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A COMPARATIVE PROPENSITY SCORE MATCHED ANALYSIS OF PERIOPERATIVE OUTCOMES OF BIPOLAR ENUCLEATION V/S BIPOLAR TURP IN LARGE PROSTATE GLANDS BASED ON COMPREHENSIVE COMPLICATION INDEX

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ABSTRACT

Background The objective of this study was to compare the perioperative outcomes of bipolar enucleation of the prostate (BPEP) and bipolar transurethral resection of prostate (B-TURP) based on comprehensive complication index (CCI) for patients with benign prostatic obstruction and having a gland size of >80 g. **Materials And Methods** We did a retrospective cohort study from January 2017 to December 2021. A Total of 108 patients were included in the study. 52 patients underwent BPEP and 56 B-TURP. The CCI was calculated using the Clavien-Dindo classification (CDC) grade of all perioperative complications collected. Demographic characteristics, preoperative clinical assessment, perioperative complications , and CCI of patients were compared between both groups. **Results** There were no significant differences between the two groups preoperatively. The mean operative time was lower in the BPEP group however, no statistical difference was found between them (p=0.77). there was significant difference in the mean resected tissue weight(52.11±17.92 v/s 77.19±17.78 g, p<0.001), irrigation time and length of stay (LOS) in favor of BPEP group. The blood loss observed in the B-TURP group and BPEP group was 2.57±0.36 and 1.45±0.44 g/dl, respectively. **Conclusion** Both procedures are safe and effective options in patients suffering from BPO, But BPEP is better in terms of low clot retention rate, less irrigation time and LOS.

KEYWORDS

INTRODUCTION

Transurethral resection of the prostate (TURP) represents a well-established benign prostatic obstruction (BPO) surgical treatment [1]. TURP results in a substantial improvement of Qmax, International Prostate Symptom Score (IPSS) and post-void residual (PVR) [2]. However, its peri-operative morbidity remains considerable [3, 4]. Bipolar TURP (B-TURP) is a modification of standard monopolar TURP (m-TURP), as it allows resection with normal saline irrigation (TURis) and requires less energy/voltage [5]. Currently, B-TURP is considered a valid alternative to m-TURP [1], offering similar efficacy with lower peri-operative morbidity [2, 6, 7].

Endoscopic enucleation of the prostate (EEP) (using Holmium Laser enucleation—HoLEP—and, more recently, bipolar enucleation) at present is considered an effective alternative to TURP and open simple prostatectomy (OP) [1], indeed it has shown similar efficacy and a more favorable peri-operative safety profile [8,9,10], and a very low reoperation rate at 10 years [11]. Transurethral enucleation of the prostate was first developed by Hiraoka and Akimoto [12], and the use of bipolar plasmakinetic energy was proposed by Neil [13]. The main advantage of enucleation is the possibility of reproducing the cleavage plane of OP in a minimally invasive setting, with the same tissue removal capability [14]. EAU guidelines consider bipolar EEP (BPEP) as an option for surgical treatment of male LUTS for men with prostate size>30 mL [1].

Despite a growing amount of data reported in the literature, it remains unclear how BPEP compares to more established B-TURP in the surgical treatment of BPO. The aim of the present study is to compare perioperative outcomes of BPEP and B-TURP based on comprehensive complication index (CCI).

Validated methods of measuring surgical outcomes include the Clavien-Dindo Classification which was first published in 1992 and revised to form a new five- scale classification system 12 years later, with the aim of presenting an objective, simple, reliable, and reproducible way of reporting negative events after surgery.

The Comprehensive Complication Index (CCI) was first developed in 2013 by Slankamenac et al., aiming to integrates all the negative events with their respective severity. The CCI is calculated as the sum of all complications with different severities classified by CDC which may ignore all additional complications that are equal or less severe. Several kinds of literature had confirmed that the CCI was a better parameter to identify risks in surgical patient groups.

In an attempt to answer this question, we carried out this study to compare BPEP and B-TURP based on CCI.

