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Comparison between UroLift and Transurethral Resection of the Prostate in the Treatment of Benign Prostatic Hyperplasia

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Abstract

Background: Benign Prostatic Hyperplasia (BPH) is among the most prevalent chronic urological conditions in aging men, producing lower urinary tract symptoms (LUTS) that markedly reduce quality of life. Transurethral Resection of the Prostate (TURP) has long served as the surgical gold standard, yet it carries substantial risks of bleeding, TUR syndrome, prolonged catheterization, and long-term sexual dysfunction. The Prostatic Urethral Lift (UroLift) is a minimally invasive, non-ablative alternative that mechanically retracts obstructing prostatic lobes using permanent implants.
Problem: There is limited comparative, prospective evidence on the relative efficacy and safety of UroLift versus TURP under the specific clinical, economic, and cultural conditions of Iraq.
Methods: A prospective comparative clinical study was conducted at The Nasiriyah Center for Urology and Nephrology from October 2022 to April 2023, enrolling 21 male BPH patients divided into a UroLift group (9 patients) and a TURP group (12 patients). Outcomes assessed at 3 months included IPSS, Quality of Life index, maximum urinary flow rate (Qmax), Post-Void Residual (PVR) volume, serum PSA, and surgical complications. Data were analyzed with SPSS v26 using t-tests, chi-square, and Fisher's Exact test (significance at $p \leq 0.05$).
Results: Both techniques produced significant symptomatic improvement, but UroLift was statistically superior in IPSS (3.44 ± 0.88 vs 5.08 ± 2.49; $p = 0.0018$), Qmax (21.33 ± 5.61 vs 16.17 ± 4.56 mL/s; $p = 0.031$), PVR (23.56 ± 23.77 vs 52.05 ± 32.11 mL; $p = 0.038$), and PSA (0.78 ± 0.61 vs 1.48 ± 0.95; $p = 0.050$). Overall complications were far lower with UroLift (33.33% vs 91.67%; $p = 0.005$), which uniquely preserved sexual function in 100% of patients.
Conclusions: UroLift achieved efficacy comparable or superior to TURP in relieving obstruction while offering a substantially safer profile and complete preservation of sexual function, making it a compelling minimally invasive option for suitable BPH patients.

Keywords: Benign Prostatic Hyperplasia; UroLift (Prostatic Urethral Lift); Transurethral Resection of the Prostate (TURP); Lower Urinary Tract Symptoms; Minimally Invasive Surgery.

1. Introduction

Benign Prostatic Hyperplasia (BPH) is one of the most prevalent chronic issues in urology in the modern world, owing to its close relationship with the biological process of aging in men. BPH results from the uncontrolled proliferation of epithelial and stromal cells, producing progressive mechanical compression of the prostatic urethra. This gives rise to several lower urinary tract symptoms (LUTS), classified into:

Voiding difficulties such as a weak urinary stream, hesitancy, difficulty starting the urine flow, and intermittency.
Storage symptoms such as urge incontinence, frequent nighttime urination, and incomplete bladder emptying. [2]
The end result of this symptom profile is significant deterioration in the patient's quality of life, with poor social, psychological, and physiological outcomes.

For more than six decades, urological societies have regarded Transurethral Resection of the Prostate (TURP) as the "Gold Standard" against which new treatments are tested. TURP is well documented in reducing glandular size, improving peak flow rate, and reducing post-void residual urine — but this surgical success carries a considerable clinical cost. [1]

Major problems associated with TURP include:
Risks of excessive intra- or post-operative bleeding, which may require blood transfusion.
TUR (Transurethral Resection) Syndrome, caused by absorption of non-ionic irrigation fluids with monopolar systems.

Longer hospital stays requiring continuous bladder irrigation and urinary catheterization.

Most importantly, TURP has a significant long-term negative influence on sexual function. Retrograde ejaculation occurs in about 65%–80% of patients due to anatomical destruction of the bladder neck, and there is a risk of urinary incontinence and erectile dysfunction owing to thermal damage to the collateral neurovascular bundle. These problems created a strong need for minimally invasive surgical techniques (MIST) that provide efficacy without structural damage.

