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Resolution of Upper Urinary Tract Dilatation and Renal Functional Outcomes After TURP in Underactive Bladder Patients: A Prospective Cohort Study

Emad Mostafa

emad_mostafa@med.sohag.edu.eg

Sohag University

Tarek Ahmed Mahmoud

Sohag University

Article

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Abstract

Background

Underactive bladder (UAB) associated with benign prostatic obstruction may cause chronic urinary retention, upper urinary tract dilatation, and impaired renal function. The effectiveness of transurethral resection of the prostate (TURP) in improving these complications remains clinically important.

Objective

To evaluate the resolution of upper urinary tract dilatation and improvement in renal function following TURP in patients with underactive bladder.

Patients and Methods:

This prospective observational cohort study included 50 male patients with underactive bladder undergoing TURP at Sohag University Hospital. Preoperative and postoperative assessments included renal ultrasonography, serum creatinine, blood urea, estimated glomerular filtration rate (eGFR), uroflowmetry, post-void residual urine (PVR), and International Prostate Symptom Score (IPSS).

Results

The mean age was 66.42 ± 7.85 years. Preoperative upper urinary tract dilatation was present in 60% of patients. Following TURP, complete resolution occurred in 40%, partial improvement in 43.3%, and persistent dilatation in 16.7% of affected patients. Serum creatinine decreased from 1.48 ± 0.42 to 1.19 ± 0.31 mg/dL [$p < 0.001$], while eGFR increased from 61.35 ± 17.42 to 74.68 ± 16.85 mL/min/1.73 m² [$p < 0.001$]. Qmax increased from 7.24 ± 2.68 to 16.82 ± 4.53 mL/s [$p < 0.001$]. Satisfactory spontaneous voiding was achieved in 82% of patients.

Conclusion

TURP was associated with improvements in upper urinary tract dilatation, renal function, and urinary outcomes in patients with underactive bladder.

Introduction

Benign prostatic hyperplasia (BPH) is a highly prevalent urological condition in aging men, serving as a primary etiology for bladder outlet obstruction (BOO), lower urinary tract symptoms (LUTS), and chronic urinary retention (CUR). Long-standing obstruction induces progressive pathological alterations in the bladder wall, including detrusor muscle hypertrophy, decreased compliance, and a subsequent loss of contractility. These structural changes frequently culminate in incomplete bladder emptying, recurrent urinary tract infections, high post-void residual (PVR) volumes, and a subsequent rise in intravesical pressure. Transurethral resection of the prostate (TURP) remains the gold-standard surgical intervention for relieving prostatic obstruction and restoring urinary flow; however, functional outcomes can vary widely depending on the duration of obstruction and the severity of pre-existing bladder dysfunction.

Underactive bladder (UAB) is a clinical symptom complex characterized by prolonged voiding, hesitancy, a weak urinary stream, and a sensation of incomplete bladder emptying, with detrusor underactivity (DU) as its urodynamic

counterpart. The coexistence of DU and BOO poses a significant diagnostic and therapeutic dilemma, as clinical symptoms alone cannot reliably differentiate impaired detrusor contractility from mechanical tissue obstruction. Consequently, preoperative pressure-flow urodynamic studies are indispensable for characterizing detrusor function and guiding surgical expectations. While TURP effectively minimizes bladder outlet resistance, the clinical efficacy of this procedure in patients with compromised detrusor contractility remains a subject of ongoing investigation and debate.

A critical sequela of high-pressure chronic urinary retention is the development of upper urinary tract dilatation, such as hydronephrosis and hydroureteronephrosis, which can progressively impair renal function. Chronic elevation of intravesical pressure hinders physiological urinary drainage from the upper tracts, leading to structural deterioration that is reflected in elevated serum creatinine and reduced estimated glomerular filtration rate (eGFR). Although TURP facilitates lower urinary tract decompression, the extent of upper urinary tract recovery and renal functional salvage is heavily contingent upon the chronicity of the pre-existing obstruction and the degree of underlying bladder compliance.

While numerous studies have evaluated TURP outcomes in patients with benign prostatic obstruction, the existing literature focuses predominantly on subjective symptom scores, maximum flow rates, and urodynamic indices, leaving a paucity of data regarding objective upper urinary tract resolution and renal functional recovery in the specific context of UAB. Therefore, this prospective cohort study was conducted to evaluate the resolution of upper urinary tract dilatation, renal functional outcomes, and bladder emptying efficiency following TURP in UAB patients managed at Sohag University Hospital.

Patients and Methods

Study Design and Setting

This prospective observational cohort study assessed the resolution of upper urinary tract dilatation and changes in renal function after TURP in patients with UAB. The study was conducted at the Department of Urology, Sohag University Hospital, Sohag University, Egypt.

Ethical Considerations

The study protocol was reviewed and approved prior to patient enrollment by the Institutional Medical Research Ethics Committee of Sohag University Faculty of Medicine (Approval number: Soh-Med-25-3-----1MD, dated March 25, 2025). The study was conducted in strict accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all individual participants prior to their enrollment in the study.

