DOI: 10.4081/aiua.2026.15191

ORIGINAL PAPER

# The learning curve of thulium laser enucleation of the prostate: A single-centre experience

**Ahmed Y. Aboelsaad [1], Ahmed M. Abdel Gawad [1], Eman M. El-Daydamony [2], Osama M. Ghoneimy [2], Ahmed I. Elshater [2], Hany Elsegeay [3], Ahmed Wahsh [3], Gamal M. Hassan [3], Mohamed M. Ali [3], Tarek M. Abuelazayem [3], Osama I. Obeidat [4], Tamer A. Abouelgreed [2]**

[1] Department of Urology, Faculty of Medicine, Al-Azhar University, Damietta, Egypt;
[2] Department of Urology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt;
[3] Department of Urology, Faculty of medicine, Al-Azhar University, Assiut, Egypt;
[4] Department of Urology, Burjeel Royal Hospital, Abu Dhabi, UAE.

**Summary** *Objectives: To estimate the learning curve for thulium laser enucleation of the prostate (ThuLEP) performed by the same surgeon, appreciating the sequential progression in skill and proficiency over time.*
*Patients and methods: The study retrospectively enrolled 60 patients with benign prostatic hyperplasia (BPH) who underwent the ThuLEP procedure performed by a single experienced endourologist. Though not initially skilled with laser enucleation of the prostate, the surgeon had observed numerous cases before. The patients were divided into three groups, each containing 20 cases. The procedure started with inspection, followed by incision and trough creation and plane development, apicolateral dissection, sphincter release, anterior dissection, bladder neck dissection, C-shaped baso-lateral dissection, and adenoma detachment technique called veil-sparing ThuLEP using the ABCD method. Perioperative parameters, enucleation and morcellation time (min), enucleation efficiency (g/min), morcellation efficiency (g/min), enucleated tissue weight (g), hospital stay time, and catheterization time (h) were recorded.*
*Results: There was a statistically significant decrease in the International Prostate Symptom Score (IPSS) 6 months postoperatively (median = 3) compared with 1-day postoperatively (median = 4) and preoperatively (median = 25). Uroflowmetry parameters, IIEF-5 scores, enucleation and morcellation efficiency, hospitalization period, and catheterization time were evaluated, showing substantial improvements and stabilization over time.*
*Conclusions: A highly skilled endourologist in TURP was able to master the learning curve of ThuLEP after completing the initial 40 patients. Upgrading the sequential progression in skill and proficiency over time for treating benign prostatic hyperplasia in addition to its safety, feasibility, efficacy that improve procedure outcome with fewer difficulties.*

*KEY WORDS: BPH; ThuLEP; Laser; Learning curve; Prostate.*

Submitted 27 March 2026; Accepted 4 May 2026

## INTRODUCTION

Laser enucleation of the prostate is a widely used endourological procedure for patients with *benign prostatic hyperplasia* (BPH), regardless of prostate size, due to its reduced bleeding and minimized hospitalization period. However, its substantial cost and demanding learning curve have limited its widespread adoption (1). Over the past decade, two laser-assisted prostate enucleation procedures, *Holmium laser enucleation of the prostate* (HoLEP) and *thulium laser enucleation of the prostate* (ThuLEP) have gained popularity due to their similarly successful outcomes (2). The HoLEP technique was first introduced by *Gilling et al.* in 1998, while ThuLEP was pioneered by *Hermann et al.* in 2010 (3, 4). HoLEP and ThuLEP employ comparable methodologies, including the incision of mucosa, vaporization, and the application of coagulative energy to the prostatic tissue. However, their lasers have distinct characteristics. The holmium laser delivers energy in pulses with a depth of 0.45 mm, while the thulium laser provides continuous energy with a 2013 nm wavelength and a 0.25 mm penetration depth. ThuLEP has demonstrated similar perioperative outcomes but is associated with higher blood loss and a greater incidence of postoperative urinary incontinence compared with HoLEP (2). Despite this, the lower penetration depth of the thulium laser offers a more straightforward learning curve (5, 6). Many endourologists new to laser procedures may feel apprehensive about performing laser prostate enucleation due to concerns about postoperative urinary incontinence or the need to convert to *transurethral resection of the prostate* (TURP) during the procedure (7, 8). The constant pulsatile laser emission with less penetration depth in ThuLEP makes it more favoured by urosurgeons. The learning curve for ThuLEP is perceived to be shorter and requires fewer patients (8). Our study aimed to assess the learning curve for thulium laser enucleation of the prostate performed by the same surgeon, evaluating the progression in skill and efficiency over time when using this specific surgical technique.