Against this technological backdrop, the Prostatic Urethral Lift (PUL), known medically as the UroLift system, represents a qualitative step forward and a genuinely new surgical concept. This approach involves no cutting, burning, or ablation of prostatic tissue; instead, it produces a purely mechanical effect by displacing the hypertrophic lobes that block the urethral lumen. Small permanent implants are placed via cystourethroscope under direct visualization, producing an instant and lasting opening of the prostatic urethral lumen while preserving the bladder neck and the vessels and nerves essential for reproductive function. [8]

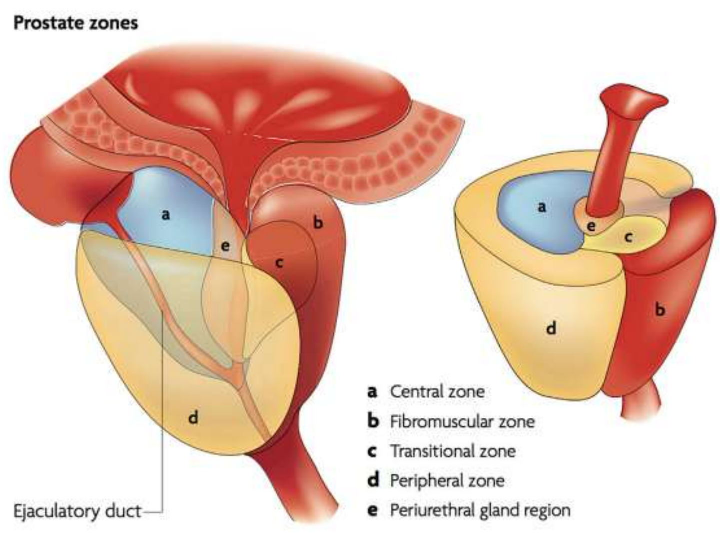

Figure 1: *The Prostatic Urethral Lift (UroLift) mechanism of action.*

1.1 Significance of the Study and Strategic Objectives

The significance of this research lies in its prospective, clinical, comparative assessment under specific geographic and clinical conditions — those of Iraq, and particularly of an advanced specialization center (The Nasiriyah Center for Urology and Nephrology). Under these conditions, economic and logistic factors together with patients' culture influence surgical decisions. The study provides a statistically grounded platform to help urologists make reasonable clinical decisions when weighing the traditional technique against modern, imported alternatives that require substantial investment.

The strategic and operational objectives of this dissertation cover the following critical aspects: [5]
Evaluating the reduction in severity of obstructive and storage symptoms through the standardized International Prostate Symptom Score (IPSS) and its correlated Quality of Life (QoL) index, before operation and at 3 months post-operatively.

Objectively measuring changes in peak urinary flow rate (Qmax, mL/s) and Post-Void Residual (PVR) urine volume via ultrasonographic examination.

Determining serum Prostate-Specific Antigen (PSA) as a biomarker of tissue modification and inflammation in relation to surgical treatment.

Documenting and comparing all early and late surgical complications for both UroLift and TURP, focusing on bleeding, infections, acute urinary retention, and sexual (ejaculatory and erectile) function.

Evaluating operative time, patient-reported pain scores, duration of hospital stay, and the required period of indwelling catheterization. [3]

