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Transurethral Resection of the Prostate (TURP) and concomitant inguinal hernioplasty: a single-center experience

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Abstract

Background Benign prostatic hyperplasia (BPH) is a prevalent condition in aging males, leading to bladder outlet obstruction (BOO) and associated urinary symptoms. With increasing life expectancy, the incidence of BPH and its co-morbidities, like inguinal hernia, has risen. This study explores the efficacy of combining transurethral resection of the prostate (TURP) and inguinal hernioplasty in a single surgical session to address both conditions, potentially reducing the need for multiple hospitalizations and surgical interventions.

Methods This retrospective study at Chi Mei Medical Center included patients from 2014 to 2023 who underwent concurrent TURP and inguinal hernioplasty. A total of 85 patients met the criteria defined for this study. Preoperative, intraoperative, and postoperative characteristics were meticulously documented. Outcomes evaluated included the duration of the surgery, incidence of intraoperative and postoperative complications, duration of Foley catheterization, length of hospital stay, and treatment efficacy. Additionally, we conducted a comparative assessment of the surgical outcomes between two distinct techniques for inguinal hernia repair: open hernioplasty and laparoscopic hernioplasty (LH).

Results In 85 patients who met the criteria, the mean age was 71.1 ± 7.8 years. The study reported no significant intraoperative complications, and postoperative care was focused on monitoring for blood loss, infection, and managing pain. The average postoperative hospital stay was 2.9 ± 1.0 days and the mean duration of catheterization was 51.6 ± 16.7 h, with a minimal complication rate observed during the one-year follow-up. A significant reduction in both operative duration and catheterization interval was observed in patients undergoing LH as opposed to those receiving open hernioplasty.

Conclusion Concurrent TURP and inguinal hernioplasty effectively manage BOO due to BPH and inguinal hernias with minimal complications, suggesting a viable approach to reducing hospital stays and surgical interventions. Laparoscopic techniques, in particular, offer benefits in operative efficiency and recovery time, making combined surgery a feasible option for selected patients.

Keywords Benign prostatic hyperplasia (BPH), Inguinal hernia, Transurethral resection of the prostate (TURP), Inguinal hernioplasty

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Background

Benign prostatic hyperplasia (BPH) is a common condition among males, especially in the elderly population [1]. The volume of the prostate increases with age, and clinically, an enlarged prostate can lead to bladder outlet obstruction (BOO), resulting in urinary symptoms. With the global increase in life expectancy over the past few decades, the prevalence of BPH has risen, as well as its complications [2]. Studies indicate that 50% of males above 60 years old are affected by BPH, and over 80% of males aged 80 and above experience BPH-related issues [1, 3, 4]. Considering this high prevalence, there is a growing need to focus on BPH treatments in various scenarios and their potential comorbidities.

One of the most common comorbidities is inguinal hernia. Co-occurrence of inguinal hernia and BPH is frequently observed. Research reports a comorbidity rate of approximately 15–25% between inguinal hernia and BPH [5, 6]. Clinically, many males with enlarged prostates face difficulties in urination, leading to the need for intra-abdominal pressure to assist in voiding, which may contribute to the development of hernias over time. Considering such comorbidities, concurrently addressing inguinal hernia repair and benign prostatic hyperplasia in a single treatment may be a viable option, anticipating a reduction in hospitalizations and surgical interventions [7]. However, concerns arise as Transurethral Resection of the Prostate (TURP) itself often requires intra-abdominal pressure for postoperative voiding, while hernia repair surgery causes surgical site discomfort, making it challenging for patients to transition early from catheterization, potentially necessitating considerations for catheter reinsertion [8–11].

This study aims to evaluate the outcomes of performing TURP and inguinal hernia repair in a single treatment.

Methods

Selection criteria

This retrospective study included cases from Chi Mei Medical Center between 2014 to 2023 that concurrently underwent TURP and inguinal hernia repair.

The inclusion criteria for patient enrollment in this study were concurrent receipt of TURP and inguinal hernia repair, ASA score beneath 4, and follow-up duration exceeding one year.

Exclusion criteria comprised complicated inguinal hernias, coagulative disorders, previous history of TURP, malignant pathology finding of the prostate specimen, and other conditions that could potentially impact the evaluation.

Within these parameters, 85 patients were included in this study.