## PATIENTS AND METHODS

This study retrospectively enrolled 60 patients with BPH who underwent ThuLEP at Al-Azhar University Hospital, between March 2022 and April 2024. The procedures were performed by a practiced endourologist who had observed numerous cases before but had no prior experi-

ence with laser enucleation of the prostate. Patients eligible for ThuLEP had little or no response to previous medical treatments, an IPSS of ≥ 8, and a maximum urine flow rate ($Q_{max}$) of < 15 ml/sec. Patients who had undergone pelvic radiotherapy, had urethral stricture, neurogenic bladder, or were diagnosed with prostate cancer after the ThuLEP procedure were excluded from the study. The patients were divided into three groups: the 1st group (patients no. 1-20), the 2nd group (patients no. 21-40), and the 3rd group (patients no. 41-60).

Preoperative variables such as prostate volume, *Prostate-specific antigen* (PSA), *haemoglobin* (Hb) levels, IPSS, *International Index of Erectile Function score* (IIEF) scores, and uroflowmetry parameters were recorded.

Uroflowmetry parameters included $Q_{max}$ (ml/sec), average urine flow rate (Qave) (ml/sec), and *post-void residua*l (PVR) (ml). In all cases, the procedure started with inspection, followed by incision and trough creation, plane development, apico-lateral dissection, sphincter release, anterior dissection, bladder neck dissection, C-shaped baso-lateral dissection, and finally, detachment of the adenoma.

This technique, called veil-sparing ThuLEP, uses the ABCD method (9). Enucleation was performed using a 550-µ end-firing thulium laser fibre with a 100 W laser (*RevoLix DUO, LISA Laser Products OHG, Katlenburg-Lindau, Germany*). Morcellation was carried out using a mechanical tissue morcellator (Storz S-PILOT® vacuum control unit and UNIMATE® 30 suction pump). After enucleation, the TURP-like cavity was inspected, the bladder was evacuated, and any remaining bleeders were coagulated. The endpoint was a TURP-like cavity reaching the capsular fibres while preserving the apical tissue. Continuous irrigation was maintained in each case through a 22 Fr three-way urethral catheter until the urine was clear, and the catheter was removed after 24 hours. Perioperative parameters, enucleation and morcellation time (min), enucleation efficiency (g/min), morcellation efficiency (g/min), enucleated tissue weight (g), hospital stay time, and catheterization time (h) were recorded. Complications were assessed perioperatively, including conversion to TURP, the need for blood transfusion if bleeding occurred, and mucosal injury during morcellation. Postoperative Hb levels on the first day and uroflowmetry, IPSS, and IIEF scores at 6 months postoperatively were also recorded. These parameters were compared among the three groups to determine the number of patients needed to optimize a safe and effective ThuLEP procedure while also identifying challenging steps. The *Statistical program for Social Science* (SPSS) version 24 was used to analyse the extracted data.

### *Ethical approval*

The protocol for this research project has been approved by ethics committee of the faculty of medicine for *Girls Al-Azhar University* with approval No. 1173/2022. Written Informed consent was obtained from all patients.

## Results

All 60 patients enrolled in our study were divided into three groups: 1st group (patients no. 1-20), 2nd group (patients no. 21-40), and 3rd group (patients no. 41-60).

### *Comparison between studied groups regarding preoperative assessment*

There was no statistically significant difference in preoperative prostate volume, IPSS, or IIEF-5 scores among the groups. However, there was a statistically significant low preoperative $Q_{max}$ in the 1st group compared with the 2nd and 3rd group (Table 1).

### *Comparison between the studied groups regarding operative data*

Regarding operative data such as enucleation, morcellation, and procedure time, as well as enucleated prostate volume, substantial differences were observed among the three groups. However, there were no statistically significant differences between the groups in terms of enucleation or morcellation efficiency (Table 2).

### *1st vs 3rd group*

High statistically significant differences were noted between the 1st group (first 20 cases) and the 3rd group (> 40 cases).