MATERIALS AND METHOD

Patients and study protocol The study was approved by the Medical Ethics Committee of our institute. The clinical data for patients who underwent BPEP and B-TURP for BPH from January 2017 to December 2021 at our center were retrospectively analyzed. Differences between the two surgical groups were estimated using propensity score (PS) to adjust for the bias inherent to the different baseline patient characteristics. The PS were estimated by fitting a logistic regression model with intervention type as the dependent variable. Age, prostate volume(PV), preoperative PSA values and IPSS scores were the co-variates considered in the PS model. The Propensity Score matching analysis selected 52 patients in BPEP group and 56 in B-TURP group. Only those with prostate volume larger than 80g on transabdominal ultrasound were included (9, 17). Any patient with a previous history of prostatic or urethral surgery, urethral stricture, neurovesical dysfunction and/or prostate cancer was excluded. Indications for surgery were a preoperative International Prostate Symptom Score (IPSS) ≥12 points, a maximal urinary flow rate (Qmax) <15mL/s, urine retention, upper tract dilatation, renal insufficiency and recurrent urinary tract infection. Age, IPSS, quality of life (QoL) score, prostate specific antigen (PSA), prostatic volume (PV) and post-void residual urine volume (PVRV) were compared preoperatively between the two groups.

Operativetechniques

Both bipolar resection procedures were performed using the Olympus Surg Master UES-40 bipolar generator system, with the power set at 200W for cutting and at 100W for coagulation. Normal saline was used as irrigant, and the irrigation pressure ranged from 80 to 100mH2O. Cystostomy was not performed in all cases. Under general or spinal anesthesia, the patient was placed in the lithotomy position. A 26-Fr resectoscope was placed in the bladder under video assisted endosurgical system guidance.

B-TURP was performed in the standard fashion .The resection was started at the bladder neck to the proximal extent of the verumontanum at the 6- o`clock position and reached the surgical capsule. After the

middle lobes were resected, lateral lobes were resected in sequence to completely remove the adenoma. At the end of surgery a 22 F foley catheter is placed in all patients. BPEP was conducted based on the classical steps of Holmium laser enucleation (HOLEP) . Briefly, an incision was created close to the verumontanum in order to incise the urethral mucosa deep to the level of the surgical capsule. After dissecting the distal mid lobe and mucosa in a retrograde fashion toward the bladder neck and detaching adenoma of the distal mid lobe from the surgical capsule, the denuded supply vessels and hemorrhage spots on the capsule surface were identified and coagulated to block the lobe blood supply. The bilateral lobes along the surgical capsule were then detached and all supply vessels were coagulated. The adenoma was finally resected. When resection was completed, all adenoma fragments were extracted using an Ellik evacuator, and a 22-F 3-way Foley catheter was placed and connected to straight drainage until hematuria sufficiently resolved.

Outcome Measures

Operative time, pre-and postoperative hemoglobin levels (on the first postoperative day), weight of resected prostatic tissue, bladder irrigation duration, hospital stay, IPSS, Qmax, QoL score, PVRV, and TPSA were calculated. Perioperative complications such as TURS, hyponatremia (at the end of operation, defined as serum sodium less than 135mmol/L), blood transfusion, bleeding requiring surgery to stop bleeding, postoperative acute urinary retention, urine incontinence and urinary sepsis were observed.

The assessment of perioperative morbidities were initially done using the CDC and then the CCI is calculated; using an online calculator, which is available on www.assessurgery.com. This innovative CCI combines all postoperative complications with their severity on a scale from 0(uneventful course) to 100(death). The value of 33.7 is the cut-off point on the scale, above which the most severe complications are found. The value of 33.7 on the CCI corresponds to grade 3b.in the CDC.

Statistical Analysis

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA). Data following a normal distribution are presented as mean±standard deviation and were compared using the t-test, while data not following a normal distribution are presented as median (range) and were compared using the Wilcoxon rank-sum test for two independent samples. Categorical data (percentages) were compared using the chi-square test or the Fisher's exact probability test. P-values <0.05 were considered statistically significant..