Study protocol and surgical procedure

Preoperative assessments

In the protocol, preoperative patient conditions (Age, ASA score, comorbidity, etc.) were recorded. For the assessment of BPH, we utilize transrectal ultrasound (TRUS), MRI or CT scan results to estimate the prostate volume in patients. Serum PSA levels are also recorded, although they may not necessarily have a direct correlation with BPH. For hernias, we document their location and confirm whether they are of the direct or indirect type through imaging or intraoperative assessment.

We typically administer intravenous cefazolin as preoperative prophylactic antibiotics. For patients admitted with moderate to severe pyuria based on urinary analysis, we initiate appropriate therapeutic antibiotics. Additional cefazolin is not administered preemptively before the surgery in such cases. The surgical duration was defined from anesthesia induction to the conclusion of the procedure.

Surgical procedure

The open hernioplasty technique begins with the incision of the external oblique aponeurosis (as known as Scarpa's fascia), followed by the elevation of the spermatic cord to facilitate the identification and classification of the hernial sac.

In cases of indirect hernias, meticulous dissection is carried out from the internal ring, followed by exploration of the sac to ensure its complete reduction into the posterior wall defect. For direct hernias, the protrusion is directly repositioned into the posterior wall defect and the inguinal ligament is sutured to the conjoined tendon. Subsequent steps involve ascertaining an adequate closure without undue tension and approximating Scarpa's fascia and the cutaneous layer.

In laparoscopic hernioplasty, the procedure commences with the strategic placement of the laparoscope, forceps, and scissors via a single or tri-trocar port and establishing a CO_2 pneumoperitoneum at 12 mmHg. This setup facilitates the meticulous examination and identification of the internal ring sites. Utilizing forceps, the peritoneum at the internal ring is elevated and incised, allowing for the dissection and mobilization of the internal spermatic vessels. The hernia type is determined, and the sac is subsequently retracted and corrected with the placement of a mesh securely affixed to the abdominal wall for reinforcement. The procedure concludes with the careful closure of all trocar entry points at the fascial level and the subsequent suturing of the skin.

During TURP, urethral calibration and dilatation precede the introduction of the resectoscope into the bladder under direct visualization. Utilizing a panendoscopic

lens, the procedure involves delineating the distance from the urethral orifices to the bladder neck and retracting the lens to the verumontanum to assess the prostatic lobes' positioning. Resection commences at one lobe, employing techniques including traditional bipolar TURP and laser-assisted prostatectomy. The procedure meticulously avoids the penetration of the prostatic capsule, halting resection upon visualization of the bladder neck and capsule fibers. The contralateral lobe undergoes a similar procedure. Post-resection, a Toomey evacuator facilitates the removal of excised tissue. The operation concludes with the withdrawal of the resectoscope, insertion of a tri-lumen Foley catheter for bladder irrigation, ensuring the integrity and functionality of the urinary tract.

Postoperative hospitalization

During the postoperative hospitalization period, we monitor blood loss and infection status through blood tests including white blood cell count and hemoglobin, as well as urine routine analysis and culture. We also document the administration of intravenous analgesics and the time from surgery completion to catheter removal. If the retention issue persists after removing Foley, re-catheterization is considered. Finally, we record the postoperative length of hospital stay and monitor for the presence of urinary tract infections or surgical wound infections during the hospitalization, and record the Visual Analog Scale (VAS) score at the time of discharge. Subsequent outpatient follow-up includes recording changes in voiding symptoms and alterations in urinary medications.

Statistical methods

Quantitative variables were presented as mean ± standard deviation. Qualitative variables were reported as frequency and percentage. For quantitative independent variables, a comparison between groups one and two was conducted using the independent sample t-test. Nonparametric quantitative variables were assessed with the Mann–Whitney U test. Qualitative variables underwent comparison using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

During the specified period and within the inclusion criteria, 110 patients were collected. After applying exclusion criteria, 85 patients remained (including 6 who had undergone previous prostate surgery, 1 with severe and complex hernia, 1 with an excessively large prostate, 1 with a high PSA level, and 16 with malignant pathology findings in the prostate specimen).