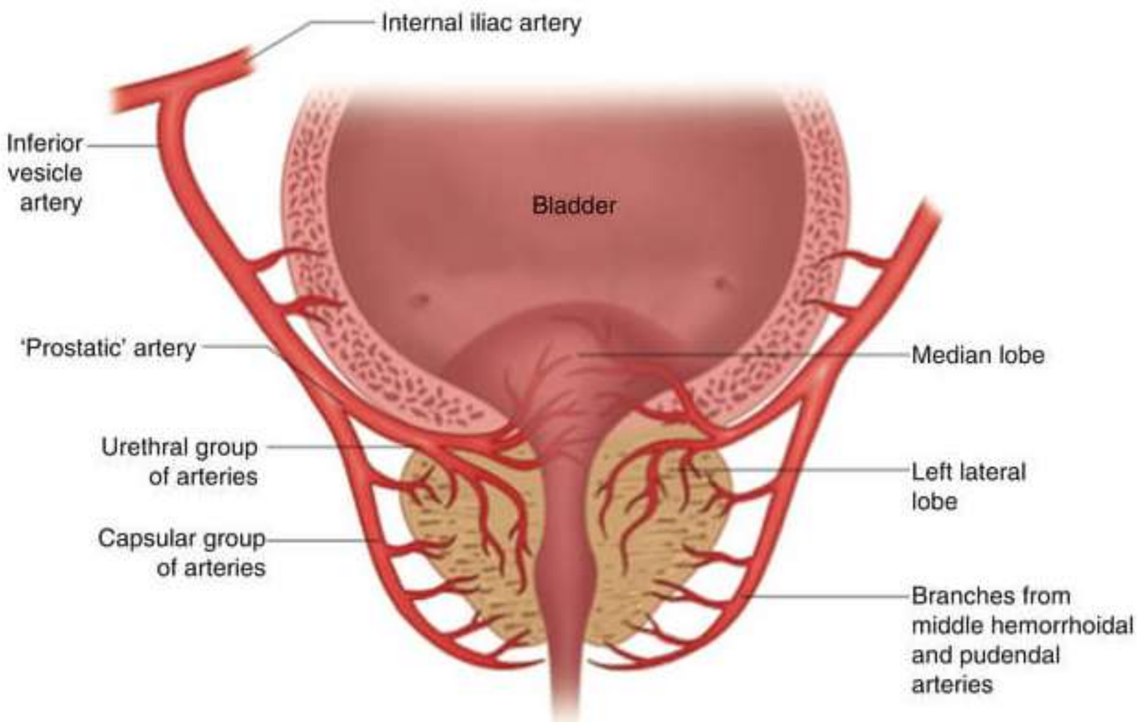

Figure 2: *Comparative overview of the study parameters.*

1.2 Research Hypotheses and Questions

The study was generated from the following scientific hypothesis:
"The Prostatic Urethral Lift (UroLift) procedure provides similar or near-identical clinical and physiological effectiveness in enhancing voiding function and alleviating symptoms compared to the standard Transurethral Resection of the Prostate (TURP), but with fundamental and substantial superiority in safety, avoidance of complications, and full preservation of sexual function and post-operative quality of life."

To test this hypothesis, the study seeks to answer the following questions:

Question 1: How large is the improvement in IPSS and QoL scores 3 months after UroLift compared to TURP, and is this difference statistically significant?

Question 2: Is the mechanical lifting of hypertrophied tissue in UroLift associated with an equal improvement in Qmax and decrease in PVR compared to complete tissue ablation in TURP?

Question 3: What are the exact percentages of irritative, hemorrhagic, and sexual complications in both groups at the Nasiriyah Specialized Center?
Question 4: How does the type of surgical intervention influence serum PSA levels following the designated follow-up period?

2. Background and Literature Review

2.1 Surgical Anatomy and the Four Tissue Zones of the Prostate

The prostate gland is the most important male gland of the genitourinary system. It has the form of an inverted chestnut: its base is directed upward and attached to the bladder neck, while its apex is directed downward, adjacent to the urogenital diaphragm and external urethral sphincter that provide voluntary control of micturition. In a young healthy man, the gland measures about 4 cm transversely, 3 cm vertically, and 2 cm anteroposteriorly, weighing 15–20 g. The prostatic urethra passes vertically through the gland for about 3 cm and then bends forward at the verumontanum — a key anatomical landmark, since resection below it destroys the external sphincter and causes urinary incontinence. [6]

Modern histopathology has moved beyond the outdated lobar anatomy (right, left, middle) and instead uses McNeal's Zonal Anatomy, dividing the gland into four zones:

Peripheral Zone — Accounts for about 70% of the volume of the typical prostate. It surrounds the distal urethra posteriorly and laterally and is the region most easily palpated on Digital Rectal Examination. It is the main site of 75%–80% of prostatic adenocarcinomas and is most susceptible to prostatic inflammation.