***Table 1.***
*Comparison between studied groups regarding preoperative assessment.*

| Pre-op parameters | Groups | | | KW | P-value |
|---|---|---|---|---|---|
| | 1st Group (n = 20) | 2nd Group (n = 20) | 3rd Group (n = 20) | | |
| IPSS | 25 (25-26) | 25 (24.3-26) | 26 (26-31.5) | 0.85 | 0.356 NS |
| PVR | 189.5 (104.3-267.5) | 197 (129.3-260) | 200 (190-280) | 0.47 | 0.490 NS |
| $Q_{max}$ | 7.3 (6.7-7.6) | 8.1 (7.4-9) | 8.3 (7.9-9) | 9.2 | 0.002 S |
| IIEF-5 score | 19 (18.3-20.8) | 19.5 (18-21) | 19 (18-19) | 0.08 | 0.772 NS |
| PSA | 3.8 (3.6-4.4) | 3.1 (1.1-3.8) | 3 (2.8-4) | 9.3 | 0.002 S |
| Hb | 14.4 (14.2-14.7) | 13.8 (11.5-14.6) | 12.8 (11.9-13.4) | 4.8 | 0.280 |

*KW: Kruskal-Wallis test; S: p-value < 0.05 (significant); NS: p-value > 0.05 (non-significant). Hb: Hemoglobin; IIEF-5: International Index of Erectile Function score; IPSS: International Prostate Symptom Score; PVR: Post-voiding residual urine; PSA: Prostate-specific antigen; $Q_{max}$: Maximum flow rate.*

***Table 2.***
*Comparison between the studied groups regarding operative data.*

| Operative data | Groups | | | KW | P-value |
|---|---|---|---|---|---|
| | 1st Group (n = 20) | 2nd Group (n = 20) | 3rd Group (n = 20) | | |
| Procedure time (min) | 98 (86-101.5) | 86.5 (80-97.3) | 75 (70-80) | 4.09 | 0.043 S |
| Enucleated prostate volume (g) | 79.5 (70.8-84.5) | 70 (69-79) | 69 (65.8-70) | 4.9 | 0.025 S |
| Enucleation time (min) | 50 (46-64.5) | 45 (41.3-50) | 35 (30-43) | 5.8 | 0.015 S |
| Enucleation efficiency (g/min) | 1.5 (1.2-1.7) | 1.6 (1.4-1.9) | 1.9 (1.6-2.4) | 1.23 | 0.267 NS |
| Morcellation time (min) | 30 (25-30) | 25 (20-28.8) | 17.5 (15-19.5) | 6.8 | 0.009 S |
| Morcellation efficiency (g/min) | 2.7 (2.4-3.4) | 3.1 (2.7-3.5) | 4.1 (3.4-4.6) | 1.79 | 0.108 NS |

*KW: Kruskal-Wallis test; S: p-value < 0.05 (significant); NS: p-value > 0.05 (non-significant).*

Enucleation efficiency showed a high statistically significant difference between the 1st group and the 3rd group.

### *2nd vs 3rd group*

Additionally, substantial differences were observed between the 2nd group and the 3rd group concerning procedure time, enucleation time, and morcellation efficiency.

***Table 3.***

*Post-hoc test for variance comparisons between the studied groups regarding operative data.*

| | | 1st vs. 2nd | 1st vs. 3rd | 2nd vs. 3rd |
|---|---|---|---|---|
| Procedure time | LSD | 6.45 | 21.3 | 14.9 |
| | p-value | 0.052 NS | < 0.001 HS | < 0.001 HS |
| Enucleated prostate volume | LSD | 5.05 | 9.9 | 4.8 |
| | p-value | 0.045 S | < 0.001 HS | 0.54 NS |
| Enucleation time | LSD | 8.25 | 18.8 | 10.55 |
| | p-value | 0.004 S | < 0.001 HS | < 0.001 HS |
| Enucleation efficiency | LSD | 0.13 | 0.48 | 0.35 |
| | p-value | 0.248 NS | < 0.001 HS | 0.002 S |
| Morcellation time | LSD | 3.85 | 10.2 | 6.4 |
| | p-value | 0.002 S | < 0.001 HS | < 0.001 HS |
| Morcellation efficiency | LSD | 0.27 | 1.11 | 0.83 |
| | p-value | 0.194 NS | < 0.001 HS | < 0.001 HS |

*LSD: Least significant difference; S: p-value < 0.05 (significant); HS: p-value < 0.001 (highly significant); NS: p-value > 0.05 (non-significant).*

### *1st and 2nd group*

There was also a statistically significant difference between the 1st group and the 2nd group regarding enucleation time.

