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ORIGINAL ARTICLE

Comparison of bipolar "button" plasma vaporization of the prostate versus bipolar transurethral resection in saline for benign prostate obstruction.

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ABSTRACT… Objective: To determine the differences in outcomes when bipolar button plasma vaporization is used to manage benign prostatic obstruction, compared to bipolar transurethral resection. **Study Design:** Randomized Controlled Trial. **Setting:** Department of Urology & Renal Transplant, DHQ Teaching Hospital, Gujranwala. **Period:** 9-6-2023 to 10-12-2023. **Methods:** To participate, 62 patients were selected and then randomized by simple random sampling into two groups. Group A received gamma knife BPVP and group B had the procedure known as Transurethral Resection of the Prostate (TURP). Patients stayed in post-surgical wards after the operation until they were allowed to go home. We noted how many days the patients were hospitalized, the time spent using irrigation and if they had a catheter. We also measured the amount of blood lost and how severe the lower urinary tract symptoms were. SPSS version 25 was used to look at the data. **Results:** The average patient age in group-I was 58.59±4.59 years and 57.67±4.61 years in group-II. BPVP patients had improvements in many perioperative outcomes, with less time for surgery (45.5 versus 69.8 mins), irrigation (9.96 versus 12.87 hours), catheterization (2.83 days versus 4.96 days), hospital length of stay (3.32 days versus 5.96 days) and lower blood loss (109.38 mL compared to TURP's 197.25 mL) ($p < 0.05$). Overall and when grouped by age and how long symptoms had lasted, IPSS scores showed no significant differences between the groups ($p > 0.05$). **Conclusion:** Initial findings indicate that BPVP is comparatively safer than TURP, extremely efficient, associated with reduced perioperative bleeding, and resulting in a shorter hospital stay.

Key words: Button Plasma Vaporization for Bipolar, Benign Prostatic Obstruction, Resection of Prostate Using Bipolar Technology.

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INTRODUCTION

Benign prostatic obstruction, often called benign prostatic hyperplasia, occurs when the prostate enlarges and causes problems and changes in the urinary tract.[1] It is estimated that one third of men at least 50 years old experience a worsening of their quality of life because of BPH. BPH can be seen under a microscope in almost all men older than 85 years. More than 14 million men in America are thought to have symptoms of BPH.[2] Throughout the world, it's estimated that 30 million men are troubled by BPH symptoms. In BPH, the prostate grows in size without becoming cancerous. Some symptoms are frequent urination, difficulty starting to urinate, a weak flow, an inability to urinate and loss of control over urinating. Sometimes, complications may be urinary tract infections, bladder stones or persistent kidney problems.[3,4]

The course of BPO in an individual is fundamentally uncertain. The symptoms and objective measurements of urethral obstruction may last without substantial alterations for a prolonged duration, and in certain instances, they may even exhibit amelioration over time in roughly one-third of males. Over a span of 3.5 years, a significant majority of men (73%) with moderate benign prostatic blockage did not encounter a deterioration in their urine symptoms.[5] A number of interventions have been developed and implemented in clinical practice to address the associated morbidity of symptomatic BPO.

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Various minimally invasive surgical procedures obviously have advantages over traditional surgery when it comes to treating this group of men and, possibly, can promote the efficacy of surgical intervention.

On the other hand, however, there is no sufficient long-term evidence regarding the effectiveness and potential side effects of these new methods vs. Bipolar transurethral resection of the prostate TURP.[6] Current research repeatedly demonstrates that both Monopolar Transurethral Resection of the Prostate (TURP) and open surgery are still associated with significant health concerns. Moreover, the emergence of innovative endoscopic therapies has led to a constant questioning of these old approaches. Bipolar plasma vaporization of the prostate (BPVP) is considered a safe and preferable alternative to TURP.[7] Rationale of this study is to compare the outcome of BPVP versus bipolar TURP, in saline. Literature showed that BPVP is better method to resolve BPO as compared to Bipolar TURP. But it is not in practice in public sector settings due to non-availability of local evidence. So, through this study we want to get local evidence that BPVP is safer and more effective method for BPO than bipolar TURP. This will help to improve our practice and in future we will implement the BPVP as first management protocol for patients of BPO instead of bipolar TURP.