Study Population and Selection Criteria

A total of 50 male patients with underactive bladder who presented for TURP for benign prostatic obstruction at Sohag University Hospital were included in the study using strict selection criteria.

- **Inclusion Criteria**: Adult male patients undergoing TURP for BPH who exhibited clinical symptoms of bladder outlet obstruction and met the urodynamic criteria for DU on preoperative pressure-flow assessment. Detrusor underactivity was defined using the Bladder Contractility Index (BCI), with a BCI < 100 indicating weak detrusor contractility. Complete baseline and follow-up data were mandatory for inclusion.
- **Exclusion Criteria**: Patients with known neurogenic bladder dysfunction, prostate or bladder malignancy, urethral stricture, previous prostatic or urethral surgery, or non-prostatic causes of bladder outlet obstruction were

excluded. Patients with pre-existing renal dysfunction secondary to primary parenchymal or non-obstructive renal diseases were also excluded to eliminate confounding factors in renal functional outcomes.

Preoperative and Postoperative Clinical Assessment

A comprehensive baseline evaluation was completed for all participants, documenting age, duration and severity of lower urinary tract symptoms, history of chronic urinary retention, and prior urinary catheterization needs. Severity of LUTS was quantified using the International Prostate Symptom Score (IPSS) and the associated Quality of Life (QoL) score. Physical examination involved detailed abdominal palpation and digital rectal examination (DRE).

Laboratory investigations included serum creatinine and blood urea assessments. The estimated glomerular filtration rate (eGFR) was calculated using standard clinical equations based on baseline parameters. Transabdominal ultrasonography of the kidneys, ureters, and bladder was executed to determine the presence, laterality, and severity of upper urinary tract dilatation, alongside grading hydronephrosis. Prostate volume and post-void residual (PVR) volume were also mapped ultrasonographically.

Uroflowmetry was conducted to measure the maximum urinary flow rate (Qmax) in patients capable of spontaneous voiding. Preoperative pressure-flow urodynamic parameters included detrusor pressure at maximum flow (PdetQmax), BCI (calculated as PdetQmax + 5Qmax), and the Bladder Outlet Obstruction Index (BOOI, calculated as PdetQmax − 2Qmax). A BOOI > 40 signified obstruction, 20–40 represented equivocal obstruction, and < 20 indicated an absence of urodynamically demonstrable obstruction.

Surgical Technique and Follow-up

All patients underwent standard transurethral resection of the prostate (TURP) utilizing endoscopic techniques under appropriate spinal or general anesthesia to eliminate obstructing tissue. Postoperative continuous bladder irrigation and urethral catheterization were maintained as standard protocols. Follow-up evaluations were systematically conducted at regular intervals postoperatively, replicating the baseline clinical, laboratory, imaging, and uroflowmetry assessments to monitor renal recovery, upper tract changes, and voiding efficiency.

Statistical Analysis

Statistical computations were performed using IBM SPSS Statistics (version 26). Data normality was evaluated with the Shapiro–Wilk test. Quantitative variables were expressed as mean ± standard deviation (SD) or median and interquartile range (IQR), while categorical elements were presented as numbers and percentages. Pre- and postoperative quantitative indices were compared via paired Student's t-test or Wilcoxon signed-rank test. McNemar's test was utilized for paired categorical comparisons. Statistical significance was defined as a p-value < 0.05.

Results

The demographic and baseline clinical details of the 50 included patients are summarized in Table 1. The cohort's mean age was 66.42 ± 7.85 years, with the majority falling in the 60–69 age group (46.0%). The mean baseline prostate volume stood at 58.36 ± 15.72 mL, and the mean duration of LUTS was 27.48 ± 13.65 months. Chronic urinary retention history was noted in 64.0% of the cohort, with 56.0% relying on preoperative catheterization. Notably, baseline upper urinary tract dilatation was documented in 60.0% of the patients.

Table 1
Demographic and baseline clinical characteristics of the patients (n = 50)

Characteristics	Value
Age (years), mean ± SD	66.42 ± 7.85
50–59 years	10 (20.0%)
60–69 years	23 (46.0%)
≥ 70 years	17 (34.0%)
Prostate volume (mL), mean ± SD	58.36 ± 15.72
Duration of LUTS (months), mean ± SD	27.48 ± 13.65
History of chronic urinary retention	32 (64.0%)
Preoperative catheterization	28 (56.0%)
Hypertension	21 (42.0%)
Diabetes mellitus	14 (28.0%)
Upper urinary tract dilatation	30 (60.0%)

Postoperative structural evaluations demonstrated marked modifications in upper urinary tract profiles (Table 2). The portion of patients showing no upper tract dilatation scaled significantly from 40.0% preoperatively to 64.0% postoperatively (p = 0.003). Simultaneously, moderate hydronephrosis rates dropped from 22.0% to 12.0%, and severe hydronephrosis configurations declined from 14.0% to 2.0% (illustrated conceptually in Fig. 1).

