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Assessment of Complications of Transurethral Resection of Prostate (TURP) Using Clavien Dindo Classification

Bashir Ahmed, Arif Ali, Ayesha Khan, Naresh Kumar Valecha, Abdul Mujeeb, Shahid Hussain

Abstract

Objective: To evaluate the magnitude of complications that manifest in patients undergoing Transurethral Resection of the Prostate (TURP), the Clavien-Dindo Classification System (ranging from Grades I to V) shall be employed.

Methodology: This cross-sectional investigation was performed within the Department of Urology at the Jinnah Postgraduate Medical Center (JPMC) located in Karachi. The selection criteria included male patients aged between 40 and 65 years presenting with benign prostatic hyperplasia and who were deemed eligible for Transurethral Resection of the Prostate. Postoperatively, patients were treated and followed closely for any TURP related complications by classifying them according to the Clavien-Dindo Classification System (Grade I–V). The data were analyzed using SPSS software, version 26, with 5% level of significance.

Results: In 87 male patients, the mean age was 59.32 ± 6.44 years. Complications occurred in 33.33% of cases. Grade I complications were most frequent (48.3%), followed by Grade II (24.1%) and Grade III (13.8%), with Grade IV and V each at 3.4%. No significant association was found with age, prostate volume, or operative time (P >0.05).

Conclusion: The investigation elucidates that Transurethral Resection of the Prostate (TURP) continues to be a procedure characterized by a generally favorable safety profile and efficacy, albeit accompanied by the potential for complications. The implementation of the Clavien-Dindo classification system facilitated a methodical evaluation of postoperative morbidity. These results underscore the imperative for diligent perioperative management and the adoption of standardized protocols for complication assessment to enhance patient care and surgical results within the domain of clinical urology.

Keywords: Prostatic hyperplasia, Transurethral resection of prostate, Postoperative complications, Clavien-Dindo classification

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Bashir Ahmed *(Corresponding Author)*
Postgraduate Trainee, Department of Urology
Jinnah Postgraduate Medical Centre
Email: basheerahmedmed@gmail.com

Arif Ali
Associate Professor, Department of Urology
Jinnah Postgraduate Medical Centre
Email: doc.arifshaikh@gmail.com

Ayesha Khan
Assistant Professor, Department of Urology
Jinnah Postgraduate Medical Centre
Email: ayeshakhan.smc@gmail.com

Naresh Kumar Valecha
Associate Professor, Department of Urology
Jinnah Postgraduate Medical Centre
Email: valechanaresh74@gmail.com

Abdul Mujeeb
Registrar, Department of Urology
Jinnah Postgraduate Medical Centre
Email: abdulmujeeb1514@gmail.com

Shahid Hussain
Assistant Professor, Department of Urology
Jinnah Postgraduate Medical Centre
Email: drshahidjmc@gmail.com

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INTRODUCTION

Benign Prostatic Enlargement (BPE) is one of the most prevalent urological disorders in older men it was estimated that in 2019 there were 79 million cases in the world in both genders aged at least 60 years old[1]. The prevalence of histopathological Benign Prostatic Enlargement rises from approximately 20% in men aged 41-50 years, to 50% in men aged 51-60 years and up-to 90% in men older than 80 years. The enlargement of the prostate gland leads to an obstruction of urinary flow from the bladder, which is clinically manifested through a constellation of lower urinary tract symptoms (LUTS) that include difficulty initiating urination, straining, intermittent urinary flow, and the sensation of incomplete bladder evacuation[2]. If not addressed therapeutically, this condition may result in a multitude of complications, such as urinary retention, urinary tract infections, the development of bladder calculi, acute renal injury, as well as alterations in bladder contractility and compliance, including trabeculation and the formation of diverticula[3]. Alpha-adrenergic antagonists and 5-alpha-reductase inhibitors represent the primary pharmacological agents employed in the medical management of uncomplicated benign prostatic enlargement, whereas surgical intervention is advised when benign prostatic

enlargement is accompanied by the aforementioned complications[4].

