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Comparative Outcomes of Open Prostatectomy and Transurethral Resection of the Prostate for Benign Prostatic Hyperplasia

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ABSTRACT

The urinary function and comfort are substantially impacted by Benign Prostatic Hyperplasia (BPH), common in aging men. Moderate to severe cases frequently necessitate surgical interventions. Both Transurethral Resection of the Prostate (TURP) and Open Prostatectomy (OP) are well-established surgical procedures. **Objective:** To evaluate the efficacy, safety and patient outcomes of OP and TURP in the treatment of BPH. **Methods:** This quasi experimental study included 288 male patients diagnosed with BPH, allocated in the groups to undergo either OP (n=144) or TURP (n=144). The primary outcomes assessed were postoperative International Prostate Symptom Score (IPSS), maximal urinary flow rate (Qmax) and postvoid residual volume (PVR). Operative time, blood loss, hospital stay, complication rates and reoperation rates were secondary outcomes. **Results:** IPSS (at 1 month and 6 months), Qmax (at 1 month and 6 months) and PVR (at 6 months) were significantly improved in TURP patients ($P < 0.05$). OP patients encountered longer operative times ($P < 0.05$) and higher intraoperative blood loss ($P < 0.05$). Although trends favored the TURP group, there were non-significant differences between the groups regarding complications viz urinary incontinence and erectile dysfunction. Postoperatively, TURP also led to reduced analgesic needs and shortened hospital stays. **Conclusion:** TURP is the preferred treatment for most patients with BPH due to its faster recuperation, reduced complications and enhanced urinary function in comparison to OP. However, OP continues to be the valuable procedure for individuals with larger prostate volumes or specific clinical scenarios in which TURP may be insufficient.

INTRODUCTION

Benign Prostatic Hyperplasia is a prevalent urological condition that is associated with non-malignant enlargement of the prostate organ. It is most prevalent among the aging male population. Approximately 50% of male are affected by BPH by age of 60 and prevalence increases significantly with age, reaching up to 90% by the age of 85 [1-2]. This condition can result in lower urinary tract symptoms (LUTS), which can substantially reduce life comfort. These symptoms include urinary frequency, urgency, nocturia, weak stream and incomplete bladder emptying [3-4]. The management of BPH has undergone significant changes over the years, with the variety of therapeutic options available, including conservative management, pharmacotherapy and various surgical interventions [5]. When symptoms are moderate to severe, medical management fails or complications such as recurrent urinary tract infections, bladder stones or renal impairment develop, surgical treatment becomes a consideration [6]. Various factors, such as the size of prostate, specific symptoms, presence of comorbid conditions and preferences of the patient and clinician, influence the selection of the surgical technique. The TURP

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has been the conventional gold standard for surgical intervention. TURP has a long history of providing effective symptom relief; however, it is also linked to risks such as infection, bleeding and the rare but severe complication of TURP syndrome, which is characterized by diluted hyponatremia and hypertension [7, 8]. The popularity of alternative surgical methods has increased in recent years as a result of technological advancements and pursuit of procedures with shorter recovery periods and fewer complications [9]. Transurethral microwave thermotherapy, prostatic urethral lift systems and laser therapies (e.g., Holmium Laser Enucleation of Prostate - HoLEP) are minimally invasive techniques that have the potential to achieve comparable efficacy to TURP, with the potential for shorter convalescence and fewer adverse effects [10]. Each technique possesses a distinctive set of advantages and limitations that warrant a thorough examination [11-14].

This study aimed to investigate and evaluate efficacy, safety and patient outcomes of various surgical techniques as they pertain to the treatment of BPH.

METHODS

From May 2023 to April 2024, a quasi-experimental study was conducted at Gomal Medical College in Dera Ismail Khan to compare the complications and outcomes of TURP and OP for treating BPH. Using convenient sampling technique, the study encompassed 288 male patients, who were diagnosed with moderate to severe BPH. The sample size was calculated by the mean maximal urinary flow rate (Qmax), between OP (16.4 + 2.3) and TURP (13.3 + 1.5), by taking 80% power of test and 95% confidence interval, the sample size was 14, which was too small to perform statistical test with good efficiency, so we increase our sample size upto 288(144 in each group) [15]. Participants were required to meet the following eligibility criteria: having over 50 years age, diagnosed with BPH through clinical examination, prostate-specific antigen (PSA) levels, digital rectal examination and prostate ultrasonography. Patients with severe cardiovascular conditions, severe respiratory disorders, significant coagulopathies or any other health issues that would pose a high-risk during surgery were excluded from the study. In our study, we utilized a consecutive sampling technique for sample selection. All eligible patients presenting with moderate to severe BPH at our institution during the study period were included, provided they met the inclusion criteria and consented to participate. The participants were allocated as follows.