Table 2
Preoperative and postoperative upper urinary tract dilatation among the patients (n = 50)

Upper urinary tract findings	Preoperative n (%)	Postoperative n (%)
No dilatation	20 (40.0%)	32 (64.0%)
Mild hydronephrosis	12 (24.0%)	11 (22.0%)
Moderate hydronephrosis	11 (22.0%)	6 (12.0%)
Severe hydronephrosis	7 (14.0%)	1 (2.0%)
Total	**50 (100%)**	**50 (100%)**
Overall P-value		0.003

\ (Fig. : DistributionofHydronephrosisSeverityBeforeandAfterTURPAmongthePatients\)

Among the 30 patients presenting with baseline upper urinary tract dilatation, postoperative assessments revealed complete structural resolution in 12 patients (40.0%) and partial improvements in 13 patients (43.3%). Persistent dilatation without notable evolution was noted in 5 patients (16.7%), while no instances of structural worsening were observed (Table 3). Overall, a positive upper tract recovery pattern was documented in 83.3% of affected individuals.

Table 3
Resolution of upper urinary tract dilatation following TURP among patients with preoperative dilatation (n = 30)

Postoperative outcome	n (%)
Complete resolution	12 (40.0%)
Partial improvement	13 (43.3%)
Persistent dilatation without improvement	5 (16.7%)
Worsening of dilatation	0 (0.0%)
Total	**30 (100%)**

Functional renal indices improved dramatically postoperatively (Table 4). Mean serum creatinine concentrations decreased from 1.48 ± 0.42 mg/dL to 1.19 ± 0.31 mg/dL ($p < 0.001$), while blood urea levels showed a parallel decline from 49.62 ± 16.35 mg/dL to 38.24 ± 12.17 mg/dL ($p = 0.002$). Furthermore, calculated mean eGFR values increased from 61.35 ± 17.42 mL/min/1.73 m² to 74.68 ± 16.85 mL/min/1.73 m² ($p < 0.001$).

Table 4
Comparison of renal functional parameters before and after TURP (n = 50)

Renal parameters	Preoperative mean ± SD	Postoperative mean ± SD	P-value
Serum creatinine (mg/dL)	1.48 ± 0.42	1.19 ± 0.31	< 0.001
Blood urea (mg/dL)	49.62 ± 16.35	38.24 ± 12.17	0.002
eGFR (mL/min/1.73 m²)	61.35 ± 17.42	74.68 ± 16.85	< 0.001

Urinary functional profiles demonstrated significant postoperative recovery (Table 5). The mean maximum flow rate (Qmax) increased from 7.24 ± 2.68 mL/s to 16.82 ± 4.53 mL/s ($p < 0.001$; typical flow changes are represented conceptually in Fig. 2). Concurrently, the mean post-void residual urine volume experienced a substantial reduction, falling from 365.42 ± 145.36 mL to 92.68 ± 65.27 mL ($p < 0.001$). Subjective profiles also reflected this improvement, with mean IPSS scores dropping from 24.36 ± 5.12 to 10.24 ± 4.36 ($p = 0.001$) and mean QoL scores improving from 4.62 ± 0.82 to 2.18 ± 0.95 ($p = 0.004$).

Table 5
Comparison of urinary functional parameters before and after TURP (n = 50)

Parameters	Preoperative mean ± SD	Postoperative mean ± SD	P-value
Qmax (mL/s)	7.24 ± 2.68	16.82 ± 4.53	< 0.001
PVR (mL)	365.42 ± 145.36	92.68 ± 65.27	< 0.001
IPSS	24.36 ± 5.12	10.24 ± 4.36	0.001
QoL score	4.62 ± 0.82	2.18 ± 0.95	0.004

\ (Fig. 2: Illustrative Uroflowmetry Curves Before and After TURP\)

Baseline pressure-flow evaluations confirmed detrusor hypo contractility across the entire cohort (Table 6). The mean baseline BCI was 69.62 ± 15.48, and the mean BOOI was 28.94 ± 16.72. Urodynamic categorization according to BOOI scores identified mechanical obstruction in 38.0% of patients, equivocal obstruction findings in 42.0%, and

unobstructed profiles in 20.0% of the cohort. Preoperative and postoperative pressure channel shifts are conceptually modeled in Fig. 3.

Table 6
Preoperative urodynamic characteristics of the patients (n = 50)

Urodynamic parameters	Value
PdetQmax (cmH_2O), mean ± SD	33.42 ± 9.65
BCI, mean ± SD	69.62 ± 15.48
BOOI, mean ± SD	28.94 ± 16.72
BCI < 100	50 (100.0%)
BOOI > 40 (obstructed)	19 (38.0%)
BOOI 20–40 (equivocal)	21 (42.0%)
BOOI < 20 (unobstructed)	10 (20.0%)

\ (Fig. 3: Illustrative Pressure -Flow Study: Pressure Channel Examples\)

Spontaneous voiding success rates post-TURP are documented in Table 7. Satisfactory spontaneous voiding was successfully achieved in 41 patients (82.0%). Conversely, 5 patients (10.0%) demonstrated spontaneous voiding accompanied by significant residual urine volumes, and 4 patients (8.0%) required continued long-term catheterization due to persistent bladder emptying failure.