Morcellation time exhibited statistically significant differences between the 1st and 2nd groups, as well as high statistically significant differences between the 1st and 3rd group and between the 2nd and 3rd group (Table 3).

### *Comparison between the studied groups regarding postoperative data*

Catheterization time showed a high statistically significant increase in the 1st group compared with the 2nd and 3rd group (Table 4).

Hospital stay was substantially longer in the 1st group (1.15 ± 0.36 days) compared with the 2nd group (1.0 ± 0.0 days) and the 3rd group (1.0 ± 0.0 days).

Complications did not show substantial differences among the groups. There were four patients (20%) with complications in the 1st group versus one patient (5%) in the 2nd group and no patients (0%) in the 3rd group (Table 5).

In the 1st group, there is a high statistically significant decrease in the 6-month postoperative IPSS (median = 3, IQR = 2-4) compared with the 1-day postoperative IPSS (median = 3.5, IQR = 2.3-4.8) and preoperative IPSS (median = 26, IQR = 26-31.5) (Table 6). There was also a high statistically significant decrease in PVR 6 months postoperatively compared with 1-day preoperatively and postoperatively. $Q_{max}$ increased substantially 6 months postoperatively (median = 23, IQR = 22.8-24) compared with 1-day postoperatively (median = 22, IQR = 20.9-23) and preoperatively (median = 8.3, IQR = 7.9-9). The IIEF-5 score showed a high statistically significant difference throughout the study.

Preoperatively, the IIEF-5 score had a median of 19 with an IQR of 18-19. One day postoperatively, the IIEF-5 score had a median of 19 with an IQR of 18-20. Six months postoperatively, the median IIEF-5 score was 22.5, with an IQR of 21-24 (Table 6).

***Table 4.***

*Post-hoc test for several comparisons between the studied groups regarding postoperative data.*

| | | 1st vs. 2nd | 1st vs. 3rd | 2nd vs. 3rd |
|---|---|---|---|---|
| Catheterization time (days) | LSD | 0.85 | 0.85 | 0.0 |
| | p-value | < 0.001 HS | < 0.001 HS | 1.0 NS |
| Hospital stays (days) | LSD | 0.15 | 0.15 | 0.0 |
| | p-value | < 0.001 HS | < 0.001 HS | 1.0 NS |
| Complications | $X^2$ | 2.05 | 4.4 | 1.02 |
| | p-value | 0.151 NS | 0.035 S | 0.311 NS |

*LSD: Least significant difference; S: p-value < 0.05 (significant); $X^2$: Chi-square test; HS: p-value < 0.001 (highly significant); NS: p-value > 0.05 (non-significant).*

***Table 5.***

*Comparison between the studied groups regarding postoperative data.*

| | | Groups | | | KW | P-value |
|---|---|---|---|---|---|---|
| | | 1st Group (n = 20) | 2nd Group (n = 20) | 3rd Group (n = 20) | | |
| Catheterization time (days) | Mean | 1.85 | 1.0 | 1.0 | F = 60.3 | < 0.001 HS |
| | ± SD | 0.48 0.0 | 0.0 | | | |
| Hospital stay (days) | Mean | 1.15 | 1.0 | 1.0 | F = 3.2 | 0.046 S |
| | ± SD | 0.36 0.0 | 0.0 | | | |
| Complications | No | 16 80% | 19 95% | 20 100% | $X^2$ = 5.6 | 0.059 NS |
| | Yes | 4 20% | 1 5% | 0 0% | | |

*S: p-value < 0.05 (significant); F: F value of ANOVA test; HS: p-value < 0.001 (highly significant); $X^2$: Chi-square test; NS: p-value > 0.05 (non-significant).*

***Table 6.***

*Comparison of studied parameters in the 3rd group.*

| | 3 rd Groups | | | F | P-value |
|---|---|---|---|---|---|
| | Pre-op (n = 20) | 1-day post-op (n = 20) | 6-month post-op (n = 20) | | |
| IPSS | 26 (26-31.5) | 3.5 (2.3-4.8) | 3 (2-4) | 32.6 | < 0.001 HS |
| PVR | 200 (190-280) | 16.5 (10-20) | 10 (0-19.8) | 32.4 | < 0.001 HS |
| $Q_{max}$ | 8.3 (7.9-9) | 22 (20.9-23) | 23 (22.8-24) | 34.9 | < 0.001 HS |
| IIEF-5 score | 19 (18-19) | 19 (18-20) | 22.5 (21-24) | 16.2 | < 0.001 HS |
| PSA | 3 (2.8-4) | 2 (1.8-2.2) | 1.4 (1-2) | 23.5 | < 0.001 HS |
| Hb | 12.8 (11.9-13.4) | 11.9 (11-12.1) | 13.6 (12.9-14) | 29.1 | < 0.001 HS |

