

Comparative Analysis of Surgical Efficacy between TURP and Thulep in Patients with Prostatic Enlargement

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Abstract

Introduction: This study focuses on prostatitis, a common urinary tract complication in men, particularly those over 50 years old. Antibiotics are commonly used for treatment, with extended periods of administration for more severe cases. Surgical interventions like transurethral resection of the prostate (TURP) and laser treatments are effective for managing benign prostatic hyperplasia (BPH). Thulium laser enucleation of the prostate (ThuLEP) is a newer technique that allows for total removal of the transition zone with minimal side effects. Thulium lasers are increasingly utilized in urology.

Aims and Objective: To comparatively analyze the efficiency of surgical outcome after Transurethral Resection of the Prostate (TURP) and Thulium Laser Enucleation of the Prostate (ThuLEP).

Methods: This prospective observational study was conducted at Pacific Medical College and Hospital from January 2021 to December 2022. It focused on 50 patients diagnosed with Benign Prostatic Hyperplasia (BPH) who visited the surgery OPD/IPD. The study obtained a comprehensive medical history, diagnosed BPH using AUA criteria, and performed diagnostic tests. Pre- and post-operative assessments were conducted, including various parameters. Inclusion and exclusion criteria were established, and statistical analysis was performed using SPSS and Excel. Ethical approval and patient consent were obtained.

Results: The study analyzed the baseline characteristics of the patients, including age, PSA, prostate volume, hemoglobin level, and IPSS. Comorbidities such as hypertension, CAD, CHF, and diabetes were also assessed. The mean age, PSA, and prostate volume were compared between the ThuLep and C-TURP groups. The study found a decrease in IPSS after the operation in both groups. ThuLep showed significant improvements in operation time, change in IPSS, VAS, blood loss, and change in hemoglobin compared to C-TURP. Hospital stay and uroflowmetry had no significant difference. Complications were higher in C-TURP, with urinary retention and urethral stricture being more common. UTI rates were similar in both groups.

Conclusion: The study has concluded that ThuLep is associated with a more significant reduction in IPSS compared to C-TURP.

Keywords: Prostatitis, Urinary Tract Complication, Thulium Laser Enucleation, Transurethral Resection of The Prostate, Resection.

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Introduction

The prostate gland is a "male reproductive organ" located below the bladder. Half of men showcase symptoms of prostatitis at a certain point in their lives. It is one of the prevalent forms of urinary tract complications in men who are older than 50 years of age [2]. However, it is the third most prevalent form of disease in men above 50 years of age. As per recent statistics, more than 2 million men visit healthcare providers for treatment of prostatitis symptoms. Numerous forms of prostatitis like "Acute bacterial prostatitis", "Chronic bacterial prostatitis" "Chronic pelvic pain syndrome", and "Asymptomatic inflammatory prostatitis" affect the male population.

Prostatitis is often cured by utilizing antibiotics of high quantity for at least 7 to 14 days and a low dose for several weeks. Individuals also rely upon medications for getting relief from pain. Effective treatment focuses on the administration of antibiotics for a longer period of time. Treatment often lasts from 4 to 12 weeks [4]. Nearly 60% of cases get cured through diagnosis. In case it is not cured with antibiotics, administration of "low-dose probiotics" taken for a longer period of time serves to be beneficial in diminishing symptoms. Several other treatments, for instance, alpha-blockers are relied upon for their treatment that relaxes prostate muscles.

TURP, as well as laser prostatectomy, are considered to be significant ways of treating signs within the lower urinary tract that occur due to enlarged prostate. When an individual experiences serious BPH signs for instance blocked urethra with infection within the urinary tract, kidney complications, or side effects due to medication, surgery is recommended by

physicians [1]. Surgical procedures often impact the quality of life and help individuals to recover from the disease. Although the risk associated with treating health complications is much lower with surgery, individuals fail commonly and require more treatment. Individuals suffering from moderate to severe infection within urinary tract complications start by making modifications within their lifestyles, undertaking medications, and being careful while awaiting.