Central Zone — The second largest zone (~25% of volume). This wedge-shaped region surrounds the ejaculatory ducts and is highly resistant to cancer and benign proliferation, with fewer than 5% of prostate cancers arising here.

Transition Zone — In healthy young men, no more than 5% of gland volume, formed by two small lobes flanking the proximal prostatic urethra. This is the only site where Benign Prostatic Hyperplasia develops. With aging, constant nodular growth compresses the central urethra into a narrow slit that impedes urination. The transition zone also accounts for about 10%–15% of prostate tumors. [5]

Anterior Fibromuscular Stroma — A purely non-glandular zone forming the anterior wall and about one-third of gland volume, composed of smooth muscle and elastic fibrous tissue. No hyperplastic or malignant lesions develop here, but it is surgically important because UroLift uses this dense stroma to anchor its urethral implants.

2.2 Vascularization and the Neural Network of the Prostate

The prostate is supplied mainly by the inferior vesical artery, a major branch of the internal iliac artery. On reaching the base of the gland, it divides into two branches:

The capsular branch, which traverses the external surface within the fibrous capsule, sending perforating vessels into the peripheral and core zones. These arteries lie adjacent to the neurovascular bundle responsible for penile erection.
The urethral branch, which enters at the bladder-neck–prostate junction and runs along the urethra to supply the transition and periurethral zones. In BPH, these vessels become greatly enlarged, which is why their transection during TURP causes significant hemorrhage. [10]

Venous drainage occurs via the prostatic venous plexus, located between the true fibrous capsule and the outer fascial layer. Its anterior portion communicates with the dorsal venous plexus (Santorini plexus) and drains into the internal iliac veins. Injury to this network during TURP causes extensive, difficult-to-manage bleeding and provides the major route for systemic uptake of non-ionic irrigating fluids, predisposing patients to TUR syndrome with acute dilutional hyponatremia and pulmonary edema.

The prostate has a dual autonomic nerve supply from the inferior hypogastric plexus:

Sympathetic fibers — Originating from T11–L2, these drive contraction of the smooth muscle of the prostatic stroma and bladder neck during ejaculation to propel semen forward.

Parasympathetic fibers — Arising from the pelvic splanchnic nerves, these regulate glandular secretions.

The nerves and vessels responsible for erection travel through a precise, delicate plane posterolaterally along the prostate. This area is highly prone to thermal injury during monopolar or bipolar electroresection in TURP, often resulting in permanent impotence — a risk absent in the purely mechanical UroLift procedure, which applies no heat or cautery. [12]

2.3 Pathological Mechanisms, Genetic and Environmental Risk Factors

The biology of BPH is complex, involving cell proliferation together with hormonal, environmental, and genetic influences. Its defining feature is true hyperplasia — an actual increase in the number of epithelial and stromal cells. Male sex hormones catalyze the process. Free testosterone within prostatic cells is converted by 5-alpha reductase (Type II), abundant in stromal tissue, into dihydrotestosterone (DHT), a hormone about ten times more potent. DHT binds androgen receptors, enters the nucleus, and activates transcription of growth-factor genes (FGF and TGF-beta). With age, the balance between cell growth and apoptosis is disrupted. Persistent hormonal stimulation prolongs cell life and delays apoptosis, increasing cell mass and producing hyperplastic nodules. Chronic silent abacterial prostatitis contributes as well: lymphocyte and mast-cell infiltration produces inflammatory cytokines that drive fibrosis and raise smooth-muscle tone through adrenergic receptors. [2]

Regarding risk factors, current research shows clear correlations between lifestyle, genetics, and disease progression: Age — the strongest independent risk factor. About 50% of men show histologic BPH by age 60, rising to over 85%–90% beyond age 80.

