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ORIGINAL PAPER

Analysis of the top-down HoLEP learning curve: A single-center experience of two clinical fellows

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Summary

Introduction: *Holmium laser enucleation of the prostate (HoLEP) is known to have a steep learning curve. The top-down technique was introduced to lessen the number of procedures required to master HoLEP. We aimed to present the experiences of two successive clinical fellows with the top-down HoLEP learning curve and compare their performance with the supervisor.*

Methods: *We conducted a prospective study of 40 patients who underwent top-down HoLEP performed by two successive fellows at our institution from September 2020 to November 2022. Before data collection, each learner observed three top-down HoLEP procedures and assisted with seven additional cases before independently performing top-down HoLEP under supervision. We collected data from each fellow's first 20 consecutive top-down HoLEP procedures. The learners' cases were grouped according to chronological order (Cases 1-10 and 11-20). The primary outcome was defined as the number of cases before the fellow could independently complete all steps of top-down HoLEP without any major intraoperative complications. The secondary outcomes included the intraoperative and postoperative outcomes of both groups. The fellows' 40 cumulative cases were then compared against retrospective data from 148 procedures conducted by their supervisor.*

Results: *There were no significant differences in patient demographics for both clinical fellows. Each learner performed the first 20 cases independently without needing the supervisor to intervene. No major intraoperative complications were recorded, and there were no statistically significant differences in intraoperative and postoperative outcomes between fellows' cases. There was a statistically significant difference between the fellows and their supervisor in terms of operative efficiency and enucleation efficiency ($p < 0.001$). We did not find a significant difference between the fellows and the supervisor regarding intraoperative complications, major postoperative complications, or postoperative subjective and objective parameters.*

Conclusions: *Top-down HoLEP shows promising and reproducible results in shortening HoLEP's learning curve. Larger comparative and multi-institutional studies are warranted.*

KEY WORDS: Prostate; Minimal invasive; Benign prostatic hyperplasia.

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INTRODUCTION

Holmium laser enucleation of the prostate (HoLEP) is a size-independent gold-standard surgical treatment for *benign prostatic hyperplasia* (BPH) (1, 2). It offers comparable outcomes to *open prostatectomy* (OP) and *transurethral resection of the prostate* (TURP), with shorter hospital stays and lower morbidity rates (3, 4). Improvements in long-term outcomes post-HoLEP are durable, with minimal late complications and low reoperation rates (5). Various barriers hinder HoLEP's widespread adoption, as mastering it requires proficiency in endoscopic techniques and presents significant challenges (6-9).

HoLEP's learning curve typically involves 25-50 procedures (10). However, a well-structured mentorship program may reduce the number of cases, allowing for faster proficiency (6, 10). Several studies attempted to determine the threshold of procedures defining the learning phase, considering factors like surgical duration, enucleation efficiency, energy expenditure, *prostate-specific antigen* (PSA) level reduction, and complication rates (9, 11, 12).

Efforts to address traditional HoLEP's steep learning curve include modifications to simplify the procedure and reduce operative time (13-17). *York et al.* introduced the top-down technique in 2017. Advantages of top-down HoLEP include minimizing the risk of overstretching the sphincter during distal mucosal flap cutting and eliminating the encircling technique (18). Our study aims to enhance understanding of HoLEP's learning trajectory by comparing two successive fellows and their supervisor performing top-down HoLEP. We endeavor to provide insights to shape training protocols and advance HoLEP's adoption in urological practice.

MATERIALS AND METHODS

Following ethics board approval, we conducted a prospective study of 40 patients who underwent top-down HoLEP performed by two successive clinical fellows at our institution from September 2020 to November 2022.

The study also included retrospective data from 148 cases performed by a *HoLEP expert* (H.E.) from October 2017 to September 2020 prior to establishing a clinical fellowship program.

Before data collection, each fellow observed three top-down HoLEP cases and assisted with seven (totaling 10 cases). Once the supervisor determined the learner attained a reasonable level of confidence in technical aspects, a prospective study was initiated. After 10 procedures, the supervisor ceased actively participating in surgery but remained present to observe and assist if needed. Our study involved the initial 20 consecutive procedures by 2 successive fellows (20 cases/fellow). Fellow 1 operated from September 2020 to June 2021, while Fellow 2 completed procedures from February to November 2022. Participants were divided into Group 1 (patients 1-10) and Group 2 (patients 11-20). We also compared the fellows' 40 cases to their supervisor's 148 cases.