*F: Friedman test; HS: p-value < 0.001 (highly significant); Hb: Hemoglobin; IIEF-5: International Index of Erectile Function score; IPSS: International Prostate Symptom Score; PVR: Post-voiding residual urine; PSA: Prostate-specific antigen; $Q_{max}$: Maximum flow rate.*

## Discussion

*Benign prostatic obstruction* (BPO) is one of the most commonly diagnosed conditions of the male genitourinary tract, and worldwide results in 1.2 million surgical procedures per year (10).

Ebbinghaus depicted the learning curve in 1885, which was then described in industry by Wright as a manner applied for reforming the experience and skill of staff, resulting in improved productivity with less cost (11, 12). Assessing surgeon performance is more difficult. However, *Luft et al.* began to correlate the magnitude of the clinical field with outcomes (13). Procedural outcome measures and measures of patient outcome are included in the processes of surgical knowledge. In patients with moderate to severe *lower urinary tract symptoms* (LUTS), ThuLEP is documented as a valid substitute for TURP and HoLEP, leading to immediate and mid-term improvements (14). The swift learning curve, higher coagulation power, and possibly the shorter operative time required to complete the procedure are considered advantages of ThuLEP over HoLEP. Nonetheless, a recent matched-pair comparison study between HoLEP and ThuLEP revealed that, despite a shorter procedure time in favor of ThuLEP, the results of the two procedures are equivalent (15). Numerous studies have shown that ThuLEP has a less steep learning curve than HoLEP. A study conducted by Saredi et al. proved that 20 cases are sufficient to achieve assertiveness with the procedure, even without direct trainer help (8). Herrmann et al. also indicated that an equal number of procedures are adequate for a comprehensive learning curve (16).

### *The learning curve for ThuLEP*

In our study, the learning curve for ThuLEP might be achieved after the first 20 cases and becomes substantially better after 40 cases. Plateauing displayed that a qualified endourologist improves substantially for en bloc ThuLEP after practicing with 40 patients.

### *Comparison between the studied groups regarding operative data*

There was a highly statistically significant difference between the first group (the first 20 cases) and the third group (the third 20 cases), as well as between the second group and the third group regarding procedure period, enucleation time, and morcellation efficiency. Additionally, the 1st group and the 2nd group displayed a statistically significant difference in enucleation time and enucleation efficiency. Regarding enucleation efficiency, there was a high statistically significant difference between the 1st group and the 3rd group. A study by *Aydogan and Binbay* (2022) indicated that, in the 3rd group of cases (after 40 cases), enucleation efficiency is almost equal to that of qualified endourologists, although our morcellation efficiency was somewhat superior to their mentors (17).

### *Comparison between studied groups regarding perioperative assessment*

Pre- and postoperative uroflowmetry, IPSS, and PVR showed no substantial improvements among their groups. In the 12th month, a substantial alteration in $Q_{max}$ was observed only. According to their outcomes, the postoperative IPSS was substantially different in Group 1 compared with Groups 2 and 3. In our study, there was a high statistically significant decrease in the 6-month postoperative IPSS (median = 3, Inter-quartile range IQR = 2-3) compared with the 1-day postoperative IPSS (median = 4, IQR = 4-5) and preoperative IPSS (median = 25, IQR = 25-26). There was a high statistically significant decrease in the 6-month postoperative PVR compared with the 1-day pre- and postoperative PVR. There was a highly statistically significant increase in the 6-month postoperative $Q_{max}$ (median = 24.9, IQR = 24.4-25.8) compared with the 1-day postoperative $Q_{max}$ (median = 22.8, IQR = 21.9-23.6) and preoperative $Q_{max}$ (median = 7.3, IQR = 6.7-7.6). Additionally, there was a highly statistically significant difference in the IIEF-5 score throughout the study. The median IIEF-5 score preoperatively was 19, with an IQR of 18.3-20.8. One day postoperatively, it decreased to 17.5 with an IQR of 16.3-18. Six months postoperatively, the median IIEF-5 score was 19.5, with an IQR of 19-21. Perfect vision and continuous hydro distension of the bladder without any ongoing bleeding improve the learning curve for morcellation. A study conducted by Bae et al. reported that 20 patients were adequate for the morcellation phase, whereas 30 patients were required for the enucleation phase throughout HoLEP (18). Catheterization time showed a highly statistically significant increase in the 1st group compared with the 2nd and 3rd groups, with a

