Sarcouncil Journal of Medical Sciences

ISSN(Online): 2945-3526

Volume- 04| Issue- 08| 2025

Research Article

Received: 15-07-2025 | Accepted: 05-08-2025 | Published: 28-08-2025

The Role of X-rays in Prostate Enlargement and Determining the Initial Complications after Surgery

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Abstract: Benign prostatic hyperplasia (BPH) is a common condition in aging men, characterized by prostate enlargement leading to urinary symptoms and complications such as bladder obstruction and urinary retention where our Methods refer to A quantitative observational study was conducted on 105 male patients aged 50-70 from Iraq with clinically confirmed BPH undergoing TURP with Preoperative X-rays were used to identify bladder obstruction, urinary retention, and other complications. Postoperative outcomes including operative time, blood loss, pain scores, complications, uroflowmetry parameters, and quality of life (via IPSS and SF-36) were recorded and analyzed so results which found in our study were Preoperative X-rays detected bladder obstruction in 51.5% and urinary retention in 28.5% of patients additionally TURP outcomes showed an average operative time of 60 minutes and acceptable blood loss with a 14.3% morbidity rate and no mortality reported with Postoperative uroflowmetry demonstrated significant improvement in urinary flow rates and reduction in residual volume, sustained up to 12 months. IPSS symptom scores and SF-36 quality of life domains showed marked surgical benefit. Patient satisfaction with X-ray imaging was high, with most appreciating the role of imaging in their care. Finally, we concluded X-ray imaging is a valuable adjunct in the management of BPH, aiding in preoperative assessment and early identification of postoperative complications. Incorporating X-rays enhances clinical decision-making, optimizes surgical outcomes, and improves patient satisfaction.

Keywords: Benign prostatic hyperplasia (bph), prostate enlargement, x-ray imaging, diagnostic utility, transurethral resection of the prostate (turp), postoperative complications, bladder obstruction, urinary retention, international prostate symptom score (ipss).

INTRODUCTION

Prostate enlargement, clinically known as benign prostatic hyperplasia (BPH), is a common condition that affects a significant number of aging men, leading to various urinary symptoms and complications where With advances in medical imaging, X-rays have emerged as an essential tool in the diagnostic workflow for assessing prostate-related conditions furthermore (Quek, M. L. *et al.*, 2006; Roehrborn, C. G. 2005; Thapa, S., & Kourlas, H. 2005). While X-rays are not the primary modality for visualizing the prostate itself, they play a vital role in evaluating potential complications related to prostate enlargement, such as bladder obstruction and kidney involvement even that In the context of surgical interventions for prostate enlargement, understanding the implications of preoperative and postoperative X-ray findings can help in predicting potential complications and guiding clinical decision-making as well as This introduction highlights the multifaceted role of X-rays in managing patients with prostate enlargement and elucidates how they contribute to the understanding of initial complications that may arise post-surgery, ultimately improving patient outcomes and enhancing the quality of care (Herzog, P., & Rieger, C. T. 2004; Grossfeld, G. D., & Coakley, F. V. 2000; Weiss, C. R., & Hafezi-Nejad, N. 2023; Kolte, S. *et al.*, 2016)

Radiology (especially interventional radiology techniques such as prostatic artery embolization or radiofrequency ablation) plays an important role in treating BPH by shrinking the prostate, improving urinary flow, and reducing symptoms without conventional surgery. After surgery, imaging (such as X-rays, CT scans, or MRIs) can be used to assess initial complications and diagnose any problems such as blood leakage or clots, damage to adjacent tissues, or even recurrence of symptoms (Rassweiler, J. *et al.*, 2006; Printz, C. 2009; Morant, S. V. *et al.*, 2017) on the other hand BPH typically develops from transitional and periurethral glandular tissue in the prostate in individuals over 60 years of age, causing compression and obstruction of the urethra and bladder neck, leading to urinary dysfunction (Kusljic, S. *et al.*, 2017; Calişkan, S. 2012; Durant, A. M. *et al.*, 2020). In type I BPH (T1-WI), the signal intensity of BPH is moderate and indistinguishable from the rest of the gland. In type II BPH (T2-WI), all types of BPH are characterized by heterogeneous signal intensity,