Although latest techniques like laser enucleation and prostate artery embolization have showed considerable efficacy is terms of improvement in lower urinary tract symptoms, Transurethral resection of prostate (TURP) still remains the most commonly performed surgical procedure for BPE worldwide[5]. It is a minimally invasive procedure and involves endoscopic removal of obstructing prostate using resectoscope[6]. It can be performed using mono-polar or bipolar electro-resection and is associated with significantly reduced complications compared to traditionally performed open surgical procedures like trans-vesical prostatectomy[7]. Though generally considered a safe procedure, it may also be associated with significant complications like urethral or capsular injury, severe bleeding and TURP syndrome[8]. Early post-operative complications of Transurethral resection of prostate include secondary hematuria, infective complications and failure to void following catheter removal while long term complications of TURP include urinary incontinence, urethral stricture, bladder neck contracture, impotence or recurrence of BPE[9]. Different studies have attempted to determine the incidence of intra-operative and early post-operative complications of mono-polar Transurethral resection of prostate.

Mbaeri et al, studied frequency of complications in patients undergoing monopolar Transurethral resection of prostate using Clavien Dindo Classification system and reported that complications were observed in 24.74% patients. Out of these, 55.2% patients had Grade II complications, 20.7% patients had Grade I complications, 20.1% patients had Grade IIIa complications while Grade IV b complications were seen in 3.45% patients[10].

Dubey et al, reported that complications were seen in 19.9% patients undergoing bipolar Transurethral resection of prostate. Out of these, 52.4% patients had Grade I complications, 23.8% had Grade II complications, 9.5% had Grade III a complication and 4.8% patients had Grade III b complications. Grade IV a and IV b complications were seen in 4.8% patients[11].

Complications like TURP syndrome and urosepsis are significant life-threatening complications of Transurethral resection of prostate and are associated with adverse patient outcomes. The rationale of this study will be to determine the frequency of common complications of monopolar Transurethral resection of prostate in a local hospital setting, in terms of Clavien Dindo Classification system. No study has been conducted in our hospital with this objective and this study will also aim to fill this gap. Findings of this study will help urologists in assessing the burden of different complications of mono-polar transurethral resection of prostate which will also lead to improvements in preoperative patient counselling and education.

METHODOLOGY

This descriptive cross-sectional research was carried from 20-06-2025 till 20-10-2025 in the department of urology, Jinnah postgraduate medical center (JPMC), Karachi, following ethical approval. Institutional Review Board (IRB) approval was obtained from Jinnah Postgraduate Medical Centre under reference NO.F.2-81/2025-GENL/341/JPMC.

Sample size of 87 participants was obtained by the W.H.O calculator, based on prevalence of Grade I complications at (20.69%)[9,] an allowable margin of error of 8.7%, and a confidence level of 95%. An informed consent was taken from all the participants. Male patients aged 40–65 years diagnosed with benign prostatic hyperplasia (BPH) and scheduled for TURP were selected through non-probability consecutive sampling. Inclusion criteria were based on prostate enlargement confirmed by ultrasonography (40–100 cc), IPSS scores between 8–35, and persistent symptoms despite medical therapy. Additional eligibility included recurrent urinary tract infections (=2 episodes within six months or =3 episodes in one year), recurrent hematuria, or upper urinary tract obstruction with raised serum creatinine. Patients with an ASA score >2, prior prostate surgery, urological malignancy, neurogenic bladder, PSA =4 ng/mL, or cognitive impairment were excluded

All patients underwent TURP under spinal anesthesia, performed by experienced urologists using monopolar resectoscopes. The Barnes technique involved resection starting from the median lobe and proceeding circularly to the lateral lobes using a clock-face reference (typically from 5 or 7 o'clock), aiming for complete removal from bladder neck to verumontanum Hemostasis was achieved using a roller ball or coagulation loop. Resected chips were evacuated using an ellik evacuator followed by placement of a 22-24 FR three-way Foley catheter for continuous irrigation.

Postoperative complications were assessed by follow-up within one month after the procedure and were graded using the Clavien-Dindo classification system, defined as follows:

• **Grade I**: Any deviation from the normal postoperative course without need for pharmacological treatment or surgical, endoscopic, or radiologic interventions.

