



Predicting TURP Success: How Preoperative Factors Make Difference

Muhammad Umair Zafar¹, Muhammad Manan Javed², Muhammad Aqib Riaz^{3*}, Muhammad Amjad⁴, Muhammad Naveed Usman Shah⁵, Muhammad Hamza Iqbal⁶

¹Senior Registrar, Urology, Nishtar Medical University and Hospital, Multan, Pakistan.

^{2,4}Nishtar Medical University and Hospital, Multan, Pakistan.

^{3*,5,6}Postgraduate Resident, Recep Tayyip Erdogan Hospital, Muzaffargarh, Pakistan.

Corresponding Author: Muhammad Aqib Riaz

Postgraduate Resident, Recep Tayyip Erdogan Hospital, Muzaffargarh, Pakistan

Email: Aqibriaz356@gmail.com

ABSTRACT

Background: The most traditional surgical intervention of benign prostatic hyperplasia is transurethral resection of the prostate (TURP) but the procedure has been reported to produce a wide range of functional outcomes due to its success in all patients after the operation.

Objective: To determine the effect of preoperative clinical, functional and comorbidity-related variables on postoperative outcomes after TURP.

Methods: This retrospective study involved 141 patients who had TURP between 2017 and 2025. The preoperative variables were mode of presentation, presence or absence of urinary bladder dysfunction discussed multiple times, catheter dependence, comorbidity, renal functioning, and previous medical treatment. The trial without catheter success, catheter dependency at the final follow up, complications and functional recovery were the evaluated postoperative outcomes.

Results: Patients who came with urinary bladder dysfunction discussed multiple times, especially chronic bladder dysfunction discussed multiple times, were significantly more likely to experience a failure to remove their catheter postoperative and also catheter dependence in the long term than they were to experience failure to remove their catheter postoperative when presenting with LUTS alone. Poor outcomes were connected to hydronephrosis and decreased renal functioning. In general, 87.2 percent of patients were catheter-free at the final follow-up.

Conclusion: Preoperative presentation and patient related factors are strong determinants of outcomes of TURP. Early intervention and thorough preoperative examination are required to better maximize postoperative outcome and patient satisfaction.

Keywords: Transurethral Resection of Prostate, Benign Prostatic Hyperplasia, Urinary Bladder Dysfunction Discussed Multiple Times, Catheter Dependency, Postoperative Outcomes.

INTRODUCTION

TURP remains the standard surgical treatment for BPH; postoperative functional outcomes vary significantly among patients. Benign prostatic hyperplasia (BPH) has been one of the most common urological diseases in older men and one of the major causes of lower urinary tract symptoms (LUTS), urinary bladder dysfunction discussed multiple times and progressive decline in quality of life. Although transurethral resection of the prostate (TURP) is still considered as a gold-standard surgical procedure in the treatment of bladder outlet obstruction caused by BPH, the postoperative outcomes are still variable and unpredictable.



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The clinical experience indicates numerous times that the symptoms relief, catheter independence and functional recovery following TURP are not always similar in patients despite the performing of technically sufficient resections. Such variability has understandably caused a modern research trend to determine patient-specific and disease-specific factors that affect the outcome of postoperative success and complications in patients, instead of considering TURP as a uniformly curative procedure (1). Recent research indicates that mode of presentation is the key to defining the outcomes of TURP. LUTS alone presentation patients are more likely to experience better postoperative courses than acute urinary bladder dysfunction discussed multiple times (AUR) or chronic urinary bladder dysfunction discussed multiple times (CUR), especially when they had extended catheterization before surgery. Presentation catheter dependence has also been demonstrated to be associated with increased rates