RESULTS AND OBSERVATIONS:

The present study included a total of 108 patients, Group A(BPEP) include 52 patients and Group B(B-TURP) includes 56 patients.

Table 1: The Baseline Characteristics Of The Two Groups

Parameters	Group A BPEP	Group B B-TURP	P-Value
Age	78.46±2.21	77.32±5.32	0.046
Prostate volume(g)	95.05±4.78	89.84±4.78	0.057
Hemoglobin (g/dl)	12.73±1.65	12.45±1.71	0.530
Serum PSA(ng/dl)	3.72±1.42	4.05±1.16	0.071
IPSS	21.14±3.11	21.53±2.45	0.302
Qmax(ml/s)	5.79±2.32	6.24±1.56	0.411
PVR	99.17±19.55	83.12±20.56	0.001

In the present study the mean age of patients in group A was 78.46±2.21 and in group B was 77.32±5.32. All the baseline parameters were comparable between the two groups.

Table 2: Type of complications in both groups

Complications	Group A BPEP N(%)	Group B B-TURP N(%)	P-Value
Intra-operative			
Hemorrhage	1(2.04%)	2(4.0%)	0.695
Capsule perforation	0	1(2.0%)	0.632
Early			
Clot retention	2(4.08%)	8(16.0%)	0.021
Secondary hmg.	3(6.1%)	7(14.0%)	0.032
Blood Transfusion	3(6.1%)	8(16.0%)	0.332
UTI	1(2.0%)	2(4.0%)	0.071
Failed first trial of voiding	1(2.0%)	2(4.0%)	0.110
Stress incontinence	3(6.1%)	2(4.0%)	0.154
Late			
Bladder neck contracture	1(2.0%)	2(4.0%)	0.086
Urethral stricture/submeatal stenosis	2(4.08%)	0	0.098

Table 3: Clavien-Dindo Classification grade of analysed complication of both groups

CDC Grades	Group A BPEP	Group B B-TURP	P-Value
Grade 1	4(7.2%)	9(16.7%)	0.001
Grade 2	3(6.1%)	28(16.0%)	0.079
Grade 3	3(6.1%)	3(6.0%)	0.086
Grade 4	0	0	0
Grade 5	0	0	0

Table 4: The correlation coefficients of the Comprehensive Complication Index and the Clavien-Dindo Classification

	CCI (r)	CDC(r)
Length of stay	0.639	0.578
Irrigation time	0.456	0.449
Blood loss	0.426	0.436

DISCUSSION

In recent years, B-TURP has been advocated as an alternative to monopolar TURP-the gold standard for the surgical treatment of BPH (19). However, since the B-TURP technique is not substantially different from the monopolar technique and the amount of resected prostatic tissue did not differ significantly between the two procedures, the functional results of B-TURP are similar to those of monopolar TURP (20). A meta-analysis of 16 randomized, controlled-trials involving 1406 patients showed no clinically relevant difference in short-term efficacy between monopolar and B-TURP procedures (21). In contrast, the BPEP technique replicates the open enucleation of prostatic adenomas in an endoscopic fashion and combines the benefits of complete enucleation and a minimally invasive approach to BPH (16), allowing for more complete adenoma removal. We therefore in the present study compared the efficacy and safety of BPEP versus B-TURP in the management of prostates larger than 80g. Unsurprisingly, we found that when compared with the B-TURP procedure, BPEP was associated with shorter operative time, postoperative bladder irrigation duration and hospital stay. Furthermore, there was a greater weight of resected prostatic tissue, less postoperative hemoglobin decrease, better postoperative IPSS and Qmax, and lower incidences of hyponatremia, urinary sepsis, blood transfusion requirement and reoperation. All these suggest that BPEP is safe and feasible in the treatment of prostates larger than 80g.