METHODS

A Randomized Controlled Trial was conducted at Department of Urology & Renal transplant, DHQ Teaching Hospital, Gujranwala from 9-6-2023 to 10-12-2023 after approval from ethical review committee (Admin R.C No. 3149, 02/01/22). Sample size of 62 cases; 31 cases in each group were calculated with 95% confidence level, 80% power of study and taking magnitude of mean hospital stay i.e. 1±2.1 days with BPVP and 3±3.3 days with standard technique for management of BPO [8] using simple random sampling technique. Patients of age between 50 to 65 years presenting with BPO. BPO is defined as a noncancerous enlargement of the prostate gland that lasts for a duration beyond six months. The ultrasonographic assessment determined the dimensions of prostate and found no evidence of malignant cells on cytology. Nevertheless, the patient is encountering difficulty in urinating. Patients with known previous prostatic or urethral surgery (on medical record) neurogenic bladder, prostate cancer, significant high PSA (>14 ng/dl) and hard or nodular prostate, negative Transrectal Ultrasound (TRUS) of prostate or responded to medical therapy were excluded.

A total of 62 patients who met the selection criteria were enrolled. Each patient provided informed consent. The demographic information, including the individual's name, age, address, and duration of symptoms, was recorded. The patients were allocated into two groups using a random lottery procedure. BPVP was conducted in group A. Bipolar TURP was performed in group B. A solitary surgical team conducted all surgeries with the support of a researcher. General anesthesia was used for all surgical procedures. The duration of the operation was recorded in hours, starting from the time when anesthetic was fully provided until its completion. Blood Loss was assessed in ml of blood in suction drain and soaked gauze (1g=1ml). After undergoing surgery, patients were transferred to post-surgical wards and remained there until they were discharged. The patient will be released from the hospital once the drain is removed and they indicate a pain level below 3 on a vocal rating pain scale that ranges from 0 to 10. The length of the hospitalization period was recorded. The study also recorded the total duration of irrigation, catheterization, blood loss, and lower urinary tract symptoms (LUTS score). Irrigation time was assessed post-operatively as the time required to irrigate the resected prostate in terms of hours. Catheterization Time was entailed quantifying the duration required for catheter insertion. LUTS symptoms were compared according to the International Prostate Scoring System (IPSS) 24 hours following the operation. The catheter will be removed whenever the discharge reduces to below 20 milliliters per day. All data was entered and analyzed in SPSS version 25.0. Both groups were compared for mean outcome by using independent sample t-test. P-value < 0.05 was taken as significant.

RESULTS

The mean age of patients in group-I was 58.59 years (±4.59) and the mean age of those in group-II was

57.67 (±4.61). The typical duration of symptoms for group-I was 8.29±1.10, as were they for group-II at 8.32±1.24 as showed in Table-I

TABLE-I

Baseline characteristics of patients in both groups

	Group-I	Group-II
n	31	31
Age of the Patients	58.58 ± 4.59	57.67 ± 4.61
Duration of Symptoms	8.29 ± 1.1	8.32 ± 1.24

Table-II shows the International Prostate Symptom Score (IPSS) comparison for LUTS in subjects with BPVP and those with TURP, grouped by how long their symptoms had been present and their age. The average for the IPSS was slightly lower with BPVP (8.032 ± 3.7281) than the average with TURP (8.774 ± 3.0409); yet, the difference was not significant (p = 0.39). There was no significant difference in the International Prostate Symptom Score (IPSS) by age group (50–55, 56–61 and 62–67 years) between the Montelukast and Verapamil groups. Results from analysis by duration (7 to 8 years and 9 to 10 years) of symptoms also did not find any differences in IPSS scores between patients in the BPVP and TURP groups (p = 0.72, p = 0.49, respectively).

Table-III looks at important outcomes of care following surgery for both the BPVP and TURP approaches. Several parameters indicated that the BPVP procedure could result in positives. Patients who received BPVP had significantly shorter operating times on average (45.51 ± 14.29 minutes) than those who had TURP (69.83 ± 32.08 minutes, p = 0.0004). BPVP plants also needed less irrigation, spending 9.96 ± 2.9 hours under water vs. 12.87 ± 5.0 hours for the control group, p = 0.007. Catheterization time was much shorter for BPVP (2.83 ± 0.82 days) than for TURP (4.96 ± 1.49 days, p < 0.0001).