Table 7
Postoperative voiding outcomes among the patients (n = 50)

Postoperative voiding status	n (%)
Satisfactory spontaneous voiding	41 (82.0%)
Spontaneous voiding with significant residual urine	5 (10.0%)
Continued catheterization requirement	4 (8.0%)
Total	**50 (100%)**

Discussion

The clinical intersection of benign prostatic obstruction and detrusor underactivity represents a complex urological paradigm characterized by high outlet resistance coupled with deficient bladder mechanical contractility. While TURP is widely accepted as an effective treatment for anatomical prostatic obstruction, its utility in patients with concurrent underactive bladder has been a matter of historical debate, given that successful micturition requires both minimal outlet resistance and coordinated detrusor function. Protracting mechanical obstruction induces microstructural damage to the detrusor wall, worsening contractility and causing high post-void residual urine volumes. When these volume loads are accompanied by high intravesical pressures, structural upper urinary tract dilatation and secondary obstructive nephropathy develop. Therefore, evaluating surgical efficacy in this subpopulation must transcend basic lower tract symptom monitoring to integrate objective tracking of upper urinary tract architecture and renal clearance kinetics.

The demographic profiles in our study, featuring a mean age of 66.42 ± 7.85 years, match classical reports by Al Mamun et al. (mean age: 65.2 ± 6.5 years) and Abbas et al. (mean age: 67.98 ± 7.18 years). Our mean prostate volume of 58.36 ± 15.72 mL was higher than that reported by Sokhal et al. (42.8 ± 6.4 mL) but lower than findings by Abbas et al. (65.87 ± 17.16 mL), variations likely driven by distinct institutional selection criteria. Furthermore, the high proportions of baseline chronic urinary retention (64.0%) and preoperative catheter use (56.0%) mirror the high-burden retention features emphasized by Negro and Muir and Stoffel. These elements emphasize that prostate size alone is an unreliable marker of obstruction severity or recovery capacity, particularly when bladder contractility is fundamentally compromised.

Preoperative upper urinary tract dilatation was identified in 60.0% of our cohort. Following surgical decompression via TURP, complete or partial resolution of hydronephrosis was achieved in 83.3% of affected individuals. This structural recovery aligns with findings by Al Mamun et al., who reported complete structural normalization in 40% and partial improvements in 60% of their cohort post-TURP. Conversely, Atar et al. noted that upper tract alterations occurred more frequently in patients with preserved detrusor function than in those with impaired contractility (83.3% vs. 15.4%), highlighting distinct pressure profiles between high-pressure retention states and low-pressure hypo contractile volumes [17–21]. The high-resolution rates observed in our dataset confirm the clinical contentions of Ghalayini et al. that pressure-induced upper tract abnormalities remain highly reversible upon adequate decompression. Persistent dilatation seen in 16.7% of our patients may stem from chronic neuromuscular remodeling or fixed anatomical adynamia in the upper collecting system.

Renal functional parameters in our study demonstrated highly favorable trends, with mean serum creatinine decreasing from 1.48 ± 0.42 to 1.19 ± 0.31 mg/dL and eGFR escalating from 61.35 ± 17.42 to 74.68 ± 16.85 mL/min/1.73 m². These improvements complement data from Al Mamun et al., where median serum creatinine shifted from 1.27 to 1.21 mg/dL post-decompression. The physiological recovery of clearance mechanisms following urinary decompression is well-mapped by Madhushankha et al. and Styles et al., who emphasized that resolving outlet resistance lowers hydrostatic pressures back through the collecting system, preserving nephron filtration. However, as noted by Yu and Kuo, complete functional recovery is impossible in nephrons with pre-existing, long-standing irreversible interstitial fibrosis, emphasizing the critical value of timely intervention.

Urinary flow indices and subjective symptom scores also improved significantly in our cohort. Mean Qmax rose from 7.24 ± 2.68 to 16.82 ± 4.53 mL/s, and mean PVR volume fell from 365.42 ± 145.36 to 92.68 ± 65.27 mL. While these parameters mimic patterns reported by Al Mamun et al. and Abbas et al., our postoperative residual volumes remained slightly higher than those seen in populations with normal detrusor function, a direct consequence of underlying bladder hypo contractility. Additionally, the observed drops in IPSS (24.36 to 10.24) and QoL scores (4.62 to 2.18) parallel the results published by Sokhal et al. and Lebani et al., reinforcing the fact that reducing bladder outlet resistance can provide substantial symptomatic and qualitative relief even without direct recovery of detrusor contractility.

Urodynamic evaluations categorized 38.0% of our patients as obstructed, 42.0% as equivocal, and 20.0% as unobstructed based on the BOOI, emphasizing the poor correlation between clinical symptoms and true mechanical resistance in UAB patients. This variability confirms the arguments of Tanabe et al. and Abdelhakim et al. regarding the absolute necessity of pressure-flow assessments to guide prognosis. Finally, our successful spontaneous voiding rate of 82.0% compares favorably with the retrospective data of Sokhal et al. It is slightly lower than standard success rates in non-UAB BPH populations reviewed by Castellani et al., due to persistent voiding failure in severe detrusor adynamia. These findings collectively demonstrate that while TURP has clear limitations in fixing the underlying adynamia, it provides profound secondary structural and clearance benefits by lowering exit resistance.