The primary outcome was the number of cases needed for the fellow to independently complete all top-down HoLEP steps without major intraoperative complications. Intraoperative safety measures included capsular perforation, bleeding requiring transfusion, and bladder injury during morcellation.

Secondary outcomes encompassed intraoperative parameters such as operative efficiency, enucleation efficiency, morcellation time, resected weight, and postoperative results. Operative efficiency, defined as the rate of prostate tissue removal during the entire HoLEP procedure (including both enucleation and morcellation phases), was calculated by dividing the total weight of enucleated tissue (grams) by the total operative time (minutes), and expressed as grams per minute (g/min). Similarly, enucleation efficiency measured the rate of tissue removal during the enucleation phase alone, excluding morcellation time. This was calculated by dividing the weight of enucleated tissue (grams) by the enucleation time (minutes), also expressed as grams per minute (g/min).

We utilized a 100-W holmium:YAG laser (*VersaPulse PowerSuite™, Lumenis, Yokneam, Israel*). Both techniques employed a 550-µm laser fiber and a 28-F continuous flow resectoscope (*Karl Storz SE & Co. KG, Tuttlingen, Germany*). Enucleated tissue was morcellated with a Karl Storz® DrillCut™ morcellator. Primary laser settings for enucleation were 2 J and 40 Hz and 2 J and 20 Hz for hemostasis.

Study population

The inclusion criteria comprised males aged > 50 years with medically refractory LUTS due to BPH, *International Prostate Symptom Score* (IPSS) ≥ 15, *Quality of Life* (QoL) score ≥ 3, and maximum flow rate (Q_{max}) < 15 mL/sec.

Patients were excluded if they had previous surgical BPH treatment, a history of prostate cancer, urethral stenosis, or neurogenic bladder, the inability to withhold anticoagulant or antiplatelet medication, and an active *urinary tract infection* (UTI).

The preoperative evaluation encompassed patient demographics, a physical examination, and a detailed medical history, including anticoagulant or antiplatelet use, history of urinary retention, and prior prostate procedures. Symptom assessment included IPSS and QoL questionnaires. All patients received PSA testing, uroflowmetry, a *post-void residual* (PVR) bladder scan, and transrectal ultrasound (TRUS) for prostate volume estimation.

Patients were advised that if medically feasible, they should temporarily withold their anticoagulant and antiplatelet medications before surgery for 3 days and 7 days, respectively. Intraoperative parameters, postoperative outcomes, and readmission data were recorded. Data on surgical parameters such as enucleation time, morcellation time, operative and enucleation efficiencies, resected weight, intraoperative complications, and the need for blood transfusion were collected. Early postoperative complications with *emergency room* (ER) visits and a failed *trial of void* (TOV) were also recorded.

Surgical technique

All HoLEP procedures were performed using the top-down technique as previously described (19). Briefly, the distinction between the traditional and top-down HoLEP techniques lies in the direction and approach of enucleation. In both traditional and top-down HoLEP, a single incision is made at the 6 o'clock position of the bladder neck for a bilobar prostate configuration. With a trilobar configuration, the bladder neck incision is made at either 5 or 7 o'clock to establish the capsular plane. The lateral lobes are then enucleated using a two-lobe approach, where one lateral lobe is followed by the combined enucleation of the other lateral lobe and the median lobe.

In traditional HoLEP, dissection follows a bottom-up approach. For the top-down technique, the anterior commissure mucosa is then incised using 2 J/20 Hz, starting from the bladder neck at 12 o'clock. The incision is deepened to separate the area between the right and left adenoma until the surgical capsule is reached. Once the plane between the adenoma and the surgical capsule is established, a top-down lateral lobe dissection is performed and extended anteroposteriorly towards the apical adenoma at 6 o'clock. The enucleated tissue is then morcellated using a Karl Storz DrillCut™ (*Germany*) morcellator.

