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Original Article

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A Prospective Analytical Study on Comparison of Bipolar Transurethral Enucleation of Prostate Vs Bipolar Transurethral Resection of Prostate

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ABSTRACT

Objectives: The purpose of this study was to evaluate the safety and effectiveness of bipolar transurethral enucleation and resection of the prostate (TUEP) compared to bipolar transurethral resection of the prostate (TURP) in the treatment of enlarged prostate, with a focus on long-term results.

Materials and Methods: The present study conducted in patients admitted in Gandhi medical college associated Hamidia Hospital, Bhopal and carried out in Department of General Surgery. The study included 40 patients who admitted with the diagnosis of benign prostatic enlargement and underwent surgical treatment either by TEUP (n=20) or TURP (n=20) between the time periods of Jan 2021 to Sept. 2022. Patient characteristic and laboratory data were recorded and were examined pre and post operatively in terms of safety and efficacy.

Results: There were no significant differences in the preoperative parameters between groups. Comparing with TURP, TUEP had shorter time taken for surgery (33.5±3.28 and 46.75±7.99), more amount of tissue resected (33±8.74 and 26.5±9.45), minimal Post-OP-IPSS score (1.05±1.05 and 4.7±1.38) and fall in HB level (1.17±1.13 and 2.03±1.00) with statistically significant difference. In TUEP group significantly fewer reoperation and complications occurs with minimal Clavien-Dindo Grading(p-value-0.0003)as compared to TURP group. The statically significant lower mean hospital stay observed in TUEP and TURP groups (3.05±0.22 and 3.95±0.82, p-value-0.0298).

Conclusion: It is recommended that TUEP be chosen as the primary method for larger prostate sizes, as it has fewer complications, a shorter hospital stay, and greater safety and efficacy compared to TURP.

Key Words: *Transurethral resection of prostate (TURP), transurethral enucleation and resection of the prostate (TUEP), benign prostatic hyperplasia (BPH), benign prostatic enlargement (BPE), Prostate*

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INTRODUCTION

The most common reason for lower urinary tract symptoms (LUTS) in elderly men is an enlarged prostate, which can lead to obstructive or irritative symptoms and even urinary retention, significantly impacting their quality of life.[1]The symptoms associated with prostate enlargement, previously referred to as voiding and storage symptoms, include straining, frequent urination at night (nocturia), a weak or intermittent urine stream, dribbling after urination, reduced force of urine, and painful urination (dysuria).[3–5]

The medical management of BPH includes the use of alpha blockers or 5 alpha reductase inhibitors. The surgical treatment options for BPH have evolved from traditional open surgeries such as suprapubic and perineal prostatectomies to more advanced procedures like transurethral resection of the prostate (TURP), which has led to the development of numerous minimally invasive and endoscopic procedures like transurethral needle ablation of the prostate (TUNA), transurethral ultrasound-guided laser-induced prostatectomy (TULIP), transurethral vaporization of the prostate (TUVP), and transurethral incision of the prostate (TUIP).[6,7]

Surgical intervention is an effective and long-term solution for managing BPH. While open surgeries are becoming less common with the rise of endoscopic procedures, they still have their place in certain cases, such as when the patient has a large prostate weighing more than 75 grams, BPH with a large bladder diverticulum, or large vesicle stones in combination with an enlarged prostate. Additionally, open surgery may be necessary in patients who cannot be placed in the lithotomy position due to conditions such as hip ankylosis. The EAU guidelines recommend TURP for prostates with

a volume between 35 and 80 ml, and clinical evidence suggests that open surgery remains the only option for treating BPH beyond this point.[8,9]

Despite significant advancements in technology, equipment, and electrocautery, the basic principles of TURP remain unchanged, and there have been notable reductions in morbidity and mortality associated with the procedure.[10] During TURP, both bipolar current and monopolar cautery can be used, and all alternative methods are compared to the established monopolar technique, it is considered the "gold standard" due to its established long-term effectiveness.[9,11]This method has shown promising results and is now a more commonly used surgical procedure for benign enlargement, with the added benefit of fewer complications. However, despite its growing popularity, bipolar TURP has not completely replaced monopolar TURP, which is still considered the preferred "gold standard." [12]

LASER enucleation procedures are similar to open prostatic enucleation but are less invasive and allow for more extensive removal of the adenoma. The procedure results in less blood loss and quicker recovery times compared to open techniques, which enables patients to go home sooner.[13] LASER enucleation/vaporization operations can also be performed on patients who cannot safely discontinue anticoagulant drugs for a short period of time. However, there is a significant initial investment involved in LASER treatments as the technology is expensive and has a steep learning curve.[7,14,15]