Study Limitations

Despite its prospective design and objective multi-parametric assessment, this study has several limitations that should be acknowledged. First, the study was conducted at a single tertiary institution with a relatively small sample size of 50 patients, which may limit the generalizability of the findings to broader populations. Second, the absence of a non-surgical control group or a comparative cohort of patients with preserved detrusor function restricts the ability to isolate the independent effect of underactive bladder on long-term recovery rates. Lastly, the follow-up duration was relatively short; a longer monitoring period is required to determine the durability of upper urinary tract resolution and to identify potential late-onset renal or bladder dysfunctions. Future multi-center prospective studies with larger cohorts and extended follow-up periods are warranted to validate these outcomes and establish definitive predictors of successful post-TURP recovery in this challenging patient population.

Conclusion

The present study concluded that TURP was associated with significant improvements in upper urinary tract dilatation, renal function, and urinary outcomes among patients with underactive bladder. Complete or partial resolution of upper urinary tract dilatation was observed in 83.3% of affected patients, accompanied by significant improvements in serum creatinine, estimated glomerular filtration rate, maximum urinary flow rate, post-void residual urine volume, and urinary symptoms. Furthermore, 82% of patients achieved satisfactory spontaneous voiding following surgery. These findings suggest that impaired detrusor contractility should not necessarily exclude patients from TURP when clinically indicated. Therefore, comprehensive preoperative assessment, including urodynamic evaluation, renal function tests, and urinary tract ultrasonography, is recommended to optimize patient selection. Regular postoperative follow-up is essential to monitor renal recovery, residual urine volume, and persistent upper urinary tract dilatation. Further prospective studies involving larger sample sizes and longer follow-up periods are recommended to confirm these findings and identify predictors of successful postoperative outcomes.

Declarations

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Author Contribution

E.A.A.M. and T.A.M. conceived and designed the study. E.A.A.M. was responsible for patient recruitment, clinical evaluations, data collection, and performing the surgical procedures. T.A.M. performed the preoperative and postoperative urodynamic assessments, calculated the estimated glomerular filtration rates, and executed the statistical analyses. E.A.A.M. wrote the main manuscript text, and T.A.M. prepared and drafted all tables and figures. Both authors critically revised the manuscript for important intellectual content, reviewed and approved the final version to be published, and agreed to

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to patient privacy and ethical restrictions but are available from the corresponding author on reasonable request.

References

1. 1. Al Mamun A, Ullah AA, Dhar S, Hasan M, Haque F, Badol MMR. Outcome of transurethral resection of prostate in patients with chronic retention of urine due to benign enlargement of prostate. Bangladesh J Urol. 2025;28:60–66.
2. 2. Sokhal AK, Sinha RJ, Purkait B, Singh V. Transurethral resection of prostate in benign prostatic enlargement with underactive bladder: a retrospective outcome analysis. Urol Ann. 2017;9:131–135.
3. 3. Gani J, Hennessey D. The underactive bladder: diagnosis and surgical treatment options. Transl Androl Urol. 2017;6:S186–S195.
4. 4. Osman NI, Chapple CR, Abrams P, Dmochowski R, Haab F, Nitti V, et al. Detrusor underactivity and the underactive bladder: a new clinical entity? A review of current terminology, definitions, epidemiology, aetiology, and diagnosis. Eur Urol. 2014;65:389–398.
5. 5. Atar K, Maiti K, Pal DK. Ideal timing of prostate operation in chronic urinary retention due to benign prostatic hyperplasia by serial urodynamic study: a prospective longitudinal study. J Clin Diagn Res. 2022;16(11).
6. 6. Madhushankha M, Jayarajah U, Kuruppu C, Goonewardena SA, Abeygunasekera AM. Clinical characteristics and outcome of high pressure chronic urinary retention: a systematic review. J Clin Urol. 2022;15:204–212.
7. 7. Lebani BR, Barcelos ADS, Gouveia DSES, Girotti ME, Remaille EP, Skaff M, et al. The role of transurethral resection of prostate (TURP) in patients with underactive bladder: 12 months follow-up in different grades of detrusor contractility. Prostate. 2023;83:857–862.
8. 8. Yu WR, Kuo HC. Usefulness of videourodynamic study in the decision-making of surgical intervention and bladder management for neurogenic lower urinary tract dysfunction among patients with myelomeningocele. Int Urol Nephrol. 2022;54:1815–1824.
9. 9. Abbas SN, Zaidi SAI, Fida Z, Rahman AU, Akram W. Improvement in uroflowmetry parameters after transurethral resection of prostate for bladder outlet obstruction in benign prostatic hyperplasia: uroflowmetry outcomes after TURP in BPH. Pak J Health Sci. 2026;117–121.
10. 10. Castellani D, Akand M, Giulioni C, Cormio A, DiBianco JM, De S, et al. Incidence of acute urinary retention/failure to void after transurethral interventions for benign prostatic enlargement: results from a systematic review and meta-analysis of comparative randomized studies by the FUTURE Collaborative of the Endourological Society. J Endourol. 2026;40:726–745.
11. 11. Negro CL, Muir GH. Chronic urinary retention in men: how we define it, and how does it affect treatment outcome. BJU Int. 2012;110:1590–1594.
12. 12. Stoffel JT. Non-neurogenic chronic urinary retention: what are we treating? Curr Urol Rep. 2017;18.
13. 13. Levin RM, Haugaard N, O'Connor L, Buttyan R, Das A, Dixon JS, et al. Obstructive response of human bladder to BPH vs. rabbit bladder response to partial outlet obstruction: a direct comparison. Neurourol Urodyn. 2000;19:609–629.
14. 14. Abrams PH, Dunn M, George N. Urodynamic findings in chronic retention of urine and their relevance to results of surgery. Br Med J. 1978;2:1258–1260.
15. 15. Abdelhakim MA, Rammah A, Abozamel AH, El Sheikh MG, Abdelazeem MS, Abdallah SM, et al. Does detrusor underactivity affect the results of transurethral resection of prostate? Int Urol Nephrol. 2021;53:199–204.
16. 16. Javle P, Jenkins SA, Machin DG, Parsons KF. Grading of benign prostatic obstruction can predict the outcome of transurethral prostatectomy. J Urol. 1998;160:1713–1717.
17. 17. Thomas AW, Cannon A, Bartlett E, Ellis-Jones J, Abrams P. The natural history of lower urinary tract dysfunction in men: minimum 10-year urodynamic followup of transurethral resection of prostate for bladder outlet obstruction. J Urol. 2005;174:1887–1891.