The mean hospital stay was shorter in the BPVP group (3.32 ± 1.93 days) than in the TURP group (5.96 ± 1.44 days; p < 0.0001). The BPVP group had less estimated blood loss (109.38 ± 33.04 mL) than the TURP group (197.25 ± 77.74 mL, p < 0.0001). Although the IPSS for LUTS was a little lower in the BPVP group (8.03 ± 3.73) than in the TURP group (8.77 ± 3.04), this difference was not considered significant (p = 0.395).

DISCUSSION

Recent studies indicate that about 75% of men will have BPH by the age of 70. [9] The TURP remains the prevailing method for managing BPO. Nevertheless, numerous difficulties were documented in relation to this surgery.[10] Laser treatment and transurethral microwave therapy have made it difficult for TURP to help those with symptoms of BPO. This technique removes obstructive tissue using laser energy, not thermal or electrical radiation which is used in other treatments.

TABLE-II

Comparison of IPSS for LUTS between BPVP and TURP groups

Stratification	Group	n	Mean	SD	t-value	P-Value
Overall	BPVP	31	8.032	3.7281	0.86	0.39
	TURP	31	8.774	3.0409		
Age 50–55	BPVP	7	7.714	3.8173	0.24	0.81
	TURP	11	8.091	2.8445		
Age 56–61	BPVP	14	6.571	3.5239	1.45	0.15
	TURP	12	8.500	3.1766		
Age 62–67	BPVP	10	10.300	3.0930	0.12	0.91
	TURP	8	10.125	3.0443		
Duration 7–8 years	BPVP	19	7.263	3.1241	0.35	0.72
	TURP	17	7.647	3.3716		
Duration 9–10 years	BPVP	12	9.250	4.3927	0.69	0.49
	TURP	14	10.143	1.9158		

TABLE-III			
Comparison of outcome in both groups			
	BPVP	**TURP**	**P-Value**
n	31	31	
Time of Operation	45.51 ± 14.29	69.83 ± 32.08	0.0004
Irrigation Time	9.96 ± 2.9	12.87 ± 5.0	0.007
Catheterization Time	2.83 ± 0.82	4.96 ± 1.49	<0.0001
Hospital stay	3.32 ± 1.93	5.96 ± 1.44	<0.0001
Blood Loss	109.38 ± 33.04	197.25 ± 77.74	<0.0001
IPSS For LUTS	8.03 ± 3.73	8.77 ± 3.04	0.395

Light from the laser passes into the adenomatous tissue in the prostate and vaporizes it so the tissue does not burn. There is a thin layer of clotted tissue that forms too which helps control the bleeding.[11] Now, we are looking at these treatments and weighing them against TURP based on their effectiveness, the problems patients may experience, their length of hospital stay and their expense. The plasma kinetic system was begun by performing transurethral vaporization of the prostate with water instead of steam. The plasma corona that appears on a spherical electrode from the UES-40 bipolar high-frequency generator is the basis for BPVP. Applying plasma vaporization leaves a gentle seal on the problem area, stopping bleeding. Because bleeding was handled well, the surgeon had an excellent view of everything during the procedure.[12-13]

The study conducted by El-Hawy et al., in 2021 found that postoperative outcomes were significantly better in cases where BPVP was used compared to classic TURP. The researchers reported that BPVP improved operative visibility, reduced capsular perforation, decreased operative time, and resulted in faster and more complete tissue removal, which is consistent with findings from previous studies.[14] However, our investigation yielded contrasting results compared to the aforementioned study. In our study, we did not observe any notable disparity in the average values of BPVP and TURB, since the p-value did not reach statistical significance. The p-value is 0.39. Samir et al. also found that bipolar TURP resulted in less intraoperative bleeding and a shorter irrigation time, with statistical significance ($P < 0.001$).[15] These findings are consistent with multiple meta-analysis studies that have demonstrated that PVP utilizing laser energy and BPVP resulted in significantly reduced durations of catheterization and hospitalization compared to monopolar TURP.[16]