Prevalent forms of urological complications faced by men are caused by "benign prostatic hyperplasia" that affects the lower urinary tract [3]. Nearly one-third of men above 50 years of age are reported to suffer from this disease. Surgical intervention is considered to be effective for treating "benign prostatic hyperplasia". Among all other surgical treatments "monopolar transurethral resection of the prostate (TURP) is considered as the preferred method. Enlarged tissues from the prostate are resected with monopolar electrodes. The procedure enhances "maximal flow rate (Q_{max})", quality of life, and urinary symptoms. TURP is recommended during prostate enlargement that causes troublesome symptoms and it fails to respond to medical treatment [8]. The resectoscope is used in TURP which is inserted within the ureter. A resectoscope assists in trimming away additional prostate tissues that prevent urine flow. TURP is specifically considered for men who suffer from moderate to severe urinary complications and failed to respond to numerous medications [5]. Though TURP is considered one of the significant treatments for treating enlarged prostate, numerous invasive procedures are gaining

significant importance. TURP assists in reducing urinary symptoms that are caused by "benign prostatic hyperplasia (BPH)" involving the urgent requirement to urinate, difficulty in initiating urination, prolonged urination, enhanced frequency of urination, and infection within the urinary tract. Furthermore, TURP is also performed to prevent the recurrence of urinary tract infections, bladder damage, formation of bladder stones, and passage of blood with urine.

Since 2000, energy systems utilizing bipolar energy and varied laser systems like thulium laser, holmium laser, and diode laser have become much more popular for the surgical treatment of "benign prostatic hyperplasia" [7]. The trend regarding surgical treatment of "benign prostatic hyperplasia" sifted from "monopolar TURP" to "bipolar TURP" and "laser treatments. Bipolar energy is used for incision, resection, and vaporization of prostate tissues by utilizing different electrodes. Thulium and Holmium laser beams are primarily absorbed by water and behave as incisional lasers.

"Benign prostatic hyperplasia (BPH)" is characterized by stromal and epithelial cell development within the transition zone. TURP has been considered a "gold standard surgical treatment" for BPH that minimizes urinary complications [6]. Improvements in instruments utilized in TURP have reduced complications but increased recurrence rate remains a major concern. "Thulium laser enucleation of the prostate (ThuLEP)" has been developed to overcome this problem, permitting the removal of the transurethral transition zone with Thulium laser [9]. Thulium lasers work in "continuous wave mode" at wavelengths of nearly 2 microns. Thulium laser leads to laser energy absorption in water. Tm-TAG is considered to be suitable for the majority of "transurethral prostate surgical processes" for instance "prostate vaporization (ThuVAP), Vaporesection [11].

ThuLEP permits total "transurethral removal of transition zone" with the

assistance of Thulium laser in combination with total anatomical enucleation with majority urodynamic outcome efficiency as well as with minute side effects. First Thulium lasers were utilized in clinical practice after the Holmium introduction. ThuLEP has become an innovative "laser technology in urology".

Materials And Methods

This prospective observational study was conducted at Pacific Medical College and Hospital from January 2021 to December 2022. It focused on 50 patients diagnosed with Benign Prostatic Hyperplasia (BPH) who visited the surgery OPD/IPD. The patients were classified based on the procedure they underwent for managing prostate enlargement. A comprehensive medical history was obtained upon admission, including background information, laboratory results (such as PSA and blood tests), and underlying comorbidities. BPH was diagnosed using the criteria of the American Urological Association (AUA), considering symptoms like urinary retention, difficulty urinating, and incontinence. Risk factors for BPH were also taken into account. Diagnostic methods included a digital rectal exam (DRE), ultrasound, and blood tests to confirm the diagnosis. Before the operation, various assessments were conducted, including PSA, prostate volume, co-morbidities, International Prostate Symptom Score (IPSS), and hemoglobin levels. Post-operation, follow-up assessments were performed at 2 weeks and 3 months, including IPSS, blood loss, Visual Analogue Scale (VAS), uroflowmetry, complications, and hemoglobin levels. Changes in hemoglobin level, uroflowmetry, complications, VAS, IPSS, and operation time were analyzed statistically.

Inclusion criteria

- Prostate refractory lower urine tract symptoms and patient of urinary

retention due to enlarge prostate size > 60cc.