of failed trial without catheter (TWOC) and prolonged catheter dependence following TURP, which underlines the negative effect of delayed surgery (1,2). These results support the idea that the functional reserve of the bladder during surgery is an important factor determining the postoperative outcome. In addition to the status of presentation, other functional parameters like urodynamic and post-void residual urine volume and detrusor contractility have proven to be very potent predictors of surgical efficacy. Persistent voiding dysfunction despite sufficient outlet relief has been linked to impaired detrusor functioning usually due to chronic overdistension in long-term bladder dysfunction discussed multiple times. Research on the measurement of preoperative urodynamic parameters proves that low levels of bladder contractility and high residual volumes have a leading impact on symptom improvement and risk of postoperative bladder dysfunction discussed multiple times (3). These notes reiterate that TURP cannot correct irreversible dysfunction of the bladder though it can provide relief to obstruction. The presence of systemic comorbidities also makes the outcomes more difficult to predict after TURP. Poorer postoperative outcomes have always been associated with diabetes mellitus specifically because of its correlation with autonomic neuropathy, and impaired detrusor function, and delayed tissue healing. It is projected that uncontrolled diabetic patients are more prone to postoperative complications, chronic LUTS, and catheter dependence than non-diabetic ones, which is why metabolic control is highly significant in prognosticating surgery (4). Other studies have also reported similar associations, in larger cohorts in which comorbidity burden predicted postoperative morbidity and delayed recovery independently (5). To counter these complexities, a number of predictive models and nomograms have been established to predict TURP outcomes in terms of preoperative variables. The models combine clinical, biochemical and imaging parameters to rank patients by anticipated value to enable clinicians to tailor counseling and timing of surgery. Nomogram methods have been shown to be reasonably accurate when it comes to predicting postoperative symptom improvement and catheter independence and justify being used in clinical decision-making (6). Machine learning progress has further enhanced predictive accuracy, especially in complications like the formation of urethral strictures, through a high-dimensional dataset analysis that is not restricted by conventional statistical tools (7). TURP also largely depends on age and physiological reserve. Although old age altogether should not be a contraindication to surgery, old patients particularly aged 85 years and older have higher postoperative morbidity and are slow to recover, in terms of functional recovery.

However, when chosen elderly patients are taken into consideration, the beneficial effect of the selected patients on the chosen symptoms remains significant as the biological age and frailty are the most important factors, not the chronological age (8). Intraoperative functional assessments including voiding scores have been suggested as immediate prognostic variables with preliminary results indicating an association between this variable and postoperative urinary outcomes (9,10).

Urinary bladder dysfunction discussed multiple times is a clinically important side effect of TURP in the postoperative period, and frequently, requires extended catheterization or re-surgery. Factors that lead to post-TURP bladder dysfunction discussed multiple times are preoperative bladder dysfunction discussed multiple times, bladder overdistension and delayed intervention. Case-control reports prove that patients who have bladder dysfunction discussed multiple times, especially chronic bladder dysfunction discussed multiple times, are significantly at a greater risk of postoperative bladder dysfunction discussed multiple times than patients with LUTS alone (11). These results are consistent with the new evidence that has declared frailty as a severe modifier of postoperative LUTS outcomes as frail patients have poorer symptom relief and more complications (12,13). Another important outcome prediction dimension is bladder contractility and detrusor functioning. It has been shown that patients with a poor detrusor contractility may still respond to TURP, with further improvements that are not always complete. Patient selection and counseling care should therefore be keen in this subgroup to get expectations to match the results that are attainable (14).

Simultaneously, the development of urethral strictures is one of the most prominent late complications, especially in patients of older age and those at risk due to inflammatory or ischemic factors, as this once again points to the necessity of personalized risk evaluation (15). Uroflowmetry is typically used to measure objective functional improvements after TURP. The prospective studies have shown a great improvement in the Q-max and the flow patterns after the operation, but with time, the effect is much less in patients who have severe dysfunction before the operation or in those with longstanding obstruction (16). The need to continue LUTS with alpha-blocker treatment post-TURP is also an indication of unsuccessful functional recovery and has been attributed to unfavorable preoperative urodynamic profiles (17). Notably, frailty-based measures have increasingly become popular in endourological surgery, and increasingly there is growing evidence that frailty scores are predictive of the early postoperative complications and the delayed recovery, which supports their use in the planning of surgery (18).