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DOI-https://doi.org/10.5281/zenodo.16988730

contributed by both stromal and glandular components. Meanwhile, the glandular type of BPH shows heterogeneous high signal intensity on T2-WI. Furthermore, a BPH volume-to-total gland volume ratio exceeding 0.75 indicates non-stromal hyperplasia (Kim, E. H. *et al.*, 2016; Luke, P. P., & Spodek, J. 2004; Li, X. *et al.*, 2013), so finally, our study aims to evaluate the Diagnostic Utility of X-rays: Assess how X-ray imaging contributes to the preoperative understanding of prostate enlargement and its associated complications

METHODOLOGY

This study employed a quantitative, observational design to assess the role of X-rays in the management of benign prostatic hyperplasia (BPH) and to determine immediate complications following transurethral resection of the prostate (TURP) where in our study The primary focus was on clarifying how X-ray imaging enhances pre-operative evaluations and post-operative outcomes in a sample of male patients with a diagnosis of BPH moreover The research was carried out at a tertiary care facility, where patients with BPH and planned TURP were recognized over six months.

- Approval was granted by the institutional review board, and informed consent was signed by all the participants before they were enrolled.
- The research encompassed a sample size of 105 male patients, between the ages of 50 and 70 years, collected from different hospitals of Iraq, with a study period between 23-5-2024 to 22-5-2025 for confirmed BPH diagnosis.
- The inclusion criteria were men who had bothersome urinary symptoms that disrupted their quality of life, and those with a history of prostate cancer or prior prostate surgery were excluded.

Data Collection of Participants

- Information regarding patient demographics, medical histories, and comorbid conditions was collected using structured questionnaires and standardized evaluation tools as following.
- Presents an overall summary of baseline characteristics that include age, BMI, Charlson Comorbidity Index, and the prevalence of associated comorbidities like hypertension and diabetes.
- The average age of subjects was found to lie mostly in the range of 57 to 63 years (38.1%), with an average BMI of 27.5 kg/m².

PRE-OPERATIVE DIAGNOSES

The participants were subjected to thorough pre-operative workup, including clinical, laboratory, and imaging investigations with X-rays on the other hand The X-ray imaging was specifically aimed at identifying possible complications related to prostate enlargement like bladder obstruction, urinary retention, and evidence of complications such as haematuria as well as identifies the diagnostic findings as observed through X-ray investigation before TURP then Pre-surgical clinical examination had identified that 51.5% of the participants had evidence of bladder obstruction and 28.5% showed urinary retention furthermore PSA levels were also assessed and presented a mean level of 10 µg/L for the cohort. Anticoagulative and antithrombotic drug history was also reported, with 28.6% of the patients having a positive history.

Preoperatively, patients were assessed using the International Prostate Symptom Score (IPSS), allowing the classification of symptom severity, so in our study, the Surgical Procedure for Transurethral Resection of the Prostate (TURP) was also the surgical procedure for all patients. The surgery was conducted under general anesthesia to maintain consistency in the surgical procedure therefore Careful records were maintained regarding operative time, estimated blood loss, hospital stay, and immediate complications in addition to can be evidenced from Table 4, the average operative time for the TURP procedure was found to be around 60 minutes, with an average blood loss of 150 mL and an average hospital stay of 2 days also were post-surgical pain management was standardized and involved the use of oral and intravenous pharmacological agents, where 57.1% of the patients required oral analgesics. Pain intensity was evaluated using a post-operative pain score system that documented the level of pain experienced, thereby giving important information regarding patient recovery outcomes.

According to the SF-36 Health Survey, a health-related quality of life survey was conducted pre-operatively and post-operatively, with scores demonstrating significant improvements in the number of domains.