Postoperative care

A 3-way catheter (22 F, with 75 mL of sterile water in the balloon) was inserted postoperatively for all patients. They were kept on *continuous bladder irrigation* (CBI) with an overnight admission, followed by a *trial of void* (TOV) within 24 hours.

Follow-up

Patients were followed up at 1, 3, and 6 months, and PSA testing was performed at 3 months. Postoperative complications included persistent hematuria, clot retention, urethral strictures, and bladder neck contraction. *Stress urinary incontinence* (SUI) was assessed by a history of involuntary urine leakage during coughing or sneezing and the use of pads to prevent wetting. Additionally, SUI was evaluated by directing the patient to cough with a full bladder and observing urine passage.

Statistical analyses

Data collection and statistical analysis were performed using the Statistical Package for the Social Sciences (*SPSS® IBM®*) version 26. Categorical variables were reported as numbers and percentages and analyzed using the Chi-squared test, while continuous data were presented as medians and ranges and evaluated using the Mann-Whitney U test. A p-value of < 0.05 was considered statistically significant.

Table 1A.
Comparison of patient demographics, perioperative and early postoperative outcomes between the fellows' 20 cases.

Parameters		Fellow 1 20 Cases	Fellow 2 20 Cases	P
Number of participants n		20	20	-
Age years median (range)		70 (52-88)	70 (59-87)	0.947
Indication n (%)	LUTS	13 (65)	12 (60)	0.500
	Retention	7 (35)	8 (40)	
	Hematuria	-	-	
ASA score n (%)	I	7 (35)	7 (35)	0.132
	II	12 (60)	11 (55)	
	III	1 (5)	2 (10)	
	IV	-	-	
Preoperative prostate size by TRUS cc median (range)		91 (56-210)	115 (80-206)	0.108
Preoperative IPSS median (range)		21 (15-30)	23.5 (17-34)	0.437
Preoperative QoL median (range)		5 (3-6)	4 (3-6)	0.689
Preoperative Q_{max} mL/s median (range)		10 (6-14)	9 (1-13.6)	0.765
Preoperative PVR mL median (range)		270 (20-500)	170 (35-650)	0.437
Enucleated tissue weight g median (range)		71 (35-140)	78 (33-240)	0.495
Operative efficiency g/min median (range)		0.83 (0.4-1.27)	0.81 (0.48-1.29)	0.947
Enucleation time min median (range)		70 (50-92)	71 (45-159)	0.327
Enucleation efficiency g/min median (range)		1.02 (0.5-1.72)	1.07 (0.52-1.72)	0.947
Blood transfusion n (%)		0	0	-
Successful first TOV n (%)		19 (95)	19 (95)	0.756
Intraoperative complications n (%)		0	0	-
Readmission n (%)		1 (5)	2 (10)	0.5
Retreatment n (%)		0	0	-
Postoperative complications n (%)	Clavien I	3 (15)	4 (20)	0.553
	Clavien II	0	0	-
	Clavien III	0	0	-
Prostate weight reduction % median (range)		80 (62-95)	81 (35-93)	0.777
PSA reduction % median (range)		84 (8-99)	91 (32-98)	0.142

LUTS: Lower urinary tract symptoms; ASA: American Society of Anesthesiologists; TRUS: Transrectal ultrasound; IPSS: International Prostate Symptom Score; QoL: quality of life; Q_{max}: Maximum urinary flow rate; PVR: Post-void residual urine test; TOV: Trial of void; PSA: Prostate-specific antigen.

Results

No significant differences in demographics and preoperative data were observed between the early and later cases for both fellows. Similarly, when comparing the 20 cases of Fellow 1 and Fellow 2, no differences were observed in patient demographics, perioperative, or early postoperative outcomes (Table 1A).

Operative and postoperative outcomes

Operative efficiency, enucleation time, and enucleation efficiency were not significantly different between the initial and subsequent 10 cases for both fellows. Fellow 1's median enucleation efficiency was 0.94 g/min for initial cases and 1.12 g/min for subsequent cases (p = 0.739). The second fellow's median enucleation efficiency was 1.11 g/min for the first 10 cases and 0.85 g/min for subsequent procedures (p = 0.436). When comparing the two fellows, there were no significant differences in operative efficiency, enucleation time, or enucleation efficiency. Fellow 1's median enucleation efficiency was 1.02 g/min, compared to Fellow 2's median of 1.07 g/min (p = 0.947).