## Declarations

***Ethical approval and consent for participate:*** *All procedures performed in this study that involved human participants were in accordance with the ethical standards of the institutional review board and the relevant ethics committee, the national research committee, and the 1964 Helsinki Declaration and its later amendments. The protocol for this research project has been approved by ethics committee of the faculty of medicine for Girls Al-Azhar University with approval No. 1173/2022. Written Informed consent was obtained from all patients.*

***Consent for publication:*** *Written informed consent obtained from all participants.*

***Availability of data and material:*** *The data that support the findings of this study are available from the corresponding author upon reasonable request.*

***Competing interests:*** *The authors have no competing interests to declare.*

***Use of AI generator in manuscript preparation:*** *None.*

***Guarantor:*** *None.*

***Provenance and peer review:*** *Not commissioned, externally peer-reviewed.*

***Funding:*** *The authors have no financial interests linked to this work.*

***Authors' contributions:*** *AY. Is the first author and wrote the initial draft of the manuscript. AY, AM, TA, EM, MA and OM. conceived and designed the study. AI, HD, HE, AW, GM, MM, and TM. Involved in the revisions and refining of the manuscript. AA. AA. FA, SA, AA and OI. Participated in statistical analysis, participated in the review of the manuscript. All authors. Participated in the final approval.*

***Acknowledgments:*** *None.*

noted highly statistically significant difference between the 1st and 3rd groups. This is consistent with results by *Ümit Yıldırım et al.*, where the 3rd group had fewer hospitalization and catheterization periods on an hourly basis (19). *Saredi et al.* used a simulator program to appreciate the learning curve for ThuLEP without the support of a tutor. Organizing regular visits to several centers with HoLEP and ThuLEP expertise plays a substantial role as the starting point for learning progression. Morcellation, rather than actual enucleation, was noted as the major cause of surgical complications but was readily resolved. Their findings indicate that fewer cases than those for HoLEP are needed for an endoscopically experienced urosurgeon to learn ThuLEP, and mentoring is not mandatory for this technique. They disclosed that a single operator mastered the learning curve after performing the procedure on 30 patients (8). There are various limitations to our study: Since our study only included one surgeon, its findings might not be applicable in other contexts. Larger-scale research projects involving comparisons with a control group are required. Restricted vision, even a small quantity of blood could hinder vision due to the small caliber of scopes used during morcellation, which will delay the process's completion. Furthermore, the follow-up period was insufficiently long. A lengthier follow-up may reveal various outcomes from the operation, as the irrigation fluid's hemoglobin concentration cannot be measured.

## Conclusions

A highly skilled endourologist in TURP was able to master the learning curve of ThuLEP after completing the initial 40 patients. Upgrading the sequential progression in skill and proficiency over time for treating benign prostatic hyperplasia in addition to its safety, feasibility, efficacy which improve procedure outcome with fewer difficulties.

## References


*1. Razzak M. BPH: HoLEP--a steep learning curve but better for patients. Nat Rev Urol. 2013; 10:66.*

*2. Bozzini G, Berti L, Aydoğan TB, et al. A prospective multicenter randomized comparison between Holmium Laser Enucleation of the Prostate (HoLEP) and Thulium Laser Enucleation of the Prostate (ThuLEP). World J Urol. 2021; 39:2375-2382.*

*3. Gilling PJ, Kennett K, Das AK, et al. Holmium laser enucleation of the prostate (HoLEP) combined with transurethral tissue morcellation: an update on the early clinical experience. J Endourol. 1998; 12:457-459.*

*4. Herrmann TR, Bach T, Imkamp F, et al. Thulium laser enucleation of the prostate (ThuLEP): transurethral anatomical prostatectomy with laser support. Introduction of a novel technique for the treatment of benign prostatic obstruction. World J Urol. 2010; 28:45-51.*