Liu et al.[16] have developed a new method for treating BPH called transurethral enucleation and resection of the prostate (TUEP), which utilizes a bipolar plasma kinetic resectoscope to enucleate and resect the prostate. Studies have shown that TUEP is a safe and effective treatment option for BPH with minimal adverse effects[17,18] and offers more clinical benefits than other procedures, but has not yet gained widespread acceptance.[18,19]

Large-sized prostates are more common in India than in developed countries due to insufficient primary care in rural areas. Although this situation is gradually improving, it is still common to find individuals with severe lower urinary tract symptoms who received surgical interventions years ago and never required or received any medical guidance or follow-up.[8]

So in this context, we conducted this prospective, analytical intervention that aims to compare the safety, efficacy, and outcomes of two surgical procedures - Bipolar Transurethral Enucleation and Resection of the Prostate (B-TUEP) and Bipolar Transurethral Resection of the Prostate (B-TURP) - for the treatment of BPH in patients with prostate sizes ranging from 40 to 100 ml.

MATERIAL & METHOD

The present prospective and analytical study was conducted in the Department of General Surgery Gandhi Medical College and associated Hamidia Hospital, Bhopal M.P., in accordance with the recommended ethical guidelines of the Institutional Ethics Committee (IEC). The study included 40 patients who admitted with the diagnosis of benign prostatic enlargement and underwent surgical treatment eitherby TEUP (n=20) or TURP(n=20) between the time periods of Jan 2021 to Sept. 2022. All patients of refractory LUTS (lower urinary tract symptoms) secondary to BPH benign prostate hyperplasia), IPSS greater than 15, andprostate size on preoperative TRUS of 40 to 100 ml were included in the study. We excluded patients with neurological disorder, active urinary tract infection, active bladder or prostate cancer and urethral stricture.

Methodology

Patients were recruited as per inclusion and exclusion criteria and divided in two groups, alternatively subjected to surgery by Bipolar TURP and TUEP technique without any bias.

Group A (TURP): All patients were given epidural anesthesia and a 400 mg intravenous dose of ciprofloxacin. The surgical procedures were performed by a single senior surgeon who was well-experienced in TURP procedures. Bipolar resection was carried out using a 24F resectoscope, a 5 mm diameter plasma-loop electrode, and a Gyrus Plasmakinetic generator set at 160 W (cutting mode) and 80 W (coagulation mode), with all prostatic chips removed from the bladder at the end of the procedure. After the operation, a 22F three-way Foley catheter was inserted into the bladder and normal saline solution was used for bladder irrigation. The patients' serum sodium and hemoglobin levels were measured again within 10 minutes after the end of the procedure. Saline irrigation was discontinued once the patient was able to drink enough fluids for auto-irrigation. Finally, the catheter was removed if the patient's urine was completely clear and they had passed stool.[20]

Group B (TUEP): The TUEP procedure was performed according to the previously established method. To begin, a cut was made near the verumontanum in order to cut the urethral mucosa deeply towards the surgical capsule level. The distal mid-lobe and mucosa were dissected in a retrograde manner towards the bladder neck, and the adenoma was detached from the surgical capsule. The denuded supply vessels and hemorrhage spots on the capsule surface were then identified and coagulated to stop the lobe blood supply. The bilateral lobes along the surgical capsule were detached, and

all supply vessels were coagulated. Finally, the adenoma was resected, and all adenoma fragments were removed using an Ellik evacuator. A 20-F 3-way Foley catheter was then inserted, and straight drainage was used until the hematuriasufficiently resolved.[16] All patients underwent laboratory tests, including hemogram, renal function tests, and urinalysis, both before and after the surgery.

Statistical analysis

The data were compiled and entered into a Microsoft Excel spreadsheet. SPSS Version 20.0 (SPSS Inc. Chicago, Illinois, USA) was used for statistical analysis. Continuous and categorical variables were expressed as mean (standard deviation) and as frequencies and percentages, respectively. Student's t-test was used for comparing continuous variables. Categorical variables compared using either the Chi-square test or Fisher's exact test. $P<0.05$ was considered as statistically significant.