18. 18. Mebust WK, Holtgrewe HL, Cockett AT, Peters PC, Bueschen AJ, Carlton CE Jr, et al. Transurethral prostatectomy: immediate and postoperative complications. A cooperative study of 13 participating institutions evaluating 3,885 patients. J Urol. 1989;141:243–247.
19. 19. Tanabe T, Ishizuka O, Ichino M, Ogawa T, Imamura T, Kurizaki Y, et al. Analysis of the pressure flow study in weak detrusor patients with benign prostatic hypertrophy. Low Urin Tract Symptoms. 2011;3:109–112.
20. 20. Bates TS, Sugiono M, James ED, Stott MA, Pocock RD. Is the conservative management of chronic retention in men ever justified? BJU Int. 2003;92:581–583.
21. 21. Dekalo S, Welk B. Early and late outcomes of transurethral prostatectomy in men with significant postvoid residual volumes and mild or no lower urinary tract symptoms. Can Urol Assoc J. 2022;16:317.
22. 22. Styles RA, Ramsden PD, Neal DE. The outcome of prostatectomy on chronic retention of urine. J Urol. 1991;146:1029–1033.
23. 23. Fowler FJ, Wennberg JE, Timothy RP, Barry MJ, Mulley AG, Hanley D. Symptom status and quality of life following prostatectomy. JAMA. 1988;259:3018–3022.
24. 24. Thomas AW, Cannon A, Bartlett E, Ellis-Jones J, Abrams P. The natural history of lower urinary tract dysfunction in men: the influence of detrusor underactivity on the outcome after transurethral resection of the prostate with a minimum 10 year urodynamic follow up. BJU Int. 2004;93:745–750.
25. 25. Ghalayini IF, Al-Ghazo MA, Pickard RS. A prospective randomized trial comparing transurethral prostatic resection and clean intermittent self-catheterization in men with chronic urinary retention. BJU Int. 2005;96:93–9