- Recurrent gross hematuria.
- Failed voiding trials.
- Urinary tract infection.
- Renal insufficiency secondary to obstruction.

Exclusion Criteria

- Patient with deranged coagulation profile for TURP.
- Patient with active Urinary Tract Infection (UTI).
- Patient with neurological condition.

Statistical Analysis

The study used SPSS 25 and MS Excel software for effective statistical analysis.

The discrete variables were expressed as counts or frequency alone or along with percentages. The continuous variables were expressed mean±standard deviation. The

outcome assessments were analyzed by employing ANOVA. The level of significance was considered to be $\alpha=0.05$.

Ethical Approval

The study process was explained to each of the patients before collection of data. The study process was approved by the hospital’s Ethical Committee. The consent form was obtained from each of the patients.

Results

The study has found the baseline characteristics of the patients in this study, including age, PSA, prostate volume, hemoglobin level and IPSS. Comorbidities were also determined by the study. The patients who were considered for this study had shown to have PSA of 5.574 ± 0.86 ng/ml and prostate volume of 50.43 ± 0.53 mL.

Table 1: Baseline characteristics of the whole study sample

| Parameters | Value |
|-------------------------|------------|
| Age (years; mean±sd) | 66.1±5.1 |
| PSA (ng/mL) | 5.574±0.86 |
| Prostate Volume (mL) | 50.43±0.53 |
| Hemoglobin Level (g/dL) | 13.23±1.06 |
| IPSS (Before Operation) | 29.06±2.37 |

The study found that 32% of all the patients in this study had hypertension while 21% each of all patients had Coronary Artery Disease (CAD) and Congestive Heart Failure (CHF). Again, 11% of the all patients was found to have type-2 diabetes mellitus (Figure 2).

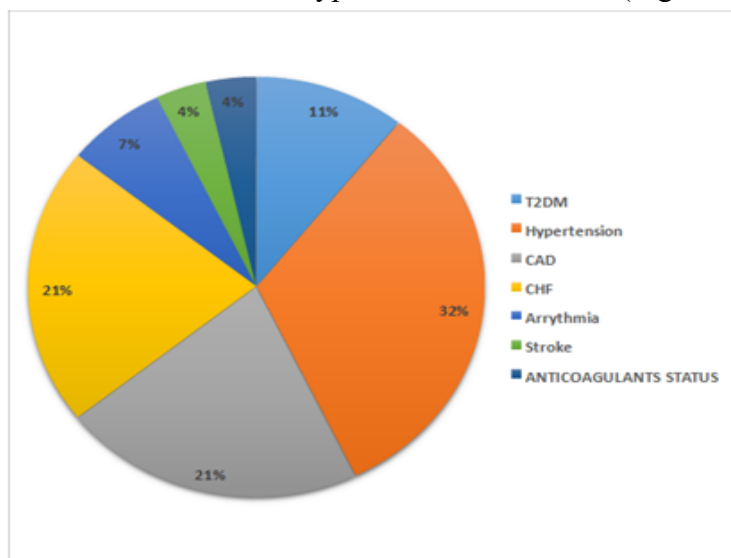


Figure 1: Co-morbidities present in the patients

The study found that the mean age in ThuLep and C-Turp group was 64.6 ± 4.39 years and 67.64 ± 5.38 years, while PSA was found to be 5.72 ± 0.85 ng/ml and 5.42 ± 0.87 ng/ml. The study further found that Prostate volume was 50.50 ± 0.50 mL in ThuLep and 50.35 ± 0.56 mL in C-TURP group (Figure 2).