1.Transurethral Resection of the Prostate group (TURP Group)

2.Open Prostatectomy group (OP Group)

Efficacy was assessed using the following primary outcome variables: International Prostate Symptom Score (IPSS), maximal urinary flow rate (Qmax) and postvoid residual volume (PVR). These were measured at baseline, 1 month, 3 months, and 6 months postoperatively to evaluate improvements in urinary function which were the primary outcomes. Pertaining to our statistical analysis, quantitative variables included age, prostate volume, International Prostate Symptom Score (IPSS), maximal urinary flow rate (Qmax), postvoid residual volume (PVR), operative time, estimated blood loss and length of hospital stay. The qualitative variables included the presence of comorbidities, complication types and need for reoperation. SPSS version 25.0 was employed to conduct the statistical analysis. Odds Ratios (ORs) were calculated using logistic regression analysis to assess the association between the type of surgical procedure (TURP vs. OP) and occurrence of postoperative complications. For continuous outcome variables, such as IPSS, Qmax and PVR, ANOVA was used to compare the means between the OP and TURP groups at each time point. Effect sizes (Cohen's d) were calculated to assess the magnitude of differences between groups. Chi-square tests was employed for categorical variables. Statistical significance was defined as a p-value of less than 0.05. Institutional Review Board of Gomal Medical College authorized the study protocol vide Notification No. 35/GJMS//JC, dated May 21, 2023. Prior to enrollment in the investigation, each participant was granted informed consent. The investigation was conducted in compliance with the ethical standards outlined in the Declaration of Helsinki.

RESULTS

A thorough comparison of TURP and Open Prostatectomy in terms of numerous postoperative outcomes was conducted. Several critical findings regarding patient demographics, intraoperative metrics and postoperative outcomes were identified during the comparative analysis of TURP and OP. The baseline characteristics of the two groups did not exhibit any significant differences in prevailing hypertension and diabetes, baseline IPSS scores, BMI or age ($P > 0.05$). Thus, the groups were well-matched for the robust comparison. However, the prostate volume was considerably higher in OP group than TURP group (55 ± 10 cc vs. 30 ± 8 cc, $P < 0.01$)(Table 1).

Table 1: Baseline Characteristics and Demographics

Variables	OP Group (n=144)	TURP Group (n=144)	p-value
Age (Year)	68 ± 8 (65-71)	67 ± 7 (64-70)	0.451
BMI (kg/m^2)	29 ± 4 (27-31)	28 ± 3 (26-30)	0.379
Prostate Volume (cc)	55 ± 10 (50-60)	30 ± 8 (25-35)	0.001*
Baseline IPSS Score	22 ± 5 (20-24)	20 ± 4 (18-22)	0.153
Baseline Qmax (mL/sec)	8 ± 2 (7-9)	10 ± 3 (9-11)	0.028

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Baseline PVR (mL)	50 ± 20 (45-55)	45 ± 15 (40-50)	0.284
Comorbidities n (%)			
Hypertension	80 (55.9)	82 (56.9)	0.852
Diabetes	30 (21)	28 (19.4)	0.747

The OP group experienced longer operative times (90 ± 20 vs. 60 ± 15 minutes, P < 0.05) and greater blood loss (400 ± 150 vs. 200 ± 100 mL, P < 0.05) intraoperatively, which highlighted the more invasive character of open surgery in comparison to the transurethral approach. The rate of conversion to another method was low and did not differ substantially between the groups, despite these differences. The hospital stay duration was significantly longer in the OP group (7.5 ± 2.1 days) compared to the TURP group (4.2 ± 1.6 days) (p<0.01). The OP group had a higher overall complication rate, but it was not significantly higher (12.6 vs. 8.3%, P > 0.05)(Table 2).

Table 2: Intraoperative Data among study participants

Variables	OP Group (n = 144)	TURP Group (n = 144)	p-value
Operative Time (Minutes)	90 ± 20	60 ± 15	0.033*
Estimated Blood Loss (mL)	400 ± 150	200 ± 100	0.006*
Conversion to Another Method n (%)	2 (1.4%)	0 (0%)	0.157
Hospital Stay (Days)	7.5 ± 2.1	4.2 ± 1.6	0.001*
Complications n (%)	18 (12.6%)	12 (8.3%)	0.221
Urinary Incontinence n (%)	6 (4.2%)	3 (2.1%)	0.28
Erectile Dysfunction n (%)	7 (4.9%)	4 (2.8%)	0.31
Bleeding n (%)	3 (2.1%)	2 (1.4%)	0.47
Infection n (%)	2 (1.4%)	3 (2.1%)	0.58