RESULTS

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Table 1: Characteristics of Patients with Benign Prostatic Hyperplasia (BPH) at Baseline

Characteristic	n (%)
Age Groups (years)	
50 - 56	35 (33.3%)
57 - 63	40 (38.1%)
64 - 70	30 (28.6%)
Total Males	105 (100%)
BMI (kg/m²)	27.5 (25.0 - 30.0)
Charlson Comorbidity Index	
1	50 (47.6%)
2	35 (33.3%)
3	15 (14.3%)
4	5 (4.8%)
Creatinine Level (μmol/L)	90 (70 - 115)
Hypertension	60 (57.1%)
Diabetes	30 (28.6%)
Hyperlipidemia	25 (23.8%)
Obesity	20 (19.0%)
Kidney Damage	10 (9.5%)
Smokers	45 (42.9%)
Alcohol Drinkers	20 (19.0%)
Education Level	
Primary School	25 (23.8%)
High School	50 (47.6%)
College/University/Above	30 (28.6%)

Table 2: Diagnostic Findings and X-Ray Technique

Finding	n (%)
Clinical Examination Detected by X-Rays Before TURP	
Haematuria Before TURP	21 (20.0%)
Urinary Retention Before TURP	30 (28.5%)
Bladder Obstruction Before TURP	54 (51.5%)
PSA Level (μg/L)	10 (5 - 15)
Prostate Volume (mL)	45 (30 - 60)
Anticoagulative/Antithrombotic Medication	30 (28.6%)
Erection Medication Previously Used	20 (19.0%)
Leak Free Continence Before TURP	55 (52.4%)
Pad Free Continence Before TURP	60 (57.1%)
Erection Sufficient for Penetration	40 (38.1%)

Table 3: Identifying Symptoms Detected in Patients Underwent X-Rays Before TURP

Symptoms	n (%)
Indicators	
Frequent Urination	70 (66.7%)
Urgency	60 (57.1%)
Difficulty Starting Urination	80 (76.2%)
Weak Urine Stream	75 (71.4%)
Intermittent Urination	50 (47.6%)
Incomplete Emptying	55 (52.4%)
Straining to Urinate	40 (38.1%)
Pain or Discomfort	30 (28.6%)
IPSS Symptoms Score	
Mildly Symptomatic (0-7 points)	25 (23.8%)
Moderately Symptomatic (8-19 points)	50 (47.6%)

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Severely Symptomatic (20-35 points)	30 (28.6%)

Table 4: Surgical Outcomes of Transurethral Resection of the Prostate (TURP)

Outcome	n (%)
Operative Time (min)	60 (10.0)
Anesthesia Used	100% General Anesthesia
Bleeding	25 (23.8%)
Blood Loss (mL)	150 (100 - 250)
Length of Stay in Hospital (days)	2 (1 - 3)
Readmission Rate	8 (7.6%)
Morbidity	15 (14.3%)
Mortality	0 (0.0%)
Post-operative Pain Scores	
None	40 (38.1%)
Mild	35 (33.3%)
Moderate	25 (23.8%)
Severe	5 (4.8%)
Pain Management Post-Surgery	
Oral Medication	60 (57.1%)
IV Medication	30 (28.6%)
No Pain Management	15 (14.3%)

Table 5: Adverse Indicators Related to X-ray-Guided TURP for BPH

Complication	n (%)
Overall Number of Post-Operative Complications within 90 Days	
Grade I	10 (9.5%)
Grade II	5 (4.8%)
Grade IIIb	0 (0.0%)
Types of Complications after TURP	
Haematuria	6 (5.71%)
UTI	3 (2.86%)
UTI and Urinary Retention	0 (0%)
UTI and Epididymitis	1 (0.95%)
Urinary Retention	3 (2.86%)
Epididymitis	2 (1.9%)
Total	15 (14.29%)

Table 6: Uroflowmetry Markers Findings at Pre-TURP and After Surgery

Uroflowmetry Findings	Pre-TURP (Mean ± SD)	2 Months (Mean ± SD)	5 Months (Mean ± SD)	10 Months (Mean ± SD)	12 Months (Mean ± SD)
Average Flow (mL/s)	15.1 ± 3.5	18.0 ± 3.0	20.5 ± 2.8	22.0 ± 2.0	23.0 ± 1.5
Max Flow (mL/s)	25.3 ± 5.0	28.0 ± 4.5	30.0 ± 4.0	32.0 ± 3.5	33.1 ± 3.0
Residual Volume (mL)	80 ± 30	40 ± 20	30 ± 15	20 ± 10	15 ± 5
Voided Volume (mL)	200 ± 50	300 ± 40	350 ± 35	400 ± 30	450 ± 20
Prostate Volume (mL)	50 ± 10				
PSA Level (µg/L)	10.2 ± 2.5	5.0 ± 1.5	4.0 ± 1.0	3.0 ± 0.5	2.5 ± 0.5

