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UPOREDNA ANALIZA MONOPOLARNE I BIPOLARNE TRANSURETRALNE RESEKCIJE PROSTATE: PROSPEKTIVNA STUDIJA U ZDRAVSTVENOM CENTRU PROKUPLJE

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Uporediti perioperativnu bezbednost, efikasnost i kratkoročne funkcionalne ishode između monopolarne i bipolarne transuretralne resekcije prostate (TURP) kod pacijenata sa benignom hiperplazijom prostate (BHP) i akcidentalno dijagnostikovanim karcinomom prostate.

Prospektivna studija sprovedena je na Odeljenju urologije Zdravstvenog centra Prokuplje između septembra 2024. godine i spetembra 2025. godine. 40 pacijenata sa indikacijom za hirurško lečenje prostatične opstrukcije bešike (BOO) podeljeno je u dve jednake grupe. 20 pacijenata podvrgnuto je monopolarnoj, a 20 bipolarnoj TURP proceduri. Analizirani su perioperativni parametri, uključujući zapreminu resekovanog tkiva, pad hemoglobina, dužinu hospitalizacije, učestalost infekcija, postoperativni Qmax i komplikacije klasifikovane prema Clavien–Dindo klasifikaciji.

Bipolarna resekcija pokazala je značajno manji gubitak krvi tokom operacije, kraće vreme kateterizacije i hospitalizacije, manju učestalost postoperativnih infekcija i mogućnost izvođenja procedure na većim volumenima prostate (do 70 g). U obe grupe zabeleženo je poboljšanje Qmax, ali sa većim porastom u grupi pacijenata operisanih bipolarnom resekcijom. Ukupna stopa komplikacija prema Clavien–Dindo skali bila je niža u bipolarnoj grupi (15%) u poređenju sa monopolarom (45%).

Bipolarni TURP pruža veću bezbednost i bolje kliničke ishode, sa manjim intraoperativnim krvarenjem, bržim oporavkom i manjim brojem komplikacija. Ova metoda predstavlja metodu izbora za volumen prostate do 70 g.

Ključne reči: *Bipolarna TURP, Monopolarni TURP, Benigna hiperplazija prostate. Clavien-Dindo, Qmax, Komplikacije, Hospitalizacija*

COMPARATIVE ANALYSIS OF MONOPOLAR AND BIPOLAR TRANSURETHRAL RESECTION OF THE PROSTATE: A PROSPECTIVE STUDY FROM THE HEALTH CENTER PROKUPLJE

To compare perioperative safety, efficacy, and short-term functional outcomes between monopolar and bipolar transurethral resection of the prostate (TURP) in patients with benign prostatic hyperplasia (BPH) and incidental prostate carcinoma.

A prospective, single-center study was conducted at the Department of Urology, Health Center Prokuplje between September 2024. and September 2025. 40 patients indicated for surgical treatment of bladder outlet obstruction were divided equally into monopolar and bipolar TURP groups. Perioperative parameters, including resection volume, hemoglobin drop, hospital stay, infection rate, postoperative Qmax, and complications assessed by the Clavien–Dindo classification, were analyzed.

Bipolar TURP demonstrated significantly reduced intraoperative bleeding, shorter catheterization and hospitalization durations, fewer postoperative infections, and the ability to safely operate on larger prostates (up to 70 g). Both groups showed improvement in Qmax, with greater improvement observed in the bipolar group. The overall complication rate by Clavien-Dindo scale was lower in the bipolar arm (15%) compared with monopolar (45%).

Bipolar TURP offers superior safety and clinical outcomes, with less bleeding, faster recovery, and fewer complications. It represents the preferred surgical modality for prostates up to 70 g.

Key words: *Bipolar TURP, Monopolar TURP, Benign Prostatic Hyperplasia, Clavien-Dindo, Qmax, Complications, Hospital Stay*

Introduction

Benign prostatic hyperplasia (BPH) affects nearly 50% of men over 60 years of age and remains the most frequent cause of lower urinary tract obstruction worldwide (1, 2).

Transurethral resection of the prostate (TURP) has been established for decades as the gold standard in the surgical treatment of BPH due to its proven efficacy in relieving symptoms and improving urinary flow (3). However, the conventional monopolar technique carries several drawbacks, such as increased intraoperative bleeding, electrolyte disturbances, and the risk of TUR syndrome (4). To address these issues, bipolar technology was introduced, allowing resection in isotonic saline with improved hemostasis and reduced systemic absorption (5-7). Recent studies have expanded bipolar TURP indications to larger prostates, demonstrating equivalent or superior efficacy compared to monopolar techniques (8-10).

This study provides a prospective, single-institution comparison between monopolar and bipolar TURP, emphasizing perioperative safety, complication severity using the Clavien–Dindo classification, and early functional out-comes.