Lastly, measures of inflammatory status and systemic response have also recently been investigated as predictors of surgical outcome in urological interventions. New machine-learning-based models that include the addition of inflammatory indices have shown potential in forecasting procedural success and complications and indicate that they could be applied in the future to predict the outcomes of TURP (19). Taken together, all these results highlight that the success of TURP does not entirely depend on the technique but it is significantly influenced by the preoperative patient factors, chronicity of the disease and the physiological reserves. By determining these factors preoperative, more precise patient counseling, better time to have surgery and more precise match of patient expectations to attainable postoperative quality of life can be achieved.

Objective: To evaluate the impact of preoperative clinical, functional, and comorbidity-related factors on postoperative outcomes following TURP.

MATERIALS AND METHODS

Study Design: Retrospective Observational Study.

Study Settings: Department of Urology, Recep Tayyip Erdoğan Hospital, Muzaffargarh.

Duration of Study: The patients who underwent TURP between January 2017 and December 2025 were selected to collect data.

Inclusion Criteria: Men aged 45 years and older with a diagnosis of benign prostatic hyperplasia and having TURP due to any of the following reasons; bothersome lower urinary tract symptoms, acute urinary bladder dysfunction discussed multiple times, chronic urinary bladder dysfunction discussed multiple times (with or without catheter), recurrent lower urinary tract disease, bladder stones, or renal compromise resulting from the bladder outlet obstruction. The patients considered were those that have their full pre and postoperative records.

Exclusion Criteria: The study excluded patients who were diagnosed with prostate or bladder malignancy; had undergone previous TURP, were diagnosed with known urethral stricture disease or whose medical records were not complete.

Methods: The hospital medical information system was used to identify eligible patients and extract the pertinent clinical data in electronic records. Preoperative variables were age, presenting symptoms, urinary bladder dysfunction discussed multiple times status, catheterization duration, history of failed trial without catheter, comorbidities, e.g., diabetes mellitus, and hypertension, renal status, e.g., hydronephrosis and estimated glomerular filtration rate, and previous medical treatments of the obstructions of the bladder outlet. Where these parameters existed, such as post-void residual urine volume and uroflowmetry results were captured as functional parameters. Consultant urologists could perform all TURP procedures with the use of monopolar or bipolar procedures. The success of trial without catheter, catheter status at final follow-up, postoperative complications, requirement of continuous medical therapy and improvement of symptoms were included in the list of postoperative outcome measures. Data analysis was done using SPSS version 25. Associations were analyzed using chi-square and independent t-tests. The continuous variables were represented in the form of means standard deviation and the categorical variables were the frequencies and percentage. The threshold value of p was 0.05.

RESULTS

One hundred and forty-one patients having undergone a transurethral resection of the prostate (TURP) were incorporated in the final analysis. The average age of the population used in the study was 70.6 Years. The majority of the patients showed lower urinary tract symptoms (LUTS) and a significant percentage of the patients also had acute or chronic urinary bladder dysfunction discussed multiple times that necessitated catheterization. Forty-four point seven percent of the patients were preoperative with a catheter, and 27.0 percent had a failed inpatient trial without a catheter (TWOC). It was found that 17.7 percent of patients had hydronephrosis, and 26.2 percent of patients had acute kidney injury on presentation.

Table 1. Preoperative patient characteristics and clinical presentation (n = 141)

Variable	Frequency (%)
LUTS at presentation	61 (43.4)
Acute urinary bladder dysfunction discussed multiple times	53 (37.6)
Painful urinary bladder dysfunction discussed multiple times	30 (21.3)
Chronic bladder dysfunction discussed multiple times with catheter	39 (27.7)
Hydronephrosis at presentation	25 (17.7)
Acute kidney injury	37 (26.2)
Diabetes mellitus	38 (27.0)

Hypertension	44 (31.2)
Failed preoperative TWOC	38 (27.0)
Catheter in situ at TURP	63 (44.7)

In the postoperative period, TWOC was successfully achieved in 82.9% of the patients, and 12.8% of the patients failed to achieve TWOC, and were left on catheterization. Finally, there was a follow-up of 87.2 percent of the patients who were catheter-free and 9.2 percent were still catheter-dependent. Mean

type of postoperative catheterization was 5.1 days $\pm$ 8.0 days. The level of postoperative complications was relatively low with readmission due to bleeding (3.6), and sepsis (2.9). Most of the patients (84.0) did not have any postoperative complications.