*5. Castellani D, Pirola GM, Gasparri L, et al. Are outcomes of thulium laser enucleation of the prostate different in men aged 75 and over? A propensity score analysis. Urology. 2019; 132:170-176.*

*6. Enikeev D, Shariat SF, Taratkin M, Glybochko P. The changing role of lasers in urologic surgery. Curr Opin Urol. 2020; 30:24-29.*

*7. Netsch C, Bach T, Herrmann TR, et al. Evaluation of the learning curve for Thulium Vapo-Enucleation of the prostate (ThuVEP) using a mentor-based approach. World J Urol. 2013; 31:1231-1238.*

*8. Saredi G, Pirola GM, Pacchetti A, et al. Evaluation of the learning curve for thulium laser enucleation of the prostate with the aid of a simulator tool but without tutoring: comparison of two surgeons with different levels of endoscopic experience. BMC Urol. 2015; 15:1-7.*

*9. Seung-June Oh. Current surgical techniques of enucleation in holmium laser enucleation of the prostate. Invest Clin Urol. 2019; 60:333-342.*

*10. Aboutaleb H, Ali TA, Zaghloul A, Amin MM. Efficacy of bipolar 'button' plasma vaporisation of the prostate compared to green laser vaporisation for benign prostatic obstruction. Journal of Clinical Urology. 2018; 11:350-356.*

*11. Wozniak RH. Introduction to memory: Hermann Ebbinghaus (1885/1913). Classics in the history of psychology. 1999.*

*12. Wright TP. Factors affecting the cost of airplanes. Journal of the Aeronautical Sciences. 1936; 3:122-128.*

*13. Luft HS, Bunker JP, Enthoven AC. Should operations be regionalized? The empirical relation between surgical volume and mortality. New Eng J Med. 1979; 301:1364-1369.*

*14. Gravas S, Cornu JN, Drake M, et al. Management of non-neurogenic male lower urinary tract symptoms (LUTS), incl. benign prostatic obstruction (BPO). ISBN (Print) 978-94-92671-01-1, ISSN (Print) 2588-817X.*

*15. Pirola GM, Saredi G, Codas Duarte R, et al. Holmium laser versus thulium laser enucleation of the prostate: a matched-pair analysis from two centers. Ther Adv Urol. 2018; 10:223-233.*

*16. Herrmann T, Kallidonis P, Kotsiris D, et al. Surgeons' self assessed learning curve for Thulium-assisted Laser Prostatectomy: Evaluation of a nationwide Survey. Hellenic Urology 2017; 29:46-53.*

*17. Aydogan TB, Binbay M. Learning curve of ThuLEP (Thulium laser enucleation of the prostate): Single-centre experience on initial consecutive 60 patients. Andrologia. 2022; 54:e14366.*

*18. Bae J, Oh SJ, Paick JS. The learning curve for holmium laser enucleation of the prostate: a single-center experience. Korean J Urol. 2010; 51:688.*

*19. Yıldırım Ü, Ezer M, Uslu M, Örs B. En bloc enucleation of the prostate with early apical release using a high-power (200 W) thulium device: studying a learning curve. Rev Assoc Med Bras (1992). 2023; 69:e20230325.*



**Correspondence**

*Ahmed Y. Aboelsaad* - aboelsaadurology@hotmail.com
*Ahmed M. Abdel Gawad* - ahgawad84@gmail.com
Department of Urology, Faculty of Medicine, Al-Azhar University, Damietta, Egypt

*Eman M. El-Daydamony* - emanmohamed.8@azhar.edu.eg
*Osama M. Ghoneimy* - elgendyosama787@gmail.com
*Ahmed I. Elshater* - drshater56@gmail.com
*Tamer A. Abouelgreed (Corresponding Author)*
dr_tamer_ali@yahoo.com
Department of Urology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

*Hany Elsegeay* - docterhany53@gmail.com
*Ahmed Wahsh* - hudaahmed320@gmail.com
*Gamal M. Hassan* - gamalshrf@yahoo.com
*Mohamed M. Ali* - drmtahtawy2017@gmail.com
*Tarek M. Abuelazayem* - dr_tarek2010@hotmail.com
Department of Urology, Faculty of medicine, Al-Azhar University, Assiut, Egypt

*Osama I. Obeidat* - osamah929292@gmail.com
Department of Urology, Burjeel Royal Hospital, Abu Dhabi, UAE