No intraoperative complications or need for blood transfusion were recorded in either group. Successful first TOV, as well as readmission and retreatment rates, were similar across both fellows' cases. None of the patients in either group experienced Clavien II-V complications. However, one participant from each fellow's cohort had a failed TOV (Clavien I), both of whom passed their TOV within one week. Five incidents of prolonged or severe hematuria requiring ER visits were recorded (2 for Fellow 1 and 3 for Fellow 2), all of which were managed conservatively with Foley catheter reinsertion and CBI (Clavien I); three patients were readmitted. None of the patients experienced any cardiovascular events or UTIs.

No significant differences in prostate weight or PSA reduction percentages were observed between both learners (Table 1A). Additionally, postoperative outcomes at 1, 3, and 6 months showed no significant differences between the two fellows. SUI rates were low and comparable across all groups (Table 1B). Tables 1A and 1B demonstrate that both learners had comparable perioperative and postoperative outcomes for all 20 procedures, with no statistically significant differences.

Table 1B.
Comparison of postoperative outcomes between the fellows' 20 cases at 1, 3 and 6 months.

Parameters	Fellow 1 20 Cases	Fellow 2 20 Cases	P
1 month postoperative			
IPSS median (range)	8.5 (1-24)	8 (2-18)	0.988
QoL median (range)	2.5 (0-6)	2 (0-5)	0.696
Q_{max} mL/s median (range)	23 (11-50)	17 (6-40)	0.31
PVR mL median (range)	44 (0-390)	47 (0-160)	0.897
SUI n (%)	3 (15)	3 (15)	0.5
3 months postoperative			
IPSS median (range)	7.5 (0-24)	5.5 (1-23)	0.347
QoL median (range)	2.5 (0-5)	1 (0-5)	0.081
Q_{max} mL/s median (range)	20 (11-34)	21 (13-45)	0.72
PVR mL median (range)	40 (0-130)	63 (0-150)	0.281
SUI n (%)	1 (5)	2 (10)	0.5
6 months postoperative			
IPSS median (range)	6 (2-16)	5 (1-10)	0.126
QoL median (range)	2 (0-4)	1 (0-3)	0.111
Q_{max} mL/s median (range)	20 (8-39)	22 (15-41)	0.532
PVR mL median (range)	49 (0-130)	24 (0-110)	0.48
SUI n (%)	0	0	-

IPSS: International Prostate Symptom Score; QoL: quality of life; Q_{max}: Maximum urinary flow rate; PVR: Post-void residual urine test; TOV: Trial of void; SUI: Stress urinary incontinence.

Comparison with supervisor's performance

Table 2 compares clinical outcomes between cases managed by the fellows and their supervisor. Regarding operative efficiency, the supervisor demonstrated a median of