After the adenoma was detached from the surgical capsule during BPEP, the blood supply to the adenoma was cut off and hemostasis was performed by coagulation under endoscopic monitoring (12). Therefore, the resection of the detached adenoma is virtually bloodless (15). In contrast, during TURP the vessels are repeatedly cut until the surgical capsule is reached (16). Therefore, intraoperative blood loss will be less in the BPEP procedure than in the B-TURP procedure (12, 16). Consistent with this previous observation, we found that postoperative hemoglobin decrease and the numbers of patients requiring blood transfusion and those developing bleeding requiring surgery differed significantly in favor of the BPEP procedure. Due to improved operative field visibility, decreased capsular perforation and more rapid, complete tissue removal (16), the operative time, postoperative bladder irrigation duration and hospital stay were significantly shortened in the BPEP procedure compared with the TURP procedure.

Excessive intraoperative absorption of irrigation fluid may lead to the occurrence of TURS, and the use of saline for irrigation can reduce the fluid absorption-associated morbidity and eliminate the risk of TURS (22, 23). In the current study, no TURS occurred in either the B-TURP group or the BPEP group, because both procedures used normal saline as irrigant. However, we found that the incidence of hyponatremia was significantly higher in the B-TURP group than in the BPEP group. This discrepancy may be explained by longer operative time and greater intraoperative blood loss associated with the B-TURP procedure.

Since BPH patients often develop urinary retention and urinary tract infections, bacteria in urine can spread via blood vessels or perforated prostatic capsule and induce urinary sepsis (24). When the adenoma is enucleated during BPEP, hemostasis is performed by coagulation. Thus, the chance of prostatic capsular perforation and the incidence of uri\nary sepsis are greatly reduced. In the present study, four patients in

the B-TURP group developed urinary sepsis, whereas no patients in the BPEP group developed this complication.

Studies have shown that the incidences of urethral stricture and bladder neck stenosis are not different significantly between the bipolar and monopolar TURP procedures (7). In this study, we found that the incidences of urethral stricture, postoperative acute urinary retention and bladder neck stenosis did not differ significantly between the BPEP and B-TURP procedures, suggesting that resection type is not a significant predictor of the risk of these complications.

Ideal TURP should involve accurate, complete removal of the adenoma. However, when performing traditional TURP, it is difficult to accurately judge the boundary between outer and inner glands and the depth of excision. This often results in excessive resection which may induce capsular perforation, or results in insufficient removal of the adenoma (18). Particularly, when the volume of the prostate gland is large, e.g., significantly above the level of the verumontanum, the surgeon often does not cut enough prostatic tissue at the apex due to serious concern about damaging the urethral sphincter and causing incontinence (12). As a result, recurrence often develops. Since the BPEP allows the removal of the adenoma accurately and completely (12, 15, 16), there is often little residual hyperplasia tissue.

In this article, we compared the two groups treated either by B-TURP or BPEP by CDC and CCI. The strength of the CDC relied on the principle of grading complications based on the therapy used to treat the complication.(21) CCI incorporates all complications that are weighted for their severity based on the CDC. Grade 1 complication only contributes 8.7 points of CCI if it occurs alone. When the patient was accompanied with multiple complications, the contribution of Grade 1 complication decreases accordingly. Thus, a low-grade complication is less important, if it occurs in combination with more severe complications. Our data showed that the incidences of complications with grade 2 or higher CDC grades between B-TURP and BPEP were without an obvious statistical difference.

Our study has several limitations. The non-randomized retrospective nature of the study is associated with a high risk of bias and may influence the interpretation of our data. In this single-center study, the relatively small sample size and short follow-up duration might lead to low statistical power and limit the strength of our conclusions. Furthermore, the inability to measure intraoperative blood loss and postoperative PV is another limitation of our study. Due to the resected cavity, the size of the residual adenoma cannot be exactly measured. Larger studies conducted in multiple centers will be required in future to confirm the findings of the present study.

CONCLUSION

In conclusion, our findings suggest that BPEP is superior to B-TURP in the management of prostates larger than 80g in terms of shorter operative time, postoperative bladder irrigation duration and hospital stay. There is also a greater weight of resected prostatic tissue, less postoperative hemoglobin decrease, better postoperative IPSS and Qmax. There are lower incidences of hyponatremia, bleeding, urinary sepsis, blood transfusion requirement, transitory incontinence and reoperation. However, longer-term and larger studies are needed to validate these results.

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