Table 2. Postoperative outcomes following TURP (n = 141)

Outcome	Frequency (%)
Successful inpatient TWOC	117 (82.9)
Failed inpatient TWOC	18 (12.8)
Catheter-free at last follow-up	124 (87.2)
Catheter-dependent at last follow-up	13 (9.2)
Long-term catheter	3 (2.1)
Intermittent self-catheterization	10 (7.1)
Bleeding requiring readmission	5 (3.6)
Sepsis	4 (2.9)

The presentation method made a considerable influence on catheter dependency at the final follow-up. The likelihood of patients who had urinary bladder dysfunction discussed multiple times to stay catheter-dependent was much higher when they had acute and chronic urinary bladder dysfunction discussed multiple times, than when they had urinary LUTS alone ($p = 0.029$). The dependency on

catheter was significantly greater in bladder dysfunction discussed multiple times group when LUTS was compared with any bladder dysfunction discussed multiple times ($p = 0.003$). Conversely, there was no statistically significant difference in case of acute and chronic bladder dysfunction discussed multiple times presentations ($p = 0.743$).

Table 3. Relationship between mode of presentation and catheter dependency at last follow-up

Presentation comparison	Catheter-free	Catheter-dependent	p-value
LUTS vs AUR	57 vs 19	1 vs 3	0.029
LUTS vs CUR	57 vs 42	1 vs 10	0.003
LUTS vs any bladder dysfunction discussed multiple times	57	1	0.003
AUR vs CUR	19 vs 42	3 vs 10	0.743

Renal status, as well, had an impact on postoperative outcomes. The hydronephrosis patients were found to have very high rates of failed postoperative TWOC ($p = 0.004$) and catheter dependency at final follow-up ($p = 0.008$). Moreover, poor long-term

outcome ($p = 0.003$) and failed TWOC ($p = 0.012$) were significantly related to lower mean estimated glomerular filtration rate (eGFR), which implied the negative effect of kidney impairment on postoperative recovery after TURP.

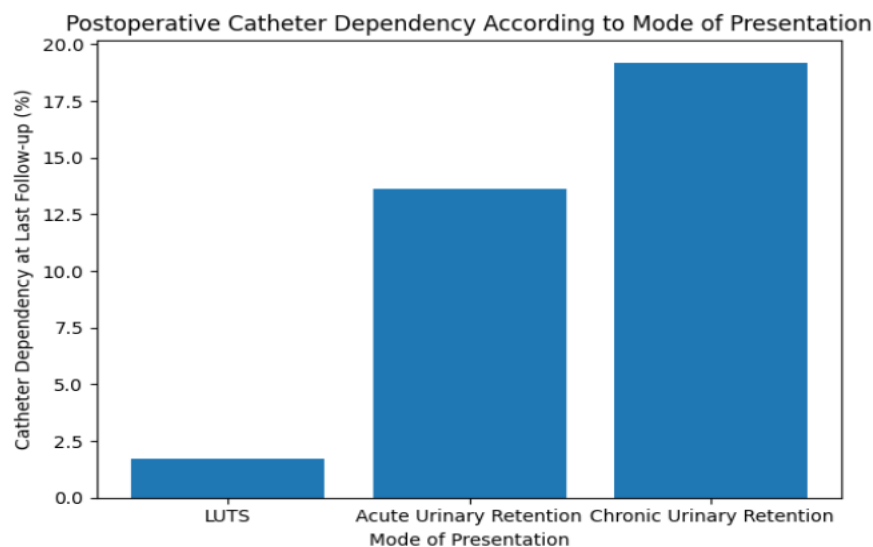


Figure 1. Postoperative catheter dependency according to mode of presentation

The bar diagram shows the ratio of patients who can still be catheter-dependent at the end-of-follow-up of various forms of presentation. Catheter dependency was lowest in patients who came with LUTS and highest in patients with chronic urinary bladder dysfunction discussed multiple times cases. Intermediate results were demonstrated with acute urinary bladder dysfunction discussed multiple times. The trend demonstrates the obvious worsening of the postoperative catheter-free status according to the severity and chronicity of the urinary bladder dysfunction discussed multiple times at the time of presentation.