Genetics — familial BPH tends to occur earlier (before age 60), with larger glands and greater need for surgery; risk rises about fourfold when a first-degree relative is affected.

Obesity and metabolic syndrome — waist circumference correlates positively with prostate size and LUTS severity; insulin resistance and hyperglycemia increase sympathetic activity and IGF-1, accelerating proliferation.

Diet and lifestyle — high saturated fat and red meat intake and physical inactivity aggravate symptoms, while a fiber- and antioxidant-rich diet is somewhat protective. [11]

3. Methods and Materials

3.1 Study Design and Sample

A prospective comparative clinical research methodology was adopted to ensure scientific validity. Field procedures were carried out in the departments of The Nasiriyah Center for Urology and Nephrology, Republic of Iraq, from October 2022 to April 2023. The sample comprised 21 male patients with Benign Prostatic Hyperplasia and moderate-to-severe LUTS who were unresponsive to conventional medical therapy (alpha-blockers and 5-alpha reductase inhibitors) or refused it because of severe side effects. [7]

The study population was divided by strict clinical and anatomical criteria into two cohorts:

Group 1 (UroLift Group): 9 patients who underwent the mechanical Prostatic Urethral Lift technique.

Group 2 (TURP Group): 12 patients who underwent classic conventional transurethral resection.

3.2 Inclusion and Exclusion Criteria

Inclusion criteria:
Adult male participants over 50 years old.
IPSS scores ≥ 13 points.
Prostate size 30–80 cm^3 measured by TRUS.
Maximum urine flow rate below 12 mL/s.
Post-Void Residual volume below 250 mL, to exclude bladder detrusor failure.

Exclusion criteria:

Significant enlargement of the prostate median lobe with intravesical displacement, since PUL cannot be used in such cases.
Prostate cancer (unexplained elevated PSA or abnormal Digital Rectal Exam with positive biopsy).
Pre-existing urethral strictures.
Bladder calculi.
Neurogenic bladder or neurological disorders affecting voiding dynamics, such as Parkinson's disease or Multiple Sclerosis.

3.3 Preoperative Evaluation and Surgical Protocols

All patients underwent a standardized preoperative evaluation: medical history, general physical examination, Digital Rectal Examination, complete laboratory investigations (renal function, urinalysis, urine culture, serum PSA), IPSS questionnaires, and digital uroflowmetry. Postoperative follow-up was performed systematically at the 3-month mark. [9]

UroLift protocol: Patients were placed in the lithotomy position under advanced local anesthesia (intraurethral 2% lidocaine gel with a perineal nerve block or conscious sedation, per patient preference). A 20 F rigid cystourethroscope with a 0° lens integrated in the UroLift Delivery System was used. After ruling out a median lobe, the scope was retracted to the prostatic urethra and the areas of maximum obstruction identified. The delivery system was oriented at the 2 o'clock and 10 o'clock positions and firm pressure compressed the hypertrophic lobe toward the outer capsule. A fine 19-gauge needle pierced the tissue and capsule, the nitinol capsular tab was deployed, the needle retracted while tensioning the monofilament PET tether, and the stainless-steel urethral end-piece was clipped to the inner urethral wall. On average, 4 implants (range 3–5) were placed per patient to achieve a continuous open, U-shaped lumen. Most patients did not require postoperative catheterization and voided freely, going home within hours. [8]

TURP protocol: Performed under spinal or general anesthesia in the lithotomy position using a 26 F continuous-flow resectoscope with a tungsten wire loop, monopolar current, and 1.5% glycine irrigation. The electrosurgical unit was set to 120 W (cutting) and 80 W (coagulation). Resection began with the median lobe (when present), then the lateral lobes of the transition zone, shaving tissue from the bladder neck to the verumontanum, with electrocoagulation of bleeding vessels. Resected chips were evacuated with an Ellik evacuator and sent for histopathology to exclude occult malignancy. A 22–24 F three-way Foley catheter (balloon 30–50 mL) was inserted under tension with continuous bladder irrigation using normal saline. Hospitalization of 2–4 days was required for monitoring of hematuria and irrigation until clearance, followed by a Trial Without Catheter (TWOC). [10]