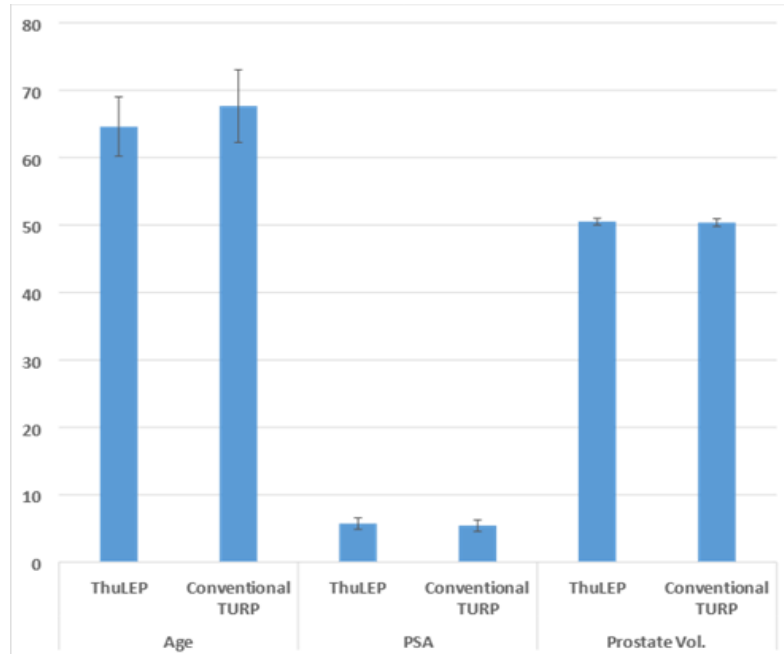


Figure 2: Baseline parameters of age, Prostate Specific Antigen (PSA) and Prostate Volume between the two groups

The study found that there were 28 patients with co-morbidities including T2DM, Hypertension, CAD, CHF, Arrythmia, Stroke and taking anticoagulants. Out of 28 patients, 21.43% of patients was having hypertension in ThuLep group while

10.71% of patients had hypertension in C-TURP group. It was found that 17.86% of 28 patients had history of CHF in C-TURP group while 3.57% of 28 patients in ThuLep group had CHF (Figure 3).

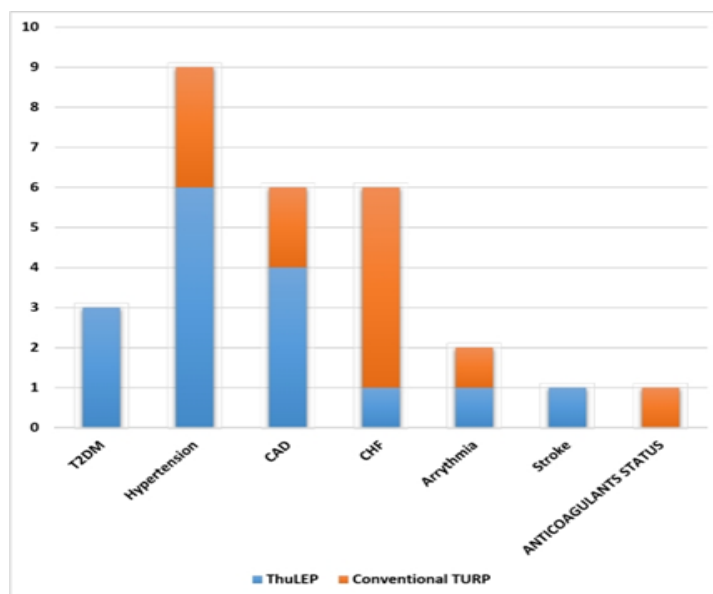


Figure 3: Number of patients with co-morbidities present in each group

The study found that IPSS decreases from 29.28 before operation in ThuLep group to 15 2 weeks after the operation which again decreases to 9.8 after 3 months of operation. The reduction in IPSS during the same

instances were noted in C-TURP group and it was found that IPSS decreases from 28.84 before the operation to 20.36 after 2 weeks of operation and ultimately reduced to 17.44 after 3 months (Figure 4).