RESULT

There was no statistical difference between the two groups regardingpreoperative parameters and both groups had comparable preoperative values for age(p-value-0.8537), prostate size (p-value-0.9658), Hb level (p-value-0.3798), and IPSS score (p-value-0.7041).(Table 1) No statistically significant difference was also observed for age group distribution between two groups (p-value-0.5616). (Figure 1)With regards to the postoperative data, there was a significantdifference between both groups in time taken for surgery (33.5±3.28 and 46.75±7.99), amount of tissue resected (33±8.74 and 26.5±9.45) and Post-OP-IPSSscore (1.05±1.05 and 4.7±1.38) which were lower in the TUEPthan in the TURP group except amount of tissue resected. Among the fall in HB level (1.17±1.13 and 2.03±1.00) and fall in IPSSscore (24.05±3.53 and19.9±4.3), there were statistically significant difference between both groups. In TUEP group reoperation done in only one case (5%) whereas in TURP group reoperation done in 7 cases (35%) and statistically significant difference between two groups was observed (p-value-0.0192). Further among all reoperated patients of TUEP, 1 patient was reoperated on 3rdday while in TURP group, 5 patients were reoperated on 2ndday and 2 patients were reoperated on 3rdday.Statistically significant difference between two groups was observedwith regard toreoperation (p-value-0.1967).Among Clavien-Dindo Grading, in TUEP group, grade "0" (12, 60%) was in majority followed by I (5, 25%) whereas II, 3A, and 3B Grades were equally distributed as 1 (5%). In TURP group, grade I (8, 40%) was in majority followed by 3B (7, 35%) and II (5, 25%). There was a statistical significant difference observed between groups with respect ClavinDindo Grading (p-value-0.0003).The majority of complications occurs in TURP group as compared to TUEP and an insignificant difference (p-value-0.0528) was observed between both groups. Among treatment prescribed, statistical significant difference observed between groups was observed (p-value-0.0222).Antipyretic (8, 28.6%) was prescribed in majority followed by blood transfusion (6, 21.4%) whereas antiemetic prescribed in 5 (17.9%) cases, among 28 patients in which complications observed. The mean hospital stay in TUEP and TURP groups were 3.05±0.22 and 3.95±0.82 respectively and statically significant difference was observed (p-value-0.0298).

DISCUSSION

Benign prostate hyperplasia (BPH) is a high prevalent disease among the middle aged/elderly male population..[21] Surgical options varying from minimally invasive procedure to open prostatectomy depending on the patients need. Several devices and techniques have been developed to overcome the limitations of Monopolar TURP .[22]

For the treatment of symptomatic benign prostatic hyperplasia, transurethral resection of the prostate (TURP) has traditionally been considered the gold standard after medical therapy has failed.[23] Despite TURP's high success rate, with a morbidity rate of 15% to 18% and a mortality rate of 0.001%, monopolar TURP has some disadvantages.[24] Bipolar TURP (BTURP) using normal saline as an irrigantsignificantly reduces the risk of transurethral resection syndrome (TURS).[25] Although the weight of resected prostatic tissue and operative duration is similar between monopolar and bipolar TURP, bipolar TURP has significantly less fluid absorption.[26] There are no significant differences in early and late complications such as clot retention, urinary retention, bladder neck stenosis and urethral stricture between the two procedures.[23] To improve its efficacy and safety, there is still a need to upgrade this technique. Transurethral enucleation and resection of the prostate (TUEP) is a newly developed procedure in which the prostate is enucleated and resected transurethrally using a bipolar plasma kinetic resectoscope.[16] Studies have suggested that TUEP is a safe and feasible treatment for BPH with few complications, and although several studies have shown that TUEP provides better clinical benefits than other treatments, it is still not widely accepted. [16,27,28]

There was no statistical significant difference between groups with respect to preoperative mean age, mean prostate size, mean Hb level and mean IPSS score of patients thus eliminating their confounding effects. The similarity of the characteristics of the patients ensures that any difference in outcome is purely due to the intervention and not due to chance bias. Our study shows that there were a fair number of men who present with moderately enlarged prostates. Possible reasons for this might be a lack of awareness and lack of access to health care, resulting in late presentation to medical facility, by which time the prostate gland would have grown considerably larger.

During comparison of postoperative parameters between two groups, there was a statistical significant difference (p-value<0.0001) and lesser time were taken in TUEP group during surgery as compared to TURP group. In contrast to our study Hirasawa et al[29] reported that total operating times of TUEP and TURPdid not differ significantly.Further a Meta

study done by Lin et al. also observed that TUEP associated with longer operative time. This finding might be attributed due to not inclusion of nucleation time in total operative time.[29]The study conducted by Palaniappan et al. [30]found that the duration of resection was significantly longer in TUEP compared to TURP. This can be attributed to the fact that TUEP involves enucleation and resection, both of which take longer. According to the authors, this is not surprising as the crucial steps in TUEP, such as identifying the cleavage plane between the false capsule and adenoma, and performing blunt detachment of the adenoma in a retrograde manner, are more challenging and time-consuming.