The mean age was 71.1 ± 7.8 years, and preoperative basic data were documented in Table 1. All patients had ASA scores between 2 and 4, and if there was a history of cancer, the ECOG score was 0. Regarding inguinal hernia types, 30 patients had a direct type, 40 had an indirect type, and 15 had both types of hernia simultaneously. Concerning inguinal hernia location, 62 were unilateral and 23 had bilateral hernias. Among the 85 patients, 12 had undergone hernia repair surgery in the past, with 6 having hernias on different sides and 6 having hernias on the same side, indicating recurrent hernias.

Table 1 Clinical characteristics of all patients

	N(%)
Total number of patients	85
Age	71.1 ± 7.8 (year)
Co-morbidities	
CAD	9
Hypertension	36
Diabetes Mellitus	10
Asthma / COPD	5
CKD	5
Anticoagulant use	14
Abdominal surgical history	17
Hernioplasty (Same side / Contralateral side)	6/6
Others	4
Type of hernia	
Direct	30 (35.3%)
Indirect	40 (47.1%)
Mixed	15 (17.6%)
Position of hernia	
Unilateral(left/right)	24/38 (72.9%)
Bilateral	23 (27.1%)
Status of hernia (primary/recurrent)	79/6 (92.9%/7.1%)
Prostate volume	60.3 ± 26.5 (g)
PSA level	4.0 ± 4.4 (μg/dL)

Regarding BPH, the average prostate volume for the 85 patients was 60.3 ± 26.5 mL. For each patient, a prostate specimen was obtained intraoperatively and sent for pathological examination to confirm the absence of malignancy. Patients with elevated PSA levels underwent transrectal ultrasound-guided prostate biopsy (TRUSP) and/or MRI.

Details related to the surgery were documented in Table 2. The average surgical time was 3 h and 31 min ± 65 min. In the combined surgeries, the choice of hernioplasty technique included 61 patients who opted for open hernioplasty, while 24 patients underwent laparoscopic hernioplasty. Regarding prostate surgery, 12 patients underwent traditional bipolar TURP, and the remaining 73 patients received laser-assisted prostatectomy. The average weight of the resected prostate was 19.5 ± 16.2 g. No patient experienced significant bleeding,

Table 2 Surgical characteristics and intraoperative complications

	N(%)
Total number of patients	85
Operation for hernia	
Open hernioplasty	61
Laparoscopic hernioplasty (3-port / 1-port)	11/13
Operation for TURP	
Traditional bipolar TURP	12
Laser prostatectomy	73
Operation time	3 h 31 min ± 65 min
TURP resection volume	19.5 ± 16.2 (g)
Intraoperative complications	
Significant hemorrhage	0
Major vascular injury	0
Spermatic cord injury	0
Urinary bladder injury	0

Table 3 Postoperative clinical characteristics and complications

	N(%)
Total number of patients	85
ΔHb	-1.6 ± 0.8 (g/dL)
ΔWBC	5.0 ± 2.5 (10^3/μL)
Duration of Foley catheter	51.6 ± 16.7 (hr)
Manual bladder irrigation	3
Re-catheterization	7
Discharge with Foley	7
Duration of hospital stay	2.9 ± 1.0 (day)
Use of IV/IM form analgesics	28
Discharge VAS	< 2 (points)
Complication during post-operative stay	
Fever	0
Wound Infection	0
Gross Hematuria	0

major vessel injury, spermatic cord injury, or bladder injury during surgery.

No patient received a blood transfusion during surgery, and the average change in hemoglobin before and after surgery was a decrease of 1.6 ± 0.8 g/dL, with a WBC increase of 5.0 ± 2.5 × 10^3/μL. However, there were no occurrences of postoperative fever, wound infection, or gross hematuria during hospitalization. The average catheter retention time during hospitalization was 51.6 ± 16.7 h, excluding 10 patients who underwent catheter reinsertion or had the catheter brought back. During hospitalization, intravenous or intramuscular form analgesics were used to assess severe pain, with 28 patients receiving injectable pain medication postoperatively. The average postoperative length of stay was 2.9 ± 1.0 days, and each patient's VAS upon discharge was beneath 2, with bladder irrigation already discontinued. Postoperative details were recorded in Table 3.