Parameters		Cumulative Cases of clinical fellows	Cases of supervisor	P
Number of participants n		40	148	-
Age years median (range)		70 (52-88)	76 (55-93)	< 0.001
Indication n (%)	LUTS	25 (62.5)	59 (39.9)	0.004
	Retention	15 (37.5)	66 (44.5)	
	Hematuria	0	23 (15.6)	
ASA score n (%)	I	14 (35)	29 (19.6)	0.002
	II	23 (57.5)	112 (75.7)	
	III	3 (7.5)	7 (4.7)	
	IV	-	-	
Preoperative prostate size by TRUS cc median (range)		99 (56-210)	116 (42-273)	0.059
Preoperative IPSS median (range)		23 (15-34)	23 (10-35)	0.529
Preoperative QoL median (range)		5 (3-6)	5 (2-6)	0.810
Preoperative Q_{max} mL/s (median (range)		8.7 (1-14)	6.7 (2.6-14)	0.013
Preoperative PVR mL median (range)		230 (20-650)	400 (5-2600)	0.019
Enucleated tissue weight g median (range)		77 (33-240)	80 (25-242)	0.288
Operative efficiency g/min median (range)		0.83 (0.4-1.29)	1.41 (1.2-1.81)	< 0.001
Enucleation time min median (range)		70 (45-159)	42 (10-96)	< 0.001
Enucleation efficiency g/min median (range)		1.06 (0.5-1.72)	1.6 (1.25-2.48)	< 0.001
Blood transfusion n (%)		0	0	-
Successful first TOV n (%)		38 (95)	136 (91.9)	0.394
Intraoperative complications n (%)		0	2 (1.4)	0.293
Readmission n (%)		3 (7.5)	3 (2.0)	0.080
Retreatment n (%)		0	0	-
Postoperative complications n (%)	Clavien I	7 (17.5)	14 (9.5)	0.001
	Clavien II	0	0	-
	Clavien III	0	0	-
Prostate weight reduction % median (range)		81 (35-95)	82 (55-97)	0.437
PSA reduction % median (range)		88 (8-99)	88 (10-99)	0.964
1 month postoperative				
IPSS median (range)		8 (1-24)	6 (0-25)	0.067
QoL median (range)		2 (0-6)	1 (0-6)	0.073
Q_{max} mL/s median (range)		19 (6-50)	25 (6-73)	0.071
PVR mL median (range)		45 (0-390)	47 (0-400)	0.328
SUI n (%)		6 (15)	9 (6.1)	0.030
3 months postoperative				
IPSS median (range)		6.5 (0-24)	4 (0-21)	0.287
QoL median (range)		2 (0-5)	1 (0-6)	0.064
Q_{max} mL/s median (range)		20 (11-45)	24 (9-49)	0.188
PVR mL median (range)		50 (0-150)	48 (0-200)	0.937
SUI n (%)		3 (7.5)	4 (2.7)	0.167
6 months postoperative				
IPSS median (range)		5 (1-16)	3 (0-30)	0.061
QoL median (range)		1 (0-4)	0 (0-5)	0.204
Q_{max} mL/s median (range)		21 (8-41)	26 (1-76)	0.109
PVR mL median (range)		44 (0-130)	45 (0-370)	0.962
SUI n (%)		0	1 (0.7)	-

LUTS: Lower urinary tract symptoms; ASA: American Society of Anesthesiologists; TRUS: Transrectal ultrasound; IPSS: International Prostate Symptom Score; QoL: quality of life; Q_{max}: Maximum urinary flow rate; PVR: Post-void residual urine test; TOV: Trial of void; PSA: Prostate-specific antigen; SUI: Stress urinary incontinence.

Table 2.
Comparison of patient demographics, perioperative and postoperative outcomes between the fellows' and supervisor's cases.

1.41 g/min, exceeding the fellows' 0.83 g/min, p < 0.001. Figure 1 illustrates the differences in enucleation efficiency between the two fellows and their supervisor.

Two patients in the supervisor's cohort experienced intraoperative superficial bladder mucosal injury during morcellation.

Postoperative outcomes, including successful first TOV, did not show statistical significance. Clavien I complications were lower in the supervisor's cohort (9.5%) compared to the learners' group (17.5%), p = 0.001. Conversely, two cases of prolonged or severe hematuria were recorded in the supervisor's group, with one occurring after the patient resumed antiplatelet therapy and was managed conservatively. In the first postoperative month, SUI occurred in 15% of the fellows' cases, significantly higher than the 6.1% observed in the supervisor's group, p = 0.030. At three months follow-up, SUI was present in 7.5% of the fellows' cases compared to 2.7% in the supervisor's cases. One patient (0.7%) from the supervisor's cohort had SUI at 6 months postoperative, while no cases of SUI were reported in the fellows' group.