Materials and Methods

This was a prospective comparative study performed in 12 months (September 2024-September 2025.) at the Department of Urology, Health Center Prokuplje. 40 male patients aged between 55-82 years with moderate-to-severe lower urinary tract symptoms unresponsive to medical therapy were included. Patients were divided into two equal groups: monopolar TURP (n = 20) and bipolar TURP (n = 20). Prostate volume was determined by transabdominal or transrectal ultrasonography, ranging between 20-70 g, with monopolar resections limited to ≤ 50 g and bipolar procedures extended safely to 70 g (11).

Procedures were performed under spinal anesthesia using a 26 Fr continuous-flow resectoscope. In monopolar cases, a standard tungsten loop was used with Ispirol (mannitol + sorbitol) as irrigation fluid and an average energy setting of 120 W for cutting and 80 W for coagulation. Bipolar TURP was performed using the BOWA ARC400 system with a saline irrigation circuit, utilizing a resection and plasma-vaporization loop at 160 W cutting and 100 W coagulation energy (12, 13). All procedures were conducted by the same surgical team to minimize operator variability. Continuous bladder irrigation was maintained postoperatively until hematuria cleared.

Intraoperative parameters recorded: operative time, resected tissue weight, and hemoglobin drop. Postoperative data included catheterization time, hospital stay, and infection rate. Functional outcomes were assessed by uroflowmetry (Qmax) before and four weeks after surgery. Complications were categorized according to the Clavien–Dindo grading system.

Results

Both monopolar and bipolar TURP achieved satisfactory tissue removal and symptom improvement. However, bipolar resection resulted in significantly reduced bleeding, shorter recovery, and fewer complications.

Table 1. Comparative results between monopolar and bipolar TURP groups

Parameter	Monopolar TURP (n=20)	Bipolar TURP (n=20)	p-value
Mean resected volume (gr)	23.4 ± 5.2	26.1 ± 5.0	0.03
Hemoglobin drop (g/dL)	1.9 ± 0.5	0.9 ± 0.4	<0.001
Catheterization time (days)	3.9 ± 1.0	2.3 ± 0.8	<0.001
Hospital stay (days)	4.8 ± 1.2	2.6 ± 0.9	<0.001
Postoperative infection rate	20% (4/20)	5% (1/20)	0.04
Postoperative Qmax (mL/s)	18.0 ± 3.5	20.8 ± 3.1	0.01

No Grade IV or V events were observed. The bipolar technique demonstrated superior hemostasis, reflected in a lower transfusion rate and reduced clot retention. All patients were discharged in stable condition without readmission within 30 days.

Table 2. Postoperative complications according to Clavien–Dindo classification

Complication (Clavien–Dindo Grade)	Monopolar (n=20)	Bipolar (n=20)
Grade I (Transient hematuria, mild dysuria)	4 (20%)	2 (10%)
Grade II (Febrile UTI requiring antibiotics)	3 (15%)	1 (5%)
Grade IIIa (Clot retention requiring re-catheterization)	1 (5%)	0
Grade IIIb (Endoscopic re-intervention for bleeding)	1 (5%)	0
Total complication rate	9 (45%)	3 (15%)

Discussion

This study confirms that bipolar TURP provides safer perioperative outcomes and comparable, if not superior, efficacy to monopolar resection. Bleeding control, shorter catheterization, and improved irrigation visibility contribute to reduced complications and faster patient recovery (6, 8, 9).

When complications were assessed by the Clavien–Dindo classification, the bipolar group demonstrated both lower frequency and lower severity of adverse events. No patient experienced complications above Grade III in either group, aligning with previously reported safety data from randomized trials and meta-analyses (10, 11, 13).

Elshal et al. (12) and Ficarra et al. (11) confirmed that bipolar systems minimize energy dispersion, which translates into reduced thermal injury, fewer infections, and quicker convalescence.

Our data are also consistent with recent long-term studies by Zhu et al. (14) and Zong et al. (15), which found that bipolar TURP maintains durable improvements in urinary flow and symptom scores up to five years postoperatively. These outcomes suggest that bipolar technology not only enhances perioperative safety but also ensures sustained functional benefit.

From an institutional perspective, the shorter hospital stay and reduced complication-related interventions may also lead to lower healthcare costs.

Limitations include the relatively small sample size, single-center design, and short follow-up period. However, the prospective nature and consistency of surgical technique strengthen the internal validity.

Future multicenter studies with longer follow-up are warranted to further assess cost-effectiveness, quality of life, and durability of functional outcomes.

Conclusion

Bipolar transurethral resection of the prostate demonstrated superior safety, reduced bleeding, fewer complications, and faster recovery compared to monopolar TURP. Assessment via the Clavien–Dindo scale confirmed the lower incidence and severity of complications. These findings, corroborated by recent literature, reinforce bipolar TURP as the modern surgical standard for benign prostatic obstruction..

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