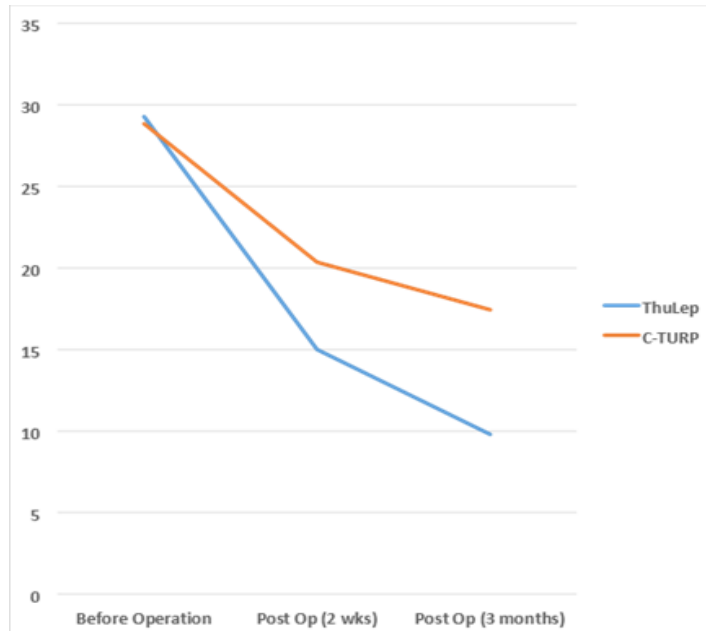


Figure 4: IPSS in each group determined at each interval (before the operation, 2 weeks post-operatively and 3 months post-operatively)

The study mainly found that the parameters like operation time, change in IPSS, VAS, blood loss and change in hemoglobin were significantly improved ($p < 0.05$) in ThuLep group as compared to C-TURP group. Again, days of hospital stay and uroflowmetry have no significant difference between the groups ($p > 0.05$) (Table 2).

Table 2: The outcome assessment of the study

| Parameters | | ThuLep | C-TURP | P-value |
|-----------------------------------|----------|-------------|--------------|---------|
| Operation Time (minutes) | | 79.84±3.6 | 86.36±4.17 | 0.0341 |
| Change in IPSS | | 19.48 | 11.4 | 0.0296 |
| VAS | 2 weeks | 2.92±0.86 | 0.68±0.48 | 0.0489 |
| | 3 months | 3.92±0.86 | 1.88±0.88 | 0.0375 |
| Hospital Stay (days) | | 1.08±0.28 | 1.2±0.41 | 0.544 |
| Blood Loss (ml) | | 83.54±30.17 | 160.61±30.53 | 0.0256 |
| Change in hemoglobin level (g/dl) | | 0.73±0.32 | 1.32±0.43 | 0.0495 |
| Uroflowmetry (ml) | | 15.2±0.81 | 14.72±1.17 | 0.0512 |

Complications were found to be more in C-TURP group as compared to ThuLep group (11 vs 9). The most common complication was found to be urinary retention while urethral stricture was more in C-TURP group. UTI was found to be same in both the groups (Figure 5).