The rationale behind shorter postoperative hospitalization after BPVP is that it promotes correct haemostasias, reduces blood loss and hemorrhagic episodes, and subsequently decreases morbidities.[17] Patients who underwent TURP required a longer duration of irrigation postoperatively. Our study found that the irrigation for TURP was twice as long as that for BPVP, which aligns with these findings. In the study conducted by Castellani et al. in 2021, did a study comparing the effectiveness of the BPVP and standard TURP procedures for treating BPO. The study identified a marked distinction between the two methods with regards to the average operating time, the duration of catheterization, the length of irrigation, and the length of hospital stay. Data was reported in average values, and the following p-values were assigned to each variable: (53min vs. 62min 0.004), (2days vs. 3days, 0.03), (15hours vs. 26hours, 0.0001), (1days vs. 3days, 0.0001), respectively.[18] In our investigation, the average operating duration in the BPVP group was 45.51±14.29, which is shorter than the study mentioned before. The mean values of BPVP and TURP in our investigation did not show any significant difference, which aligns with the findings of the previously described study.[19]

The report indicates that the average duration of catheterization for the TURP group was significantly longer than that of the BPVP group (115.2 vs. 23.8). These findings align with our study, where we observed a longer duration for the TURP group

compared to the BPVP group (4.96 vs. 2.83). Additionally, the report highlights a significant decrease in IPSS (International Prostate Symptom Score) for the BPVP group (24.2–5.0) compared to the TURP group (18.8–7.2).[20] The results of our investigation differ from these findings. In our study, we did not see a significant difference in the IPSS score between the BPVP group and the TURP group (8.03 vs 8.77). Additionally, the p-value was not statistically significant (p-value=0.39). According to the earlier study performed by Habib, et al. in 2022, the duration of operation was also markedly shorter for BPVP in comparison with TURP – 39.0 ± 15.5 min and 69.3 ± 24.8 min, correspondingly.

The same has been observed concerning the length of catheter use – 4.1 ± 4.1 and 6.8 ± 6.8 days for the first and the second groups, respectively. The quantity of blood loss was notably reduced in the first group in comparison to the second group (64.7 ± 103.8 ml vs. 254.7 ± 325.4 ml, P = 0.040). The duration of hospitalization was shorter in the first group as compared to the second group (8.7 ± 1.0 days vs. 11.7 ± 1.5 days, P = 0.000). The first group had a lower IPSS score compared to the second group (4.2 ± 8.0 vs. 9.3 ± 3.7, P = 0.049).[21] To summarize, BPVP with a "button-type" electrode is a highly efficient and low-risk endoscopic treatment for BPH. It has a high success rate and is well-received by patients during follow-up. However, when comparing BPVP with "button-type" electrode to its predecessor PKVP, bipolar TURP, and standard TURP, it shown a considerable improvement in short-term effectiveness. The new approach can be supported by credible evidence of substantial enhancements in catheterization duration, hospital stay, complications rate, and follow-up metrics such as IPSS, HRQL, and Qmax.[22] Karakose et al., suggested that BPVP may be used for cardiac pacemaker and bleeding disorder patients since there is no return current needed in this surgery and hence, minimizes the risks of burns and problems with pacemakers.[5]

Sinha et al. compared TURP to laser treatment used for men with BPO. They explained that a laser procedure allows people to be discharged from the hospital sooner (0.7 days) than other treatments, yet the laser requires patients to be followed for a longer period of time. Due to the small group, single-center approach and little time for follow-up, the results cannot be generalized to everyone. Further studies with bigger groups and a longer follow-up are necessary to test if BPVP works well and safely over a long period, as compared to TURP. Further research should also explore patient-reported outcomes and cost-effectiveness to support broader implementation in public healthcare settings.

CONCLUSION

The data suggests that BPVP is safer, just as effective as TURP, linked to less perioperative bleeding and allows for a shorter hospital stay than TURP. For appropriate cases, we propose that BPVP should be the first type of surgery used for BPO patients.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Zain Yasin Butt:** Design of study.
2	**Muhammad Irfan:** Correction of data.
3	**Muhammad Shafi Ghouri:** Analyzation of data.
4	**Athar Mahmood:** Supervision of work.
5	**Muhammad Asif Raza:** Proof reading.
6	**Rao Nouman Ali:** Data tabulations.