3.4 Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 26. Continuous variables were presented as Mean ± Standard Deviation, and categorical variables as frequency tables with percentages. Continuous variables were compared with Student's t-test; complication rates were compared with the chi-square and Fisher's Exact tests. Results were considered statistically significant at $p \leq 0.05$ and highly significant at $p < 0.01$.

4. Results

Values obtained from patients' charts at the 3-month follow-up revealed the principal differences in the physiological and clinical efficacy of both methods, which were analyzed for statistical significance.

4.1 Clinical and Laboratory Parameters (3-Month Follow-Up)

IPSS: Both groups began in the severe category (>22 points). At 3 months, both showed remarkable improvement, but with a highly significant advantage for UroLift, whose mean IPSS fell to 3.44 ± 0.88 (very mild symptoms) versus 5.08 ± 2.49 for TURP ($p = 0.0018$). Mechanical lifting provided faster, more effective relief, likely because it avoids the pain and irritation of tissue sloughing and thermal cautery that prolong healing after TURP. [7]
Qmax: The UroLift group reached 21.33 ± 5.61 mL/s — an excellent physiological flow well above the smooth-voiding threshold — versus 16.17 ± 4.56 mL/s for TURP ($p = 0.031$). UroLift alters urethral geometry without scar tissue or bladder-neck contractures that hinder flow.
PVR: Both groups improved, but UroLift achieved near-complete bladder emptying with a mean PVR of 23.56 ± 23.77 mL versus 52.05 ± 32.11 mL for TURP ($p = 0.038$), confirming the efficiency of the mechanical lift in relieving urethral resistance.
PSA: Mean PSA at 3 months was 0.78 ± 0.61 for UroLift versus 1.48 ± 0.95 for TURP ($p = 0.050$). Electroresection creates a large field for tissue regeneration and inflammation, raising PSA in the early months, whereas UroLift keeps tissue intact and provokes no glandular inflammatory response. [9]

4.2 Surgical Complications and Sexual Function

Any complication or side effect occurred in only 33.33% of UroLift patients (3 of 9) versus 91.67% of TURP patients (11 of 12). This difference was highly significant on Fisher's Exact test ($p = 0.005$).

Qualitative analysis of complications:

Irritative symptoms (dysuria, frequency, minor pelvic pain): 1 UroLift patient (11.11%), mild and self-resolving within two weeks with analgesics; 2 TURP patients (16.67%), more severe and prolonged due to the raw resected cavity and thermal injury.
Urinary incontinence: none in the UroLift group (0%), as the technique spares the external sphincter and bladder-neck dynamics; 3 TURP patients (25%) had temporary incontinence requiring pads and Kegel exercises.
Hematuria / Acute Urinary Retention: no acute hematuria or retention in UroLift patients, all discharged the same day without continuous catheterization; all TURP patients had expected gross hematuria, one developed AUR from clot obstruction requiring re-catheterization and longer stay, and two developed UTI (16.67%) from prolonged catheterization.
Epididymitis: 1 UroLift case (11.11%) at two weeks, from minor urinary reflux through the ejaculatory ducts, fully resolved with oral antibiotics without sequelae.

Sexual function — the most clinically decisive outcome: UroLift preserved erectile function and normal ejaculation in 100% of patients, owing to its purely mechanical action that spares the bladder neck and neurovascular bundles. By contrast, 3 TURP patients (25%) developed severe sexual dysfunction as retrograde ejaculation ("dry orgasm") from removal of bladder-neck smooth muscle, along with reduced erectile function from thermal spread to the cavernous nerves.

