacy of minimally invasive surgical therapies for lower urinary tract symptoms secondary to benign prostatic hyperplasia. Curr Urol Rep. 2015;16:70. [Crossref]
14. Elmansy HM, Kotb A, Elhilali MM. Bipolar plasma vaporization of the prostate: technical update and critical appraisal. Int Urol Nephrol. 2012;44:1071-1078. [Crossref]
15. Roehrborn CG, McConnell JD. Etiology, pathophysiology, epidemiology, and natural history of benign prostatic hyperplasia. Campbell-Walsh Urology. 11th ed. [Crossref]
16. Jung JH, Kim DS, Lee YJ, Park J. Comparison of bipolar radiofrequency thermotherapy and transurethral resection of the prostate in patients with benign prostatic obstruction and overactive bladder symptoms. Int Neurourol J. 2024;28:145-152. [Crossref]
17. Hosseini A, Navid R, Gholami M, Darabi MR. Efficacy of radiofrequency thermotherapy compared with TURP in improving storage symptoms of BPH: a randomized controlled trial. J Clin Urol. 2023;16:345-352. [Crossref]
18. Fenton AS, McVary KT. Treatment of benign prostatic hyperplasia: update on minimally invasive therapies. Curr Urol Rep. 2023;34:78-85. [Crossref]
19. Ahmed H, Gilling P, Kennett K, Fraundorfer M. Long-term outcomes of radiofrequency thermal therapy for benign prostatic hyperplasia: a 5-year follow-up study. J Endourol. 2012;26:1457-1462. [Crossref]
20. MacDiarmid SA, Staskin DR. Minimally invasive treatments for BPH in patients on anticoagulation: balancing efficacy and safety. Rev Urol. 2010;12:e88-e94. [Crossref]