DISCUSSION

Ethical approval was obtained from the institutional review board. The current research has shown that preoperative patient factors, presentation, and functional reserve are highly significant to the final results of postoperative outcomes following transurethral resection of the prostate (TURP) and not the procedure itself. Though TURP still is effective in bladder outlet obstruction relief, we have found that the symptom resolution, catheter independence, and improvement in the quality of life are not universal. This inconsistency shows the necessity of finding predictive variables that can be used to select patients, counsel them, and choose the time of intervention, which is becoming more and more stressed in modern urological literature (1). Among the key discoveries of this research is the fact that mode of presentation and postoperative catheter dependency have a strong relationship. Patients who came with lower urinary tract symptoms alone had much better post-operative results compared to patients who came with acute or chronic urinary bladder dysfunction discussed multiple times.

Chronic urinary bladder dysfunction discussed multiple times, specifically, was linked towards the greatest catheter and long-term catheter dependency failure rates. The same result is in line with the rest of the literature that demonstrated that both delays in presentation and delays in obstruction causes irreparable bladder dysfunction that restricts the functional utility of TURP despite a satisfactory amount of prostate resection (1,2). This embraces the clinical finding that an earlier surgical intervention process is associated with better functional recovery. Effects of preoperative urinary bladder dysfunction discussed multiple times on the postoperative results are well verified. The research assessing urodynamic parameters has shown that protracted bladder dysfunction discussed multiple times is linked to impaired detrusor contractility, and diminished compliance of the bladder that continues to be experienced after the operation and is evidenced by incomplete voiding or a recurrent bladder dysfunction discussed multiple times (3). These findings are consistent with our findings, with the patients presenting with bladder dysfunction discussed multiple times demonstrating poorer results in both cases, with the bladder dysfunction discussed multiple times being acute or chronic and it is important to note that the status of the bladder at the time of operation is a crucial factor which determines success.

Systemic comorbidities were also contributive factors in the preoperative outcome. A significant percentage of our cohort had diabetes mellitus, and it was linked to low recovery after surgery. This fact is supported by prospective evidence that diabetic patients receiving TURP experience a higher rate of complications, delayed recovery, and LUTS persistence because of diabetic cystopathy and autonomic dysfunction (4). Likewise, wider cohort

studies in resource constrained environments have also shown that comorbidity burden itself predicts postoperative complications after TURP (5). These results support the presence of extensive preoperative optimization and setting of realistic expectations in patients with severe medical comorbidities. Hydronephrosis and renal impairment were also other adverse prognostic factors in our research. Failure to take out the catheter on the postoperative period and long-term catheter dependence were significantly higher in patients who came in with the diagnosis of hydronephrosis or with low renal functioning.

These results are in line with predictive nomograms that have used renal parameters and the post-void residual volumes to estimate the efficacy of TURP (6). The alterations in chronic backpressure are the factors of the existence of advanced disease and the prolonged obstruction, when surgical intervention is unlikely to lead to the further worsening, yet it might be unable to restore the normal bladder functionality completely. The latest developments in predictive analytics also confirm our results. Models that make use of machine learning show better accuracy in predicting postoperative complications like the development of urethral stricture because of incorporation of various preoperative variables together (7). Age by itself was not a disqualification to successful results in our group, which is in line with the research that even the very old patients can still benefit with TURP with proper selection, although morbidity rates are still more prevalent in the group (8).