Table 7: Health Assessment Related to Patients with BPH after TURP Using IPSS Scores

Symptom	Mean Score Pre-TURP (SD)	Mean Score Post-TURP (SD)	Improvement
Frequent Urination	4.5 (1.0)	1.5 (0.8)	Yes
Urgency	4.0 (0.9)	1.2 (0.7)	Yes

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Difficulty Starting Urination	3.9 (1.1)	1.1 (0.6)	Yes
Weak Urine Stream	4.2 (1.2)	1.4 (0.5)	Yes
Intermittent Urination	3.6 (1.0)	1.0 (0.4)	Yes
Incomplete Emptying	4.1 (1.1)	1.3 (0.6)	Yes
Straining to Urinate	4.0 (1.0)	1.3 (0.5)	Yes

Table 8: Patient Satisfaction with X-Ray Imaging

Satisfaction Level	n (%)
Very Satisfied	40 (38.1%)
Satisfied	45 (42.9%)
Neutral	15 (14.3%)
Non-Satisfied	3 (2.9%)
Very Non-Satisfied	2 (1.9%)

Table 9: Health-Related Quality of Life (SF-36) Questionnaire Domains

Domain	Preoperative Mean (SD)	Post-Operative Mean (SD)
Physical Function	46.0 (15.0)	75.0 (10.0)
Role Physical	52.0 (16.0)	70.0 (12.0)
Bodily Pain	50.0 (14.5)	80.0 (11.0)
General Health	44.0 (13.0)	80.0 (10.0)
Vitality	51.0 (15.0)	65.0 (12.0)
Social Function	64.0 (12.5)	85.0 (9.0)
Role Emotional	67.0 (14.0)	75.0 (11.0)
Mental Health	62.0 (13.0)	75.0 (10.0)

DISCUSSION

In our study, we discussed the results above, which began on Baseline Characteristics of Patients with Benign Prostatic Hyperplasia (BPH)

The baseline demographic and clinical characteristics demonstrate a representative BPH population, with most between 57 and 63 years of age (38.1%) and a mean BMI of 27.5 kg/m², which is in line with established risk factors for BPH, namely middle-to-late age and mild overweight. The Charlson Comorbidity Index distribution demonstrates a high burden of comorbidities, mainly hypertension (57.1%) and diabetes (28.6%), which are very often related to both prostate disease and surgical risk profiles. The rate of smoking (42.9%) also mirrors established lifestyle risk factors for worse outcomes in urological disease. Such information again highlights the value of a thorough preoperative assessment since comorbidities may affect surgical planning and recovery after surgery, then we found in Diagnostic Findings and X-Rays Technique.

X-ray imaging prior to TURP revealed bladder obstruction in over half of the patients (51.5%) and urinary retention in nearly 30%, highlighting the role of X-rays in detecting important mechanical complications of BPH that can guide surgical timing and urgency. Haematuria detected in 20% corroborates the clinical presentation of BPH-related mucosal irritation or coexisting infection, while the PSA level, averaging 10 µg/L, while elevated, remains within ranges often seen in BPH rather than malignancy, affirming appropriateness of patient selection. The history of anticoagulant use in 28.6% raises considerations for perioperative bleeding risk, and the reported erectile dysfunction metrics suggest a baseline impairment that must be considered in counseling patients about post-TURP sexual function outcomes.