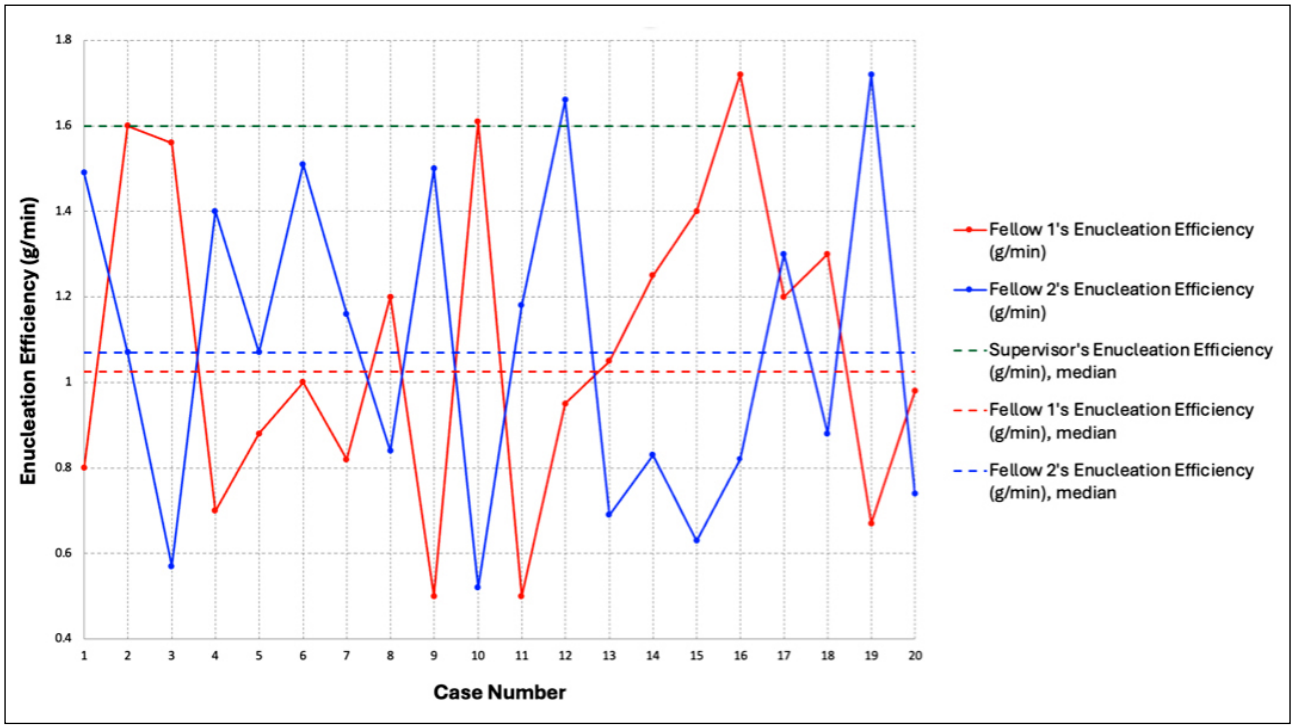
Discussion

Although the term "learning curve" lacks a standardized definition, it's often described as the number of cases required to accomplish procedures efficiently, with acceptable complication rates and fair health outcomes (20).

Our study sought to assess whether the top-down technique could decrease HoLEP's learning curve by comparing the performance and outcomes of two fellows with their experienced supervisor. To our knowledge, this is the first comparative study assessing procedural efficacy, safety profiles, and learning curves of top-down HoLEP in a supervised training environment.

Both fellows had prior experience with TURP. Each learner observed 3 cases while receiving practical instructions. The fellows progressively assisted and performed parts of surgery under supervision (7 cases/fellow), leading to eventual independent performance. This teaching approach is comparable to *El-Hakim* and *Elhilali* (21), where a urology resident observed 10 HoLEP procedures performed by an experienced supervisor. Afterwards, the resident operated on 27 patients, divided into two groups (15 and 12 participants), with minimal to moderate mentor intervention. The greater number of observed cases reported by *El-Hakim* and *Elhilali* (21) compared to our study (10 *vs.* 3, respectively) underscores the "*easier-to-grasp*" characteristic of the top-down technique over traditional HoLEP. Similar to our study, the performance and outcomes of both initial and subsequent cases exhib-

Figure 1.
Comparison of median enucleation efficiency between the fellows and their supervisor.