• **Grade II**: Complications requiring pharmacological treatment with drugs other than such allowed for Grade I (e.g., antibiotics, transfusions).

• **Grade III**: Complications requiring surgical, endoscopic, or radiological intervention

IIIa: Intervention not under general anesthesia.

IIIb: Intervention under general anesthesia.

• **Grade IV**: Life-threatening complications requiring intensive care management.

IVa: Single-organ dysfunction.

IVb: Multi-organ dysfunction.

- **Grade V:** Death of the patient due to complications

The analysis of data was carried out with SPSS 26.0. Demographic and clinical variables used descriptive statistics (mean, standard deviation, frequency and percentage). The Chi-square test was used to determine association of the grade of complications with demographic and clinical variables, with p = 0.05 taken as the level of significance.

RESULTS :

In our study comprising 87 subjects undergoing prostatectomy, the mean age was calculated to be 59.32 years (±6.44), with a noteworthy majority (87.4%) exceeding the age of 50 years. The average recorded prostate volume was 97.77 ml (±14.61), and 67.8% of the participants exhibited prostate volumes surpassing 90 ml, thereby suggesting a heightened occurrence of larger prostate dimensions within the studied population. The mean duration of surgical procedures was 69.06 minutes (±9.69), with 83.9% of the operations lasting beyond 60 minutes. The average duration of postoperative hospitalization was 2.2±0.1 days, and 1.79% of the subjects remained hospitalized for a period exceeding 2 days (TABLE I).

As shown in Table II, postoperative complications among the 29 patients who underwent transurethral resection of the prostate (TURP) were graded according to the Clavien-Dindo classification system. The majority of complications were of low severity, with Grade I events accounting for 48.3% of cases. The most common complication was hematuria requiring washout and irrigation, occurring in 37.9% of patients, all classified as Grade I. Other Grade I events included stress urinary incontinence and failed trial without a catheter, each reported in 6.9% of patients. Grade II complications, requiring pharmacological treatment were observed in 24.1% of cases, including epididymorchitis (17.2%) and primary hemorrhage requiring transfusion (6.9%). Grade III complications, necessitating surgical or endoscopic intervention, were reported in 13.8% of patients, primarily due to hematuria requiring operative intervention and failed catheter trials necessitating re-resection of residual tissue. Severe complications were infrequent but notable: one patient (3.4%) developed TURP syndrome, categorized as Grade IV, and one patient (3.4%) experienced mortality due to hemorrhage, classified as Grade V. These findings underscore that while TURP is generally associated with manageable postoperative morbidity, vigilance is warranted for potentially severe or life-threatening complications.

In the comparison of Clavien-Dindo complication grades with age group, prostate volume, and operative time, no statistically significant associations were observed. Among patients aged 40–50 years, Grade I complications were most frequent (57.1%), followed by Grade II (28.6%) and Grade III (14.3%), with no cases of Grade IV or V. In those aged over 50 years, Grade I complications were also most common (50.0%), followed by Grade II (22.7%), Grade III (13.6%), Grade IV (4.5%), and Grade V (9.1%) (p=0.897). Regarding prostate volume, patients with =90 ml prostates most frequently experienced Grade I complications (45.5%), followed by Grade II (27.3%), Grade III (18.2%), and Grade V (9.1%), whereas those with >90 ml prostates had Grade I complications in 55.6%, Grade II in 22.2%, Grade III in 11.1%, Grade IV in 5.6%, and Grade V in 5.6% (p=0.880). For operative time, cases lasting =60 minutes showed Grade I complications in 42.9%, Grade II in 14.3%, Grade III in 28.6%, and Grade IV in 14.3%, with no Grade V events, whereas cases >60 minutes had Grade I complications in 54.5%, Grade II in 27.3%, Grade III in 9.1%, and Grade V in 9.1%, with no Grade IV events (p=0.218) (TABLE III).