Figures

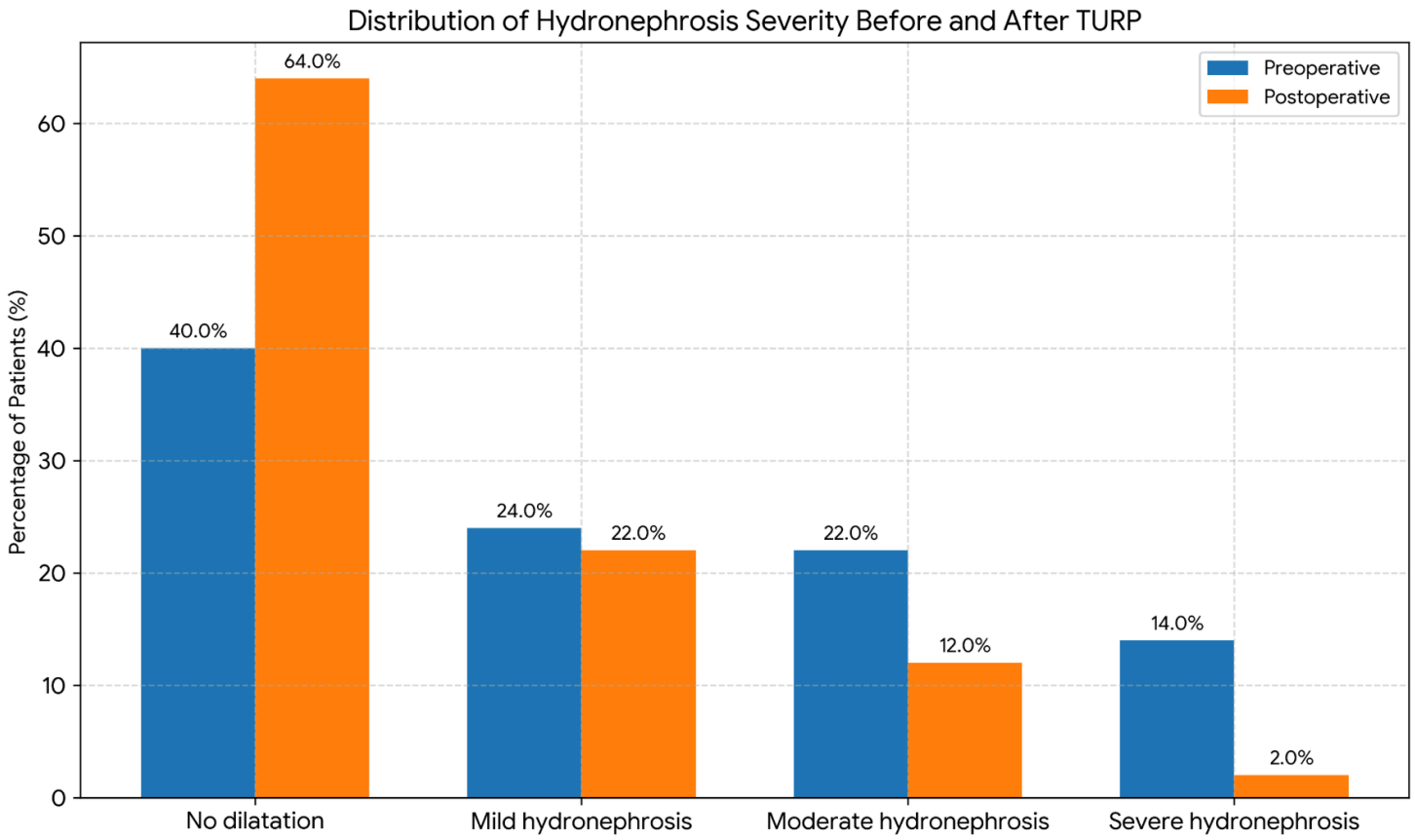


Figure 1

DistributionofHydronephrosisSeverityBeforeandAfterTURPAmongthePatients\)