ited no significant differences, indicating consistency and rapid mastery of the procedural skill set.
Conversely, *Seki et al.* suggested that HoLEP could be learned without a qualified instructor, but achieving competence typically required > 50 cases of operational experience (22). The higher number of cases to achieve competency compared to our study confirms that the top-down approach, combined with structured training, may ease and shorten the HoLEP learning curve for novices.
Despite training at different intervals, the fellows exhibited no significant differences in cumulative case experiences, affirming the efficacy and consistency of our teaching approach. *Kim et al.* demonstrated the reproducibility of conventional HoLEP by assessing the procedure at two hospitals on different continents (23).
Prostate volume is considered pivotal in the early learning phase. *Shah and colleagues* reported that operators achieved proficiency in HoLEP after a mean of 20 cases, but only for small prostates (8). Further learning was required to advance from small to intermediate glands and larger prostates.
This observation was supported by a larger retrospective study involving 1,113 patients and 39 surgeons (24), which also corroborated the findings of *Moody et al.* (25). The latter study suggested completing at least 30 procedures on smaller glands (< 50 g) before attempting to enucleate larger adenomas with standard HoLEP. The mean prostate volume of patients operated on by both fellows in our study exceeded 90 cc, surpassing the average volumes reported in various publications assessing the HoLEP learning curve for inexperienced surgeons or trainees. From our observations, attempting to enucleate glands < 50 g would be challenging and not advisable for novice HoLEP learners.
Our findings indicate no significant differences in operative efficiency, enucleation time, or enucleation efficiency between both fellows' initial and subsequent cases. These findings contrast with *Seki et al.*'s data, which demonstrated a significant increase in enucleation efficiency with growing experience when comparing initial to last standard HoLEP cases (22). They reported that the average tissue enucleation efficiency significantly increased from 0.29 g/min to 0.75 g/min between the initial and final 10 cases, respectively.
Moreover, *Placer et al.* studied 125 patients and found that enucleation efficiency increased with the number of procedures, eventually reaching a plateau (9). These results indicate potential differences in operative efficiency improvement patterns between conventional and top-down HoLEP with increasing experience, suggesting that standard HoLEP may show more improvement with additional cases.
Consistent performance across early and later cases in our study extends to postoperative outcomes. Our results align with those of *Seki et al.*, who found no change in postoperative parameters (22).

Comparative analysis of performance with supervisor

Comparative analysis of both fellows to their supervisor when performing the top-down technique revealed valuable insights, particularly concerning surgical efficiency and postoperative outcomes. Regarding enucleation efficiency, an objective parameter for gauging operative learning, the fellows had a median of 1.06 g/min, lower than their supervisor's median of 1.6 g/min. These findings emphasize the importance of progressive experience for enhancing operative efficiency in HoLEP, regardless of the technique utilized. Despite using a similar approach to condensing the learning process into a short, supervised

period, *El-Hakim* and *Elhilali* found that resident-performed cases yielded outcomes comparable to those of an experienced urologist, possibly due to increased supervisor intervention in the initial cases of their study (21).
Although we noted differences in operative performance, early postoperative outcomes such as successful TOV were similar between the learners and their supervisor. Similarly, no significant differences were observed in postoperative parameters, including IPSS, QoL, Q_{max}, and PVR. These findings align with data from *Shah et al.* (8) and *Shigemura and colleagues* (24), which showed no change or improvement in these parameters with increasing surgical experience.
In the initial 4 weeks post-HoLEP, transient SUI can significantly bother patients. Predictors of transient SUI following HoLEP are multifaceted and can be associated with either the patient or the procedure, as reported by several studies (12, 13, 26-29).
One purported benefit of top-down HoLEP is reducing sphincter overstretching by cutting the mucosal flap attached to it, potentially reducing transient SUI.
However, our recent randomized controlled trial comparing top-down and traditional HoLEP demonstrated that at 3 months postoperative, two patients (4.1%) in the conventional and one (2.2%) in the top-down HoLEP group experienced SUI without significant difference (30).
In our analysis, SUI rates one month postoperatively were higher in the fellows' cumulative cases (15%) compared to the supervisor's (6.1%), p = 0.030. However, no differences were observed at the three-month follow-up. The high SUI rate initially among the fellows' group may be attributed to challenges of the early learning curve, as noted by *Placer et al.* (9). However, these early findings may not fully demonstrate the impact of experience on incontinence rates, as transient SUI is typical in the early postoperative phase. The comparable SUI rates at 3 months indicate that with 20 cases, the fellows attained an early proficiency level, yielding low SUI rates similar to experienced surgeons.
Numerous studies have demonstrated that achieving low SUI rates requires an initial experience of 20 