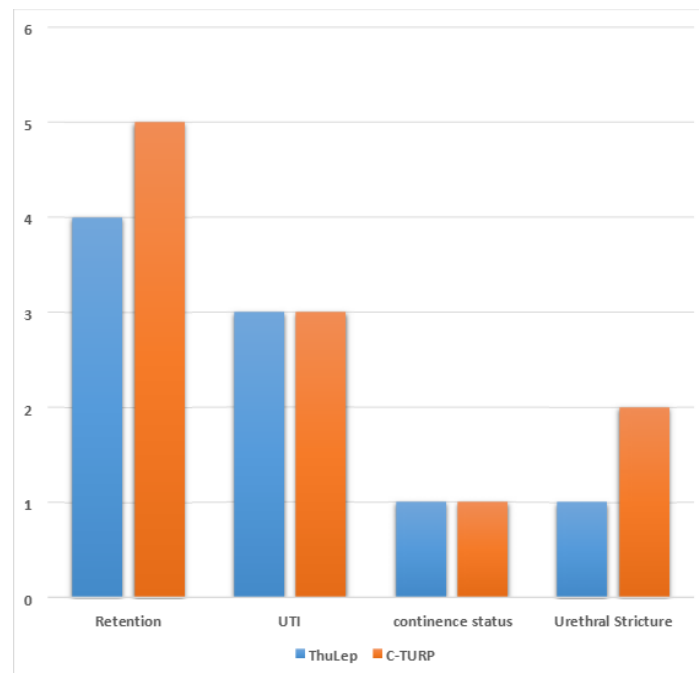


Figure 5: Complications found in each group after the operation

Discussion

The increasing elderly population is considered to be one of the major challenges in urology and medicine in specific. Indications associated with disobstructive surgery among elderly patients are required to balance surgical risk, life expectancy, and functional outcome. Nearly 12% of patients older than 75 years die post urinary retention and the rate rises up to nearly 30% among nursing home patients who went through TURP [10]. In parallel, functional outcome reduces with passing age. However, after TURP, morbidity is enhanced by age, "preoperative urinary retention and polymedication. TURP is considered to be a prevalent invasive treatment associated with "benign prostatic obstruction. Study design on patients older than 85 years was conducted between 2015 to 2020. Baseline parameters for instance, age, retention volume, "indwelling catheter preoperatively", retention volume, "post-void residual volume", and anticoagulation were recorded. Several postoperative and intraoperative parameters were accumulated as "modality of resection", resection volume, hospitalization days, and

operation time. Follow-up data was obtained postoperatively [8]. Individuals took 5.2 permanent medications. Nearly 64% were on anticoagulation while 19.6% of individuals suffered from diabetes mellitus and 17.2% suffered from neurological comorbidities. Indication for surgery further implied urinary retention indicating a requirement for permanent catheterization among 65% of patients. However, before surgery, only 4.2% of individuals went through urodynamic testing. Resection was performed in about 74.4% of cases with the bipolar technique. Median resection volume was reported to be 20.5gm while operation time was 55min. Patients underwent an operation through general anesthesia. Significant differences in relation to blood transfusion relying on resection techniques were observed.

Study results highlighted that nearly 86% of patients were capable of urinating spontaneously and the PVR rate has been reported to be lower than 100ml and discharged without an indwelling catheter. Patients were discharged after 6 days. A single patient died postoperatively. Follow-up data was obtained after 12 months. Out of 93 patients, nearly 85.7% void

spontaneously with PVR lower than 100ml [12]. Mean PVR has been reported to be 51.3ml. Urinary incontinence has been recorded to be 5.4%. Surgical re-intervention was performed in nearly 3 patients. Several studies have successfully documented efficacy and safety associated with desobstructive surgery while the success rate and complications are less favorable. Early as well as late complication rates were reported to be nearly 41% as well as 22%. Among all patients with a retention rate, 80% were able to void out residual volume post-operation [12]. Optimistic results associated with desobstructive surgery in the case of elderly patients from present and previous studies varied largely from studies conducted on nursing home patients. Study results on preoperative catheterization highlighted the mortality rate to be 30% while 95% remained on permanent catheterization. Results further indicated nearly all patients were on catheterization after one year of surgery indicating failure of TURP among all patients. Eau guidelines further recommended urodynamic evaluation on elderly patients before prostatectomy due to age-associated urodynamic changes towards reduced obstruction and increased detrusor dysfunction. Despite the recommendation, nearly 5% of men underwent preoperative urodynamics. A substantial difference was observed in transfusion rate in mono and bipolar TURP [6]. Thus desobstructive surgery on elderly patients further suggested that geriatric factors influenced the outcome while "preoperative geriatric assessment" assists in decision-making procedures. Geriatric factors, for instance, frailty, comedication, and co-morbidities are the predictors indicating the outcome of elderly patients after laser ablation. Furthermore, "holmium laser enucleation" is not at all associated with catheterization among patients above 80 years of age. However, prospective studies further suggested that elderly patients were reported to have worse outcomes and

benefitted from in-depth evaluation. Elderly frail patients were required to go through minimally invasive treatment like a prostate artery, and water vapourization that was performed under local anesthesia. The efficacy of mono, as well as bipolar TURP for the treatment of BPO, was demonstrated for the first time in the old cohort. At 12 months after TURP, nearly 85% of patients were capable of voiding spontaneously with PVR less than 100 ml while perioperative mortality has been reported to be lower than 1%.