Intraoperative functional markers too have become the subject of attention as a prognostic tool. The studies comparing intraoperative voiding scores indicate that early postoperative voiding outcomes could be associated with a long-term outcome (9,10). Even though intraoperative scoring was not directly evaluated within our cohort, the high correlation between early TWOC success and long-time catheter-free status provides evidence of the suitability of early functional outcomes in prediction of outcomes. The issue of postoperative urinary bladder dysfunction discussed multiple times has been one of the key contributors of patient dissatisfaction after TURP. Our results are in line with the case-control studies that indicate that case-operational bladder dysfunction discussed multiple times is a major risk factor that preoperative bladder dysfunction discussed multiple times (11). Notably, recently, there is some emerging evidence that frailty, and not the age per se, is a strong predictor of unfavorable LUTS outcomes following TURP. Frail patients do not have a lower number of symptoms and more complications, which is why frailty assessment should be included in preoperative evaluation (12,13).

Another important factor is detrusor functionality. Despite the fact that patients with damaged detrusor

contractility still can gain advantages of TURP, the outcomes are inconsistent and frequently unsatisfactory, and patients should be carefully counseled (14). The incident of long-term complications including the formation of urethral stricture further complicates recovery especially in older patients and patients who have inflammatory risk factors (15). These results underline that obstruction relief, but also the long-term improvement in functioning should be considered the successful outcomes of TURP. Objective data like uroflowmetry give useful information on the postoperative recovery. Although there are generally noticeable increases in Q-max following TURP, this increase is less apparent in patients with advanced disease or long-standing obstruction as prospective studies have shown (16). To continue LUTS following TURP that is still treated with alpha-blockers is yet another indicator of incomplete functional recovery and has been associated with unfavorable preoperative urodynamic profiles (17). Lastly, systemic inflammation and physiological resilience are increasingly becoming significant in prognostication in surgery. Investigations that included frailty scores and inflammatory indices have shown that they can predict initial postoperative complications in all endourological operations (18). Machine-learning methods based on the combination of inflammatory indicators further highlight the prospects of outcome prediction in urology in the future (19). Taken together these results support the idea that the results of TURP are multifactorial and preoperative evaluation should go beyond the size of the prostate and the level of symptoms. Early detection of at-risk patients enables improved counseling, improved timing of surgery and improved reconciliation of patient expectations and quality of postoperative life that can be achieved.

Limitations

There are a number of limitations in this study that must be taken into consideration when interpreting the results. To start with, the retrospective observational design ensures that the analysis is based on the validity and completeness of the medical records, which can bring about information and selection bias. Second, the research involved one center, and it can be argued that the findings might not be applicable to other groups of people, health facilities, or surgeries. Third, even though important clinical and comorbidity-related variables were evaluated, other important functional parameters, including standardized symptom scores (as IPSS), detailed urodynamic measures, prostate volume, and frailty indices, were not equally available and could not be analyzed. Moreover, the sample size, although sufficient to perform the exploratory analysis, might have reduced the statistic power to detect the smaller yet clinically significant associations, especially in comparison of

subgroups. Lastly, the outcomes of the postoperative were predominantly centered on the dependency on the catheter and short- and mid-term functional recovery, and the quality-of-life outcomes were not assessed in the long term. These findings should be validated and extended in future prospective and multicentric studies using standardized assessment and follow-up.

CONCLUSION

This research shows that the outcome of transurethral resection of the prostate highly depends on the preoperative patient conditions as opposed to the surgery itself. The mode of presentation, especially the urinary bladder dysfunction discussed multiple times, renal impairment and comorbid conditions like diabetes mellitus play a significant role in influencing the postoperative catheter independence and functional recovery. Patients with early lower urinary tract symptoms have better outcomes in comparison to patients with late presentation and extended catheterization. Markers of progressive illness, such as hydronephrosis and bladder dysfunction are correlated with worse outcomes after surgery in spite of sufficient surgical decompression. These outcomes support the significance of thorough assessment during the preoperative stage to determine the patients who are most likely to show positive response to TURP. The use of clinical, functional and comorbidity-related variables during preoperative counseling would benefit patient selection, optimal timing of surgery and conforming postoperative expectations to realistic outcomes, which would in turn increase patient satisfaction and quality of life after TURP.

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