The TURP group generally demonstrated superior outcomes, with significantly lower IPSS scores at 1 month (8 ± 2 vs. 10 ± 3) and higher Qmax at both 1 month (18 ± 4 vs. 15 ± 5 mL/sec) and 6 months (21 ± 3 vs. 19 ± 3 mL/sec)(P < 0.05). The effect size calculations implied that TURP may be more effective in short to medium term in alleviating urinary symptoms and improving flow rates, as they indicated a moderate to strong effect in favor of TURP for both IPSS scores and Q-max. Furthermore, efficacy of TURP in reducing urinary retention postoperatively was further supported by the fact that postvoid residual volume (PVR) was substantially lower in the TURP group at 6 months (10 ± 5 vs. 15 ± 7 mL, P < 0.05)(Table 3).

Table 3: Postoperative Outcomes at 1 and 6 Months

Outcome Measure	Time Point	OP Group	TURP Group	p-value
IPSS Score	1 Month	15 ± 5 (14-16)	8 ± 2 (7-9)	0.04*
	3 Months	9 ± 2 (8-10)	7 ± 2 (6-8)	0.05
	6 Months	7 ± 2 (6-8)	0 (0%)	0.09
Qmax (mL/sec)	1 Month	15 ± 5 (14-16)	18 ± 4 (17-19)	0.01*
	3 Months	19 ± 3 (18-20)	21 ± 3 (20-22)	0.03*
PVR (mL)	6 Months	15 ± 7 (14-16)	10 ± 5 (9-11)	0.02*

Repeated Measures ANOVA

The IPSS of both groups demonstrated progressive improvement from 1 to 6 months post-surgery as time progressed. The TURP group consistently revealed lower IPSS scores at each time point, implying more favorable outcome in terms of symptom relief than OP group (Figure 1).

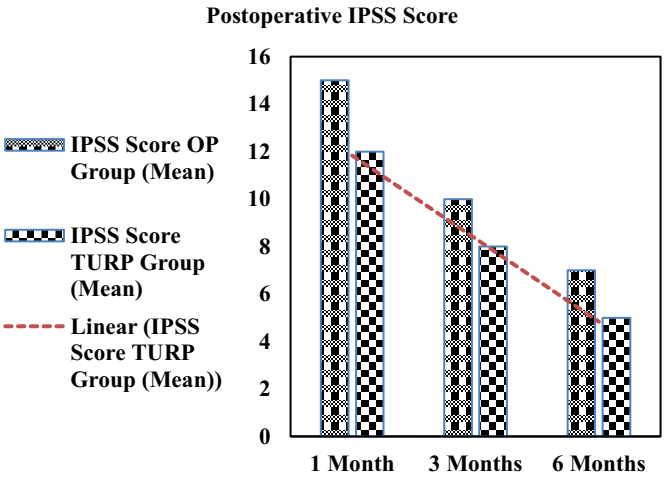

Figure 1: Postoperative IPSS Score Trends over Time

The postoperative challenges associated with each surgical approach were emphasized, while the observed odds ratios indicated trend toward the higher incidence in OP group, the differences in rates of urinary incontinence and erectile dysfunction between the two groups at 6 months were not statistically significant (P > 0.05). In particular, the more invasive nature of OP was indicative of potential hazards, as the incidence of urinary incontinence and erectile dysfunction in OP group was approximately twice that of TURP group and 1.6 times that of the TURP group, respectively (Table 4).

Table 4: Complications and Reoperation Rates at 6 Months

Complication Type	Severity	Time Point	OP Group n (%)	TURP Group n (%)	p-value	Odds Ratio (95% CI)
Urinary Incontinence	Mild	6 Months	6 (4.2)	3 (2.1)	0.28	2.0 (0.5-6.8)
	Moderate	6 Months	3 (2.1)	2 (1.4)	0.47	1.5 (0.3-7.5)
	Severe	6 Months	1 (0.7)	0 (0)	0.32	1.0 (0.2-5.8)
Erectile Dysfunction	Mild	6 Months	7 (4.9)	4 (2.8)	0.31	1.8 (0.5-6.1)
	Moderate	6 Months	6 (4.2)	4 (2.8)	0.39	1.5 (0.4-5.6)
	Severe	6 Months	2 (1.4)	2 (1.4)	1.00	1.0 (0.2-5.4)
Reoperation Rate	-	6 Months	5 (3.5)	3 (2.1)	0.45	1.7 (0.4-7.1)

The immediate postoperative period demonstrated that OP group experienced substantially higher pain scores and analgesic use at both 24- and 72-hours post-operation. These results were statistically significant, with p-values less than 0.01 and substantial effect sizes. The 72-hour

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period was particularly noteworthy with Cohen's d value of 2.0, indicating that OP is more invasive and associated with higher requirement for pain management and greater immediate postoperative discomfort (Table 5).