According to the prevalence and severity of symptoms evaluated by IPSS items and symptom scores, they offer a clinical correlate to radiographic results and establish the surgical indication. Importantly, start urination difficulty (76.2%) and weak urine stream (71.4%) depict classic symptoms of bladder outlet obstruction characteristic of advanced BPH, validating the X-ray findings. The severity distribution of symptoms, with close to 28.6% highly symptomatic patients, indicates a population with significant clinical burden, validating the TURP intervention rationale. Mild or moderate pain or discomfort (28.6%) presents an additional level of symptom complexity that is associated with patient distress and quality of life effects. Operative time of 60 minutes and blood loss of 150 mL are within expected parameters for TURP, confirming procedural standardization and surgical

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experience. Hospital length of stay of 2 days on average is representative of modern fast-track recovery pathways; also, the incidence of bleeding (23.8%) is within accepted risks of TURP, particularly in the setting of anticoagulation. Postoperative pain scores reveal that most had mild to moderate pain, successfully controlled in 85.7% of patients with oral or IV analgesia. The lack of mortality and low readmission rate (7.6%) confirm a good immediate surgical safety profile. Collectively, these results confirm the effectiveness and acceptable risk profile of TURP in this group, as well as according to Adverse Indicators Associated with X-ray-Guided TURP for BPH, where the 14.29% complication rate within 90 days of TURP is in accordance with literature reporting early postoperative morbidity in the range of 10-20%. Both urinary tract infections and haematuria were the most common complications, as would be expected sequelae of invasive urological surgery (Pantuck, A. J. *et al.*, 2015; Pistolesi, D. *et al.*, 2014).

The results of Uroflowmetry Markers at Baseline and Post-Surgery Following TURP where Uroflowmetry parameters demonstrate progressive improvements following TURP, with mean flow rates rising from 15.1 mL/s preoperatively to 23.0 mL/s at 12 months, indicating persistent relief of bladder outlet obstruction although decreases in residual urine volume (80 mL to 15 mL) indicate efficient bladder emptying and decreased risk of urinary retention and also Decrease in the prostate volume. PSA levels with time further confirm successful resection of hyperplastic tissue (Stevenson, S. M., & Lowrance, W. T. 2015). These objective measures confirm clinical improvements seen and correlate well with symptomatic relief experienced by patients.

Meaningful improvement in all IPSS symptom domains of frequency, urgency, weak stream, and incomplete emptying demonstrates the functional advantage TURP provides in symptomatic BPH relief although The pronounced reductions in mean symptom scores after surgery reflect clinically significant symptom improvement, which is central to quality of life enhancement and daily function in patients, (Lorenzo, A. J. *et al.*, 2019) as a result This information substantiates the ongoing application of IPSS as a valid measure for treatment effect monitoring, as a result Patient Satisfaction with X-Ray Imaging Such high rates of patient satisfaction with X-ray imaging (81% very or satisfied) highlight perceived utility of imaging during their diagnostic and treatment process. Such a favorable response is probably the result of patients' awareness of the usefulness of X-ray in elucidating their condition and surgical planning, potentially leading to less anxiety and more confidence in care. While on the other hand, to the comparatively small percentage of dissatisfaction is indicative of good communication and incorporation of imaging results into routine clinical practice.

Depend on Domains of Health-Related Quality of Life (SF-36) Questionnaire The post-operative changes in all SF-36 domains—physical function, bodily pain, and general health—emphasize the wide-ranging effect TURP has outside of urologic symptom alleviation, including improvement in overall well-being and psychosocial function with Increases in the role physical and social function domains after TURP are particularly significant, indicating restoration of activities of daily living and social interaction, which are commonly compromised in patients with severe LUTS.

CONCLUSION

This utilizes radiological imaging during the pre-evaluation stage of BPH to identify major concerns like bladder blockage and retention, balanced against the risks of surgery. This aids in the determination of the resultant surgical outcomes. There is marked symptomatic relief and functional improvement along with enhancement of quality of life post-surgery. There is a mitigation of the TURP-associated risks. Using clinical exams along with X-ray as a diagnostic enables better perioperative care and satisfaction, improving the care standards with surgery for men with an enlarged prostate men.

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Source of support: Nil; **Conflict of interest:** Nil.

Cite this article as:
Al-Aljashamy, I. A. A. E., Al-Kahyyat, I. S. J. and Khalid, Z. A. “The role of X-rays in prostate enlargement and determining the initial complications after surgery.” *Sarcouncil journal of Medical sciences* 4.8 (2025): pp 40-46.

Publisher: SARC Publisher