5. Discussion

The findings of this prospective comparative study directly address the research hypothesis and questions. Both UroLift and TURP produced genuine, significant improvements in obstructive and storage symptoms relative to baseline, confirming that each is an effective treatment for BPH. However, across every primary outcome measured at 3 months — IPSS, Qmax, PVR, and PSA — UroLift demonstrated a statistically significant advantage.

The superior symptomatic relief seen with UroLift (IPSS 3.44 ± 0.88 vs 5.08 ± 2.49; $p = 0.0018$) can be attributed to the absence of a raw resected surface and thermal injury, which in TURP require a prolonged healing period accompanied by irritative symptoms. The better Qmax and PVR results reflect the geometric reopening of the urethral lumen without the scar tissue and bladder-neck contractures that can follow electroresection. The lower post-operative PSA after UroLift is consistent with tissue preservation and the absence of an inflammatory regenerative field.

The most striking difference lies in the safety profile. The overall complication rate was almost three times higher after TURP (91.67% vs 33.33%; $p = 0.005$), and only TURP produced urinary incontinence, acute retention, catheter-related UTI, and — most importantly — sexual dysfunction. UroLift preserved sexual function in 100% of patients, directly answering the study's central question regarding the preservation of ejaculatory and erectile function. These observations are consistent with the mechanistic rationale of the technique, which avoids manipulation of the bladder neck and the posterolateral neurovascular bundles.

Taken together, the results support the study hypothesis: UroLift offers efficacy comparable — and in several parameters superior — to TURP, while providing a fundamentally safer profile. The main limitations are the relatively small sample size (21 patients) and the short 3-month follow-up, which does not capture the long-term durability of the mechanical implants. Larger, longer-term studies are warranted to confirm these findings and to evaluate cost-effectiveness under local conditions.

6. Conclusions

This research examined, through accurate clinical study and observation, one of the most important and fastest-growing topics in current urological surgery. Conducted at The Nasiriyah Center for Urology and Nephrology, the prospective comparative study provided evidence-based answers distinguishing two treatment methods from two different surgical eras in the management of BPH.

The study demonstrated that technological development in medical engineering has broken the long-standing monopoly of TURP as the sole gold standard through the Prostatic Urethral Lift (UroLift). Moving away from a philosophy of tissue cutting and destruction toward mechanical lifting and displacement proved well suited to the needs of the modern patient. UroLift achieved excellent efficacy in opening the urinary passage — in several parameters better than conventional resection — while ensuring the safety and preservation of sexual and vital functions that were considered impossible in conventional endoscopic procedures.

Based on statistical inference from the 3-month follow-up, the study reached the following conclusions:

Both modalities produced significant improvement in obstructive and storage symptoms, but UroLift showed statistical superiority in reducing IPSS (3.44 ± 0.88 vs 5.08 ± 2.49; $p < 0.0018$).

UroLift produced a steady physiological increase in Qmax (21.33 ± 5.61 mL/s), statistically better than TURP (16.17 ± 4.56 mL/s; $p = 0.031$).

Ultrasound confirmed UroLift's superiority in reducing PVR (23.56 ± 23.77 mL vs 52.05 ± 32.11 mL; $p = 0.038$).
Serum PSA stabilized better after UroLift (0.78 ± 0.61 vs 1.48 ± 0.95; $p = 0.050$), reflecting reduced post-repair inflammation.

UroLift showed a markedly safer profile, with post-operative complications in only 33.33% of patients versus 91.67% for TURP ($p = 0.005$).

Recommendation: UroLift should be considered a first-line minimally invasive option for suitable BPH patients — particularly those for whom preservation of sexual function is a priority — provided that anatomical selection criteria (absence of an obstructing median lobe) are met. Larger, longer-term studies are recommended to confirm durability and cost-effectiveness under local conditions.

7. Acknowledgment

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8. Conflict of Interest

The authors declare that the study was conducted in accordance with the applicable ethical standards and with the informed consent of all participating patients. The authors declare that they have no conflict of interest, financial or otherwise, related to the equipment, techniques, or manufacturers referenced in this study.

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