DISCUSSION

The objective of the current study was to assess the incidence and severity of complications associated with TURP, grading them by the Clavien-Dindo Classification System (Grade I–V). Our results indicated a 33.33% complication rate. Among these, Grade I and Grade III complications were 20.7% each while Grade II complications were the highest (55.1%). 6 Other complications included grade IV (3.4% of patients) and grade V (3.4% of patients). These results modestly illustrate the morbidity of TURP in tertiary care and largely conform to regional and international reports.

In a study by Mbaeri et al.[10], complications encountered in 24.74% of the cases. Among them, Grade II complications occurred most frequently (55.2%), followed by Grade I (20.7%), Grade IIIa (20.1%), and Grade IVb (3.45%). Another study done by Dubey et al complications[11] were distributed as grade I: 52.4%, grade II : 23.8%, grade IIIa: 9.5%, gradeIIIb: 4.8%, grade Iva: 4.8%, and grade IVb: 4.8%. These figures are consistent with our results. Also Nadjimitdinov and co-workers[12] concluded that the complications following TURP were recorded in 19.4% of the patients: 50% were Grade I,20.8% Grade II, 16.7% Grade IIIb, and 12.5% were Grade IVb. The overall complication rate of their series may have been lower, yet the relative distribution of higher-grade complications, particularly that of Grade IVb, was significantly higher than in our series.

Table 1: Characteristics of Study Participants (N=87)

Variable	**n (%)**
Age (Mean ± SD) = 59.32 ± 6.44 years	
40 - 50 years	11 (12.6)
>50 years	76 (87.4)
Prostate Volume (Mean ± SD) = 97.77 ± 14.61 ml	
=90 ml	28 (32.2)
>90 ml	59 (67.8)
Operative Time (Mean ± SD) = 69.06 ± 9.69 minutes	
=60 minutes	14 (16.1)
>60 minutes	73 (83.9)

Table 2: Clavien-Dindo Grading of Complications in Patients with Transurethral Resection of the Prostate (N=29)

Complications	Clavien-Dindo Grading				
	Grade I	Grade II	Grade III	Grade VI	Grade V
Hematuria requiring washout and irrigation	11 (37.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Failed trial without a catheter	2 (6.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Stress urinary incontinence	2 (6.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Epididymorchitis	0 (0.0)	5 (17.2)	0 (0.0)	0 (0.0)	0 (0.0)
Primary hemorrhage requiring transfusion	0 (0.0)	2 (6.9)	0 (0.0)	0 (0.0)	1 (3.4)
Hematuria requiring operative intervention	0 (0.0)	0 (0.0)	2 (6.9)	0 (0.0)	0 (0.0)
Failed trial without catheter requiring resection of residual apical tissue	0 (0.0)	0 (0.0)	2 (6.9)	0 (0.0)	0 (0.0)
TURP syndrome	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.4)	0 (0.0)
Hemorrhage resulting in Mortality	0 (0.0)	0 (0.0)	(0)	0 (0.0)	1 (3.4)

Table III: Comparison of Clavien-Dindo Complication Grades with Age Group, Prostate Volume, and Operative Time

Clavien-Dindo Grading	Age Group		P-Value
	40 - 50 years	>50 years	
Grade I	4 (57.1%)	11 (50.0%)	0.897
Grade II	2 (28.6%)	5 (22.7%)	
Grade III	1 (14.3%)	3 (13.6%)	
Grade IV	0 (0.0%)	1 (4.5%)	
Grade V	0 (0.0%)	2 (9.1%)	
Clavien-Dindo Grading	**Prostate Volume**		**P-Value**
	<90 ml	**>90 ml**	
Grade I	5 (45.5%)	10 (55.6%)	0.880
Grade II	3 (27.3%)	4 (22.2%)	
Grade III	2 (18.2%)	2 (11.1%)	
Grade IV	0 (3.6%)	1 (5.6%)	
Grade V	1 (9.1%)	1 (5.6%)	
Clavien-Dindo Grading	**Operative Time**		**P-Value**
	<60 minutes	**>60 minutes**	
Grade I	3 (42.9%)	12 (54.5%)	0.218
Grade II	1 (14.3%)	6 (27.3%)	
Grade III	2 (28.6%)	2 (9.1%)	
Grade IV	1 (14.3%)	0 (0.0%)	
Grade V	0 (0.0%)	2 (9.1%)	

Chaudhary et al.[13], who described an overall complication rate of 6.17%: Grade I complications were 3.70%, grade II were 1.85%, and grade IV were 0.62%. The marked discrepancy in complication rates compared to our results could possibly be explained by the variations in study type, the patient population, surgical experience, and follow-up period. Similarly, underreporting of less severe complications or inconsistencies in the assessment of Clavien-Dindo grades could explain these differences.