Follow-up will continue for one year after discharge and the details were established in Table 4. One patient developed urinary tract infection and epididymitis two weeks after discharge, another patient developed hyponatremia two weeks after discharge, and three patients experienced urethral stricture within a year, undergoing transurethral incision of the bladder neck (TUIBN). We conducted a follow-up study on the usage of oral alpha-blockers (such as Tamsulosin, Doxazosin, and Silodosin) in different stage of the treatment to infer the severity of BOO induced by BPH and thereby to evaluate the efficacy of the surgical intervention. Preoperatively, alpha-blockers were prescribed to 68 out of 85 patients (80%). This number decreased to 47 patients (55.3%) one month after the surgery, and further declined to 15 patients (17.6%) by the twelve-month postoperative mark. Additionally, within the one-year follow-up, no patients experienced a hernia recurrence on the operated side, further substantiating the effectiveness of hernioplasty within the concurrent surgery.

Regarding hernioplasty, the differences between open and laparoscopic approaches were compared in concurrent surgery. A significant difference was noted in operative times between open hernioplasty (3 h 45 min ± 67 min) and LH (2 h 55 min ± 45 min), p = 0.0011. Analysis of patients who successfully had their Foley catheters removed prior to discharge revealed average durations of 54.5 ± 17.9 h for open hernioplasty and 44.7 ± 11 h for laparoscopic hernioplasty ($p = 0.0492$). No significant statistical difference was noted in catheter reinsertion rates. Details comparing open and laparoscopic hernioplasty are documented in Table 4.

Discussion

The comorbidity rate of BPH and inguinal hernia is notably high, with incidences of inguinal hernia in"post-prostatectomy cases" ranging between 15–25%, in contrast to a general prevalence of approximately 5% [8]. This elevation in prevalence has been hypothesized to stem from increased intra-abdominal pressure during micturition [12, 13]. Given this prevalence, the feasibility of simultaneous surgical interventions has been postulated to potentially reduce overall costs, operative and anesthesia durations, and hospitalization lengths, a concept supported by existing literature [7, 8].

Considerations for combined procedures include potential complications and the difficulty in catheter

Table 4 Comparsion surgical outcome for open and laparoscopic hernioplasty

	Open hernioplasty N(%)	Laparoscopic hernioplasty N(%)	*P* value
Total number of patients	61	24	
Age	71.1 ± 8.4 (year)	70.9 ± 6.2 (year)	0.886
Prostate volume	57.9 ± 27.5 (g)	66.4 ± 23.3(g)	0.183
Operation time	3 h 45 min ± 67 min	2 h 55 min ± 45 min	0.0011
Use of IV/IM form analgesics	23 (38%)	5 (21%)	0.6246
Duration of Foley catheter[a]	54.5 ± 17.9 (hr)	44.7 ± 11 (hr)	0.0492
Re-catheterization	6 (10%)	1 (4%)	0.6762
Duration of hospital stay	3.15 ± 1.09 (Days)	2.73 ± 0.65 (Days)	0.2219

[a] Duration of Foley Catheter: 75 patients were involved in this analysis, 53 underwent open hernioplasty and 22 underwent laparoscopic hernioplasty. 10 patients who underwent catheter reinsertion or had the catheter brought back were excluded

removal post-operation. Therefore, a case series analysis was conducted on patients electing for combined surgery within our institution. Some researches indicate that concurrent TURP and hernioplasty do not elevate postoperative complication rates, a finding corroborated by ours [14, 15]. In previous research, it has been noted that resection of a large volume prostate gland can result in micro-injuries and micro-perforations to the prostatic capsule at the bladder neck. Such damage facilitates the extravasation of fluid into the pre-peritoneal space, theoretically posing a significant risk of infection, particularly concerning when considering the pre-peritoneally placed mesh in concurrent surgeries of TURP and hernioplasty [16–19]. Despite these concerns, our study did not observe any incidents of pre-peritoneal infection postoperatively among the patients, suggesting that with appropriate surgical techniques and perioperative management, the risk of such complications may be mitigated.