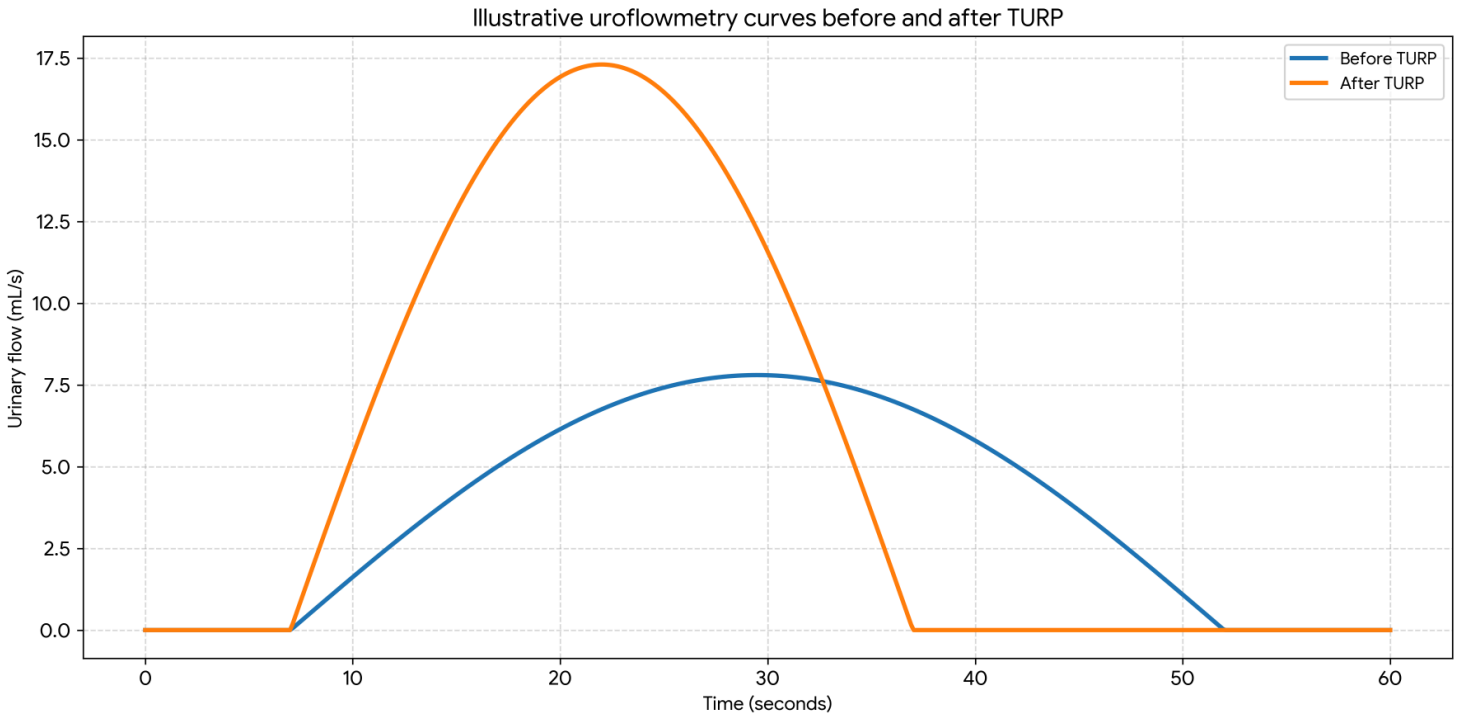


Figure 2

Illustrative Uroflowmetry Curves Before and After TURP

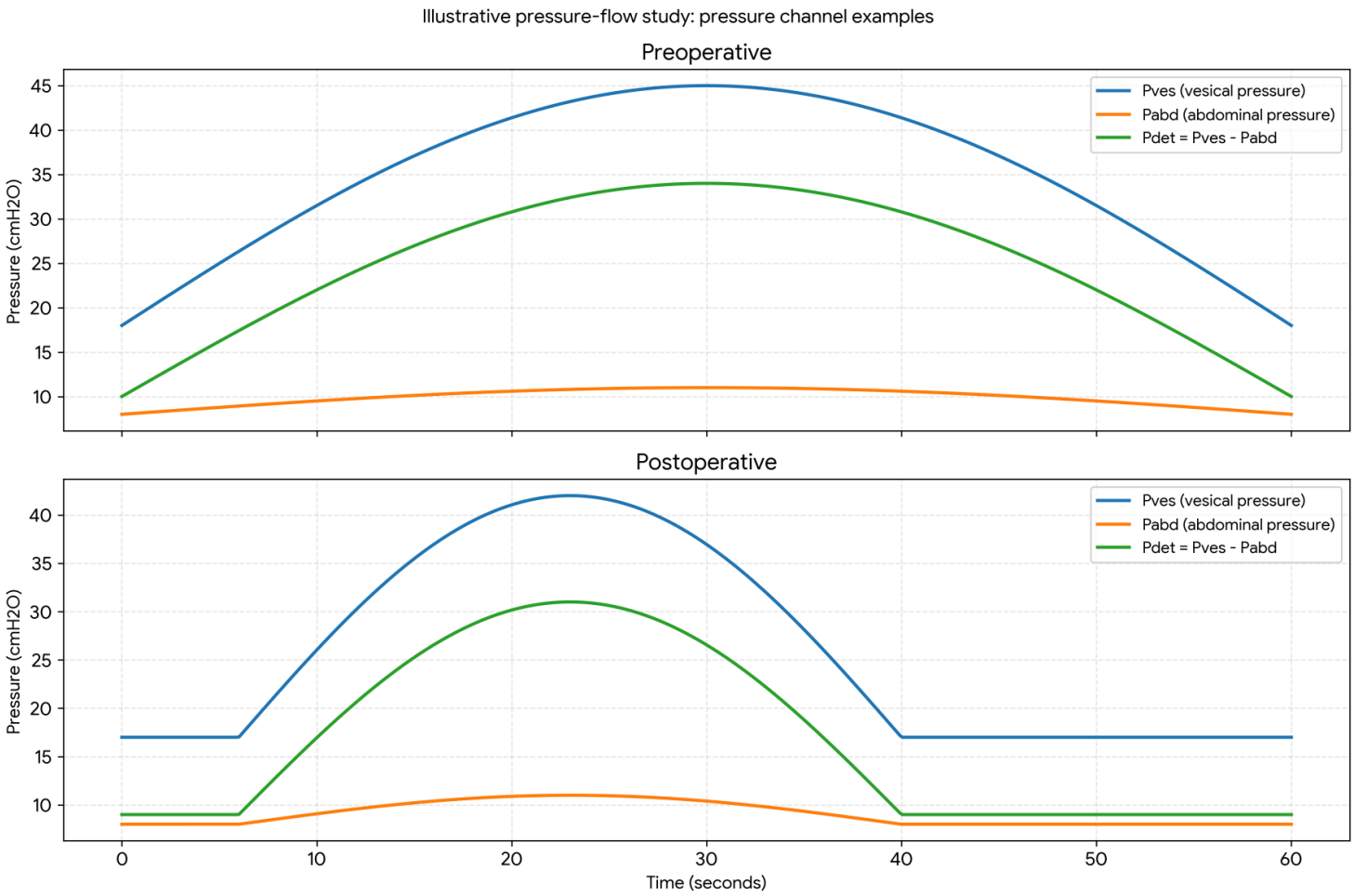


Figure 3

Illustrative Pressure -Flow Study: Pressure Channel Examples