Due to excellent hemostasis in TUEP, thefall in hemoglobin level was significantly lower in TUEP. Similar observation were reported by several studies which stated that TUEP generated a smaller drop in serum hemoglobin level.[18,31–34].However, insignificant difference between the groups with respect to post-OP Hb level.

Previous reports on TUEP suggest that patients with a prostate size of 40-80 g on ultrasonography would be ideal candidates for this procedure. This is because the plane between the adenoma and false capsule is more clearly defined in larger prostates than in smaller ones (i.e. those below 40 g). Chronic inflammation may be a possible cause of a less well-defined plane in smaller prostates. Prostates that weigh more than 80 g can be challenging, as enucleation can create potential spaces that may disorient a beginner. In this case, the surgeon can perform enucleation and resection simultaneously, without having to complete enucleation before adenoma resection.[30]

Amount of tissue resected in TUEP group was 33.00±8.74 and 26.50±9.45 gm in TURP group which was statistically significant different (p-value-0.0298).This in an agreement withChen et al.[35], Geavlete et al.[36], Rao et al.[32] and Ou et al.[18] studies which reported more prostate tissueresected in TUEP group.

With regards to its efficacy and safety, in our study, TUREPachieved a better outcome in terms of postoperativemean IPSS score, fall in IPSS score, reoperation, mean hospital stay, Clavien-Dindo Grading and lesser complications.

This statisticallysignificant outcome was in agreement with the results ofLin et al and Hirasawa et al., who reported significant improvement in IPSS score in TUEP group.[29,37]In another study done Mallikarjuna et al also observed improved mean IPSS score after TUEP with significant improvement in all aspects of IPSS which fully matched with our observations.[7]In contrast to our findings Cheng et al. reported insignificant improvement in IPSS which is not agreement to our study.[30]

In the present study in TUEP group reoperation done in fewer case (5%) whereas in TURP group reoperation done in more cases (35%) which was statistically significant differe(p-value-0.0192). These finding matched with Wei et al. study, who observed nil cases in TUEP and 7 cases of reoperation in TURP in a study of total 474 patients.[38]

The mean hospital stay was statically significant differ between both groups with respect to hospital stay (p-value-0.0298).Wei, et al [38] also reported significantly shorter hospital stay in the B-TUEP group (4 Days) than in the Bipolar TURP (5 day) group ($P<0.05$) which is comparable to our findings. Several others workers also reported that BTUEP required significant smaller hospital stay as compared to BTURP.[7,29,30,37,39] however, Liao and Yu and Luo et al noted that there was no significant difference in postoperative catheterization time and postoperative hospital stay.[40,41] Also, Kan et al found that there was no significant difference in hospital stay between the two groups.[42]

In patients with benign prostatic hyperplasia (BPH), urinary retention and urinary tract infections are common, and the presence of bacteria in urine can cause urinary sepsis by spreading through blood vessels or a perforated prostatic capsule.[43] During TUEP, hemostasis is performed by coagulation after enucleating the adenoma, which reduces the risk of prostatic capsular perforation and the incidence of urinary sepsis. We found that four patients in the Bipolar TURP group developed urinary sepsis, whereas none of the patients in the TUEP group had this complication.We used Clavien-Dindo Grading to assess the complications among two groups.Among Clavien-Dindo Grading, grade “0” (12, 60%) and grade I (8, 40%) were in majority in TUEP groupand TURP group respectively with statistical significant difference (p-value-0.0003). Our findings comparable to other authors also who reported significantly minimal complications in TUEP as compared to TURP group.[38] Other studies have also suggested that TUEP is a safe and feasible treatment for BPH with few complications.[16–18,28]

CONCLUSION

Our study suggests that TUEP appears to be a secure method for treating larger prostates. It is recommended that this procedure be chosen as the primary method for larger prostate sizes, as it has fewer complications, a shorter hospital stay, and greater safety and efficacy compared to TURP.