Table 5: Postoperative Pain and Analgesic Requirement

Outcome	Time Point	Measurement	OP Group	TURP Group	p-value	Effect Size (Cohen's d)
Pain Score (VAS)	24 Hours	Mean ± SD (95% CI)	7 ± 2 (6-8)	4 ± 1 (3-5)	0.003*	1.5
	72 Hours	Mean ± SD (95% CI)	4 ± 1 (3-5)	2 ± 1 (1-3)	0.007*	2.0
Analgesics Used	24 Hours	Number of Doses	3 ± 1	2 ± 1	0.018*	1.0
	72 Hours	Number of Doses	2 ± 1	1 ± 0.5	0.028*	1.0

DISCUSSION

The comparative analysis of TURP and Open Prostatectomy revealed substantial differences in outcomes that are essential for the rationale of clinical decisions regarding the management of BPH. Effective surgical interventions are necessary to alleviate the symptoms and enhance quality of life, as BPH remains the prevalent issue, particularly in elderly male population. The findings of this investigation are crucial in elucidating the extent to which each procedure influences recovery, symptom alleviation and long-term satisfaction [16-18]. TURP has been regarded as the gold standard for surgical treatment of BPH for an extended period due to its effective relief of symptoms and minimal invasive nature. In this investigation, patients who underwent TURP demonstrated consistently superior outcomes in terms of IPSS scores over the six-month period in comparison to those who underwent OP. Christidis *et al*. have reported in 2017 that TURP has superior outcomes in terms of both efficacy and recovery time, which is consistent with the results of other studies [19]. Lin *et al*. advocated for using TURP in clinical practice, particularly for patients with moderate prostate enlargement, due to the gradual improvement in urinary symptoms and reduced IPSS scores that are associated with it [20]. However, OP continues to be a viable option for patients with larger prostate volumes or when other complicated factors are present. Even though OP is more invasive, it can be particularly effective in patients with substantially enlarged prostates, where TURP may not be as efficient or feasible. In this context, our results suggested that OP can provide significant symptom relief, albeit at the delayed recovery pace and with higher complication rates, including increased pain and greater need for analgesics post-surgery, these findings are also supported by the literature [17, 21]. The pain management findings are particularly noteworthy, as OP patients exhibited substantially higher pain scores and greater analgesic requirements within an initial 72 hours following surgery. Beilstein *et al*. (2022) also observed that patients who undertake more invasive prostate procedures typically require more intensive postoperative pain management strategies, which these results corroborate [22]. It is imperative to implement effective pain management, as it has the potential to substantially impact patient satisfaction and recovery. Consequently, the selection of the surgical technique should take into account the potential for the more difficult recuperation period and increased postoperative discomfort, despite the fact that OP can be effective for large prostates. The reoperation rates and extended hospital stays that are linked to OP emphasize the personal and economic expenses of this method. In addition to the impact on healthcare costs, patients' comfort is also affected by the extended institutionalization, as it delays the return to normal activities [23]. In healthcare environments where resource allocation and patient throughput are critical considerations, it is necessary to balance these factors against the advantages of OP. Although there was no statistically significant difference between the groups in terms of urinary incontinence and erectile dysfunction, there was trend toward higher rates in OP group. These findings are consistent with the study suggesting more extensive surgical interventions may bear higher risk of such adverse events, which is consistent with potentially long-term complications associated with the more invasive nature of OP [24]. The study's implications are not limited to clinical outcomes; they also extend to the development of policy and practice guidelines. In the context of overall healthcare efficacy, patient satisfaction and cost-effectiveness, healthcare providers and policymakers must take these findings into account to facilitate the most effective surgical techniques and optimize resource utilization.

CONCLUSIONS

This comparative study of Open Prostatectomy and TURP established that, even though TURP provides less invasive alternative with the faster recovery, improved symptom management and fewer complications, OP continues to be significant surgical option for patients with significantly larger prostate volumes or when TURP is not suitable. The indications, benefits and drawbacks of each surgical method are distinct. Consequently, selection of the surgical procedure should be customized to unique characteristics of each patient, ensuring that the potential for symptom relief and quality of life enhancement is balanced against the invasive nature of the procedure and the corresponding recovery challenges to BPH patients.

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Authors Contribution

Conceptualization: IUR
Methodology: IUR, MF
Formal analysis: NA, MLJ, MF
Writing, review and editing: KK, MLJ, IUR, RN

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

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