In contrast to TURP, several other studies focused on highlighting the efficacy of ThuLEP permitting the removal of the transurethral transition zone with Thulium laser in combination with total anatomical enucleation with minimal side impacts and high urodynamic efficacy. Evaluation was conducted on 148 patients with a mean age of 68.2 who were treated with the ThuLEP technique for BPH. Study results highlighted that 39% of patients had urinary retention before surgery and were unable to void without a catheter [5]. The thuLEP process was conducted successfully in all patients. No patients have TURP syndrome, incomplete morcellation, ureteric orifice injury, and clot retention. However, 2 patients suffered from bladder injury during the morcellation process, 4 patients needed early recatheterization post-surgery, and residual tissues were observed at the apex of the "prostate fossa". Histopathological tests on enucleated tissue showcased "incidental adenocarcinoma of the prostate" among 8 patients and "benign prostate hyperplasia" among 140 patients [9]. Death of 4 patients was observed during follow-up while 14 failed to attain follow-up. Patients suffering from adenocarcinoma were excluded from follow-up. Thus out of 148, only 122 were available at the time of follow-up.

TURP in varied forms is considered a predominant process that was performed globally for small adenomas. A simple prostatectomy is considered a suitable

treatment for a large prostate. Study analysis based on analyzing the efficacy of ThuLEP showcased a safe profile with a prevalent complication rate in order: 6.7% of irritating symptoms, 12.8% of UTI, and 2.7% of recatheterization. The data further revealed 2.7% of transfusion rate and 2.7% of recatheterization while 1.3% of bladder injury [11]. ThuLEP is considered to be an alternative for TURP in the future while OP would be used for BPO as it offers the advantages of "minimally invasive surgical intervention", benefits of endoscopic, and benefits of "anatomical blunt dissection of adenoma" with limited complication rate. Laser energy is utilized for describing accurate dissection borders at the prostate apex, prostate lobe, and bladder neck. ThuLEP ensures that no prostatic tissue remains behind. This further implies effective outcomes in terms of "post void residual urine", IPSS, and uroflowmetry. ThuLEP represents an effective and safe surgical option among patients with BPH. It is considered to be an alternative to TURP.

In comparison to laser prostatectomy TURP is associated with increased complication rates but reduced reoperation rate in elderly persons with numerous comorbidities. Propensity score matching further highlighted that men who went through TURP vs LP had 7% enhancement-adjusted odds for nearly 90 days of emergency visits and hospital readmission [9]. Individuals with multiple comorbidities have been reported to have 8% reduced odds for outcomes with TURP. Furthermore, patients with complicated risk profiles have even opted for LP with respect to 90-day complications, individuals who underwent "TURP vs LP" showcased 28% enhancement "odds of hematuria". Prostate volume as well as usage of anticoagulants were not properly assessed. Multimorbid groups on the other hand were reported to possess 17% reduced odds associated with urinary tract infection after TURP. TURP was associated with

19% and 20% reduced adjusted "odds of reoperation" after six months in comparison to LP among the multimorbid population [10]. A study in comparison to the efficacy of ThuLEP and TURP thus indicated that IPSS diminishes much more significantly in the case of ThuLEP in comparison to TURP. The time undertaken for surgery in the case of ThuLEP is less than required in TURP [7]. Furthermore, improved results of IPSS and VAS were observed among patients who received ThuLEP intervention. Individuals who received ThuLEP showcased limited changes in hemoglobin. Thus ThuLEP has been considered to be a significant choice of BPH specifically for patients who are afraid of pain and have a tendency of bleeding.

Conclusion

The study has concluded that ThuLep is associated with a more significant reduction in IPSS compared to C-TURP. This research study has provided important insights into the management of BPH and its various parameters. The findings reveal that the average age of patients in the hospital was above 65 years, with a significant portion having hypertension, CAD, and CHF. ThuLep also exhibited advantages such as shorter surgery time, improved IPSS and VAS scores, reduced blood loss, and fewer complications. Therefore, the authors recommend ThuLep as the preferred treatment for BPH, particularly for patients with bleeding tendencies and concerns about pain management. In terms of future perspectives, it is important to note that this study was conducted in a single center. To strengthen the findings and broaden the generalizability, further studies with larger population sizes should be conducted. Additionally, future research could explore long-term outcomes, cost-effectiveness, and patient-reported outcomes to provide a comprehensive evaluation of different treatment options for BPH.

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