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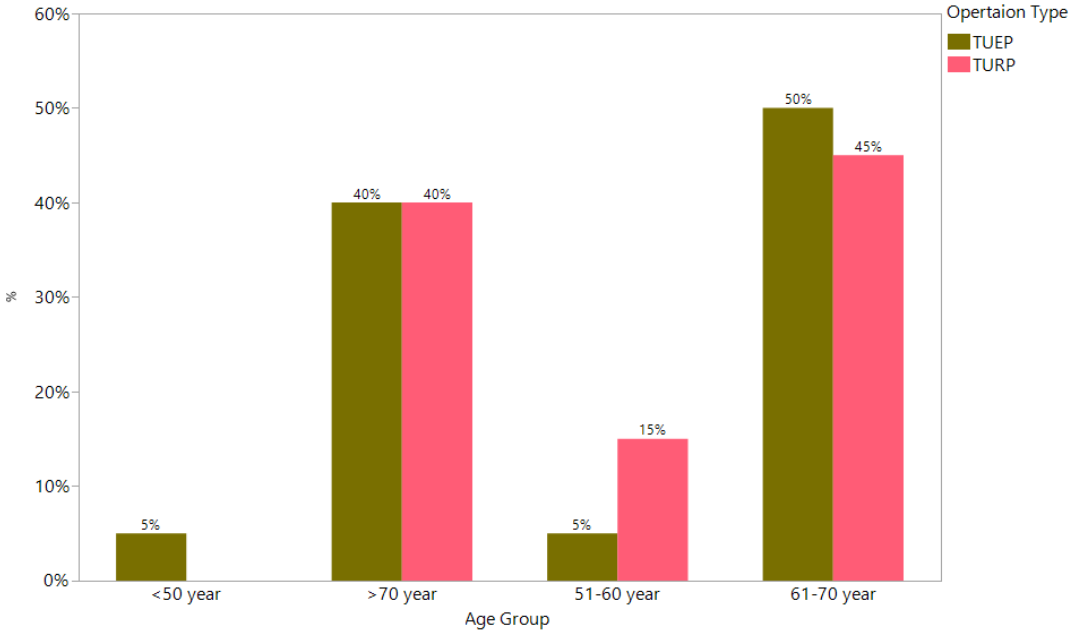

Figure 1: Distribution of cases according to agebetween the groups

Table 1: Baseline preoperative parameters between the groups

Pre-OPParameters	TUEP (n=20) (Mean± SD)	TURP (n=20) (Mean± SD)	P value
Mean Age	68.60±7.59	68.00±9.35	0.8537
Prostate Size	56.75±20.69	56.50±15.63	0.9658
Hb-Pre-OP	11.1±1.28	11.48±1.45	0.3798
IPSS-Pre-OP	25.1±3.22	24.60±4.87	0.7041

Table 2. Comparison of postoperative parameters between the groups

Post-OPParameters	TUEP (n=20) [Mean±SD/ n(%)]	TURP (n=20) [Mean±SD/ n(%)]	P value
Time Taken for Surgery	33.5±3.28	46.75±7.99	<0.0001
Hb-Post-OT	9.78±1.36	9.45±1.45	0.4698
Fall In HB	1.17±1.13	2.03±1.00	0.0150
Amount of Tissue Resected	33±8.74	26.5±9.45	0.0298
IPSS- Post-OP	1.05±1.05	4.7±1.38	<0.0001
Fall in IPSS	24.05±3.53	19.9±4.3	0.0019
Reoperation Done			
No	19(95)	13(65)	0.0192
Yes	1(5)	7(35)	
Reoperation Done On			
2nd Day	0 (0.0)	5 (71.4)	0.1967
3rd Day	1 (12.5)	2 (28.6)	
ClavinDindo Grading	12(60)	0(0)	
0			
I	5(25)	8(40)	
II	1(5)	5(25)	0.0003
3A	1(5)	0(0)	
3B	1(5)	7(35)	
Complications			
Fever	1(12.5)	7(35)	
Severe Anemia	1(12.5)	5(25)	
Vomiting	4(50)	1(5)	
Difficulty in Micturition	0(0)	3(15)	0.0528
Increased Frequency of Micturition	1(12.5)	2(10)	
Poor Stream Of Urine	0(0)	2(10)	
Urinary Incontinence	1(12.5)	0(0)	
Treatment/ Reoperation			

Antipyretic	1(12.5)	7(35)	
Blood Transfusion	1(12.5)	5(25)	
Antiemetic	4(50)	1(5)	0.0222
Reoperation	1(12.5)	7(35)	
KEGEL Exercise	1(12.5)	0(0)	
Hospital Stay (Days)	3.05±0.22	3.95±0.82	<0.0001

TUEP, transurethral enucleation and resection of the prostate; TURP, Transurethral Resection of the Prostate;IPSS, international prostate symptom score; Hb, Haemoglobin.