In contrast, Agrawal et al.[14] there is an increased complication rate of 34.4%, surpassing that in the present series. The explanation for this is likely to be related to shifting patient characteristics over the decade (with a rise in elderly and co-morbid patients who are at risk of developing postoperative complications). Sagen et al. reported the results of their biochemical analyses of these samples[15] also support this heterogeneity as their series demonstrated a broader spectrum of complications may be found in routine clinical practice when the Clavien-Dindo grading is formalized.

Pan et al.[16] also showed the practical application of the Clavien-Dindo classification in comparison of complication between various endoscopic treatments for benign prostatic hyperplasia. Their prognostic analysis highlighted the need for standardized classification to enable significance comparisons, particularly when assessing surgical outcomes between institutions.

Further, the research by Islam et al.[17] noted predictors of morbidity using a modified Clavien system and emphasized the importance of meticulous perioperative care to decrease complications. Shukla et al. [18] reported on inter-observer agreement in the grading of TURP complications, emphasizing the role of subjective bias that might impact on the fidelity of findings between centers. The study by Gravas et al.[19] demonstrated that monopolar and bipolar TURP have similar morbidity when graded equally. Rassweiler et al. identified urethral stricture and bladder neck sclerosis as relevant late complications following TURP, indicating that postoperative evaluation remains important in long-term patient management.[20]

Our observations confirm that postoperative complications following TURP are frequent, although they are mainly in the grade I range. The Clavien–Dindo grading was effective for categorization of the severity of complications and comparison of data with different studies. These findings highlight the importance of preoperative evaluation, standardized surgical techniques, and close postoperative care to mitigate complications and optimize patient management in TURP interventions.

The main limitation was cross-sectional design that observations were confined to hospital stay and complications were not taken into account after discharge. A limitation

might be the relatively small number of patients (n=87) that may not have offered enough strength for subgroup analyzes. Additionally, the Clavien-Dindo Classification System is a widely used system for stratifying complications, although some clinical events might be assessed subjectively, potentially affecting the inter-observer agreement

The study had several strengths despite these limitations. It used a well- defined inclusion and exclusion criteria, which minimized the risk of confounding factors due to preexisting urologic or systemic diseases. A validated complexity grading system led to the possibility of a more meaningful comparison with other international series. Moreover, all operations were carried out by professional urologists in accordance with the standardized institutional practice patterns, which greatly increased the reliability of the results. Further research should be conducted using a prospective, multicenter design in a larger number of cases with longer follow-up time for possible late postoperative complications. The addition of patient-reported outcome measures and quality-of-life studies after TURP would also provide a more complete picture of surgical success and patient satisfaction.

CONCLUSION

The investigation elucidates that Transurethral Resection of the Prostate (TURP) continues to be a procedure characterized by a generally favorable safety profile and efficacy, albeit accompanied by the potential for complications. The implementation of the Clavien-Dindo classification system facilitated a methodical evaluation of postoperative morbidity. These results underscore the imperative for diligent perioperative management and the adoption of standardized protocols for complication assessment to enhance patient care and surgical results within the domain of clinical urology.

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Authors Contribution:
Bashir Ahmed: Data collection, Analysis and interpretation, Manuscript Drafting, Conceived original idea
Arif Ali: Supervision of study, critical revision of the manuscript, input on study design
Ayesha Khan: Supervision of study, critical revision of the manuscript, input on study design
Naresh Kumar Valecha: input on study design, data interpretation, critical revision of manuscript
Abdul Mujeeb: Provided clinical oversight, reviewed and revised the manuscript for accuracy
Shahid Hussain: Contributed to data collection and assisted in the critical revision of the manuscript

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