In our study, concurrent surgeries were effective in managing both inguinal hernia and BOO secondary to BPH. Among 85 patients undergoing concurrent surgery, all presented with inguinal masses and micturition difficulties preoperatively, with postoperative follow-ups indicating complete resolution of inguinal hernia and the majority achieving successful catheter removal and spontaneous urination during hospitalization. Only a minority required catheter reinsertion. At outpatient follow-ups, most patients reported satisfactory urination, with those discharged with catheters having them removed at the first follow-up, without subsequent complications and expressing satisfaction with their postoperative quality of life. Moreover, upon assessing the 12-month postoperative use of alpha-blockers, initially, 68 patients (80%) were prescribed alpha-blockers before surgery. By the 12-month postoperative mark, only 15 patients (17.6%) remained on such medications. This significant reduction indicates that the TURP component of the concurrent surgery effectively achieves the desired therapeutic outcomes. Among all participants, only one encountered a urinary tract infection within two weeks post-surgery, and another developed hyponatremia. Within a year, none reported recurrent hernia, and only three patients underwent TUIBN surgery for urethral stricture, indicating a similar complication rate compared to previous studies [20]. The significant difference in operative times and duration of Foley catheterization between open hernioplasty and LH suggests that, LH is the preferable choice in concurrent surgeries, effectively shortening operative time and duration of catheterization. However, since the *p*-value for the duration of Foley catheterization is 0.0492, which is very close to 0.05, its statistical significance should not be overly emphasized. It is hoped that future studies can expand the sample size to strengthen the *p*-value. As previously mentioned, existing literature suggests that TURP requires the use of intra-abdominal pressure for postoperative voiding, while hernia repair surgeries contribute to surgical site discomfort. Notably, open surgical approaches are associated with more significant discomfort, potentially resulting in slower wound healing and, consequently, a prolonged need for catheterization. This extended catheterization period may inherently elevate the risk of urinary tract infections.

This study, encompassing 85 patients undergoing concurrent surgery and meticulously documenting preoperative, intraoperative, and postoperative patient conditions, presents the largest case series to date on simultaneous surgery for hernia and BPH-induced BOO. However, caution should be exercised when interpreting these findings due to several limitations. The study's external validity is constrained by its single-center design, stringent inclusion and exclusion criteria, and the potential insufficiency of a one-year follow-up duration. Additionally, the absence of a control group precludes direct statistical analysis of certain variables. Furthermore, as previously mentioned, we hope to have a larger sample size in future

studies to achieve greater reliability and address the issue of *p*-values hovering around the threshold. Additionally, since this study aimed to analyze the feasibility of combining the two surgical procedures, it does not delve into the detailed techniques of TURP and methods of laparoscopic hernioplasty. However, it is acknowledged that these factors may potentially influence the outcomes. Future research should aim to address these aspects.

In an era of advancing anesthetic and surgical techniques, efforts should be made to reduce the frequency and costs associated with the management of highly comorbid conditions, as each hospitalization and anesthetic procedure carries its own risks. Our study demonstrates the low complication rates of combined surgeries and their efficacy in treating both conditions.

Conclusion

Our study results demonstrate that a concurrent TURP and inguinal hernioplasty is effective for managing BPH-induced BOO and inguinal hernia over a one-year follow-up period, with a minimal complication rate. Crucially, this approach is expected to reduce the number of hospital stays and surgical interventions, thereby lowering associated risks and costs. Moreover, within the context of combined surgery, laparoscopic techniques offer the advantage of shorter operative times and potentially reduced durations of catheterization. Overall, combined surgery appears to be a feasible surgical option for appropriately selected patients.

Abbreviations

BPH	Benign prostatic hyperplasia
BOO	Bladder outlet obstruction
TURP	Transurethral resection of the prostate
LH	Laparoscopic hernioplasty
PSA	Prostate specific antigen
TRUS	Transrectal ultrasound
ASA	American Society of Anesthesiologists
CT	Computerized tomography
MRI	Magnetic resonance imaging
VAS	Visual analog scale
TRUSP	Transrectal ultrasound-guided prostate biopsy

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Authors' contributions

T.W.H: data collection and management, data analysis, manuscript writing/editing; W.H.T: protocol/project development, data collection or management, data analysis, manuscript editing; S.K.H: protocol/project development, manuscript writing/editing; A.W.C: protocol/project development, manuscript writing/editing; C.F.L: protocol/project development, manuscript writing/editing; Y.L.S: protocol/project development, manuscript writing/editing.

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Availability of data and materials

All datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by our institutional ethical committee (Chi Mei Medical Center, Taiwan). Due to the retrospective nature of the study, an Informed Consent Statement was not used. The need for informed consent was waived by the ethics committee of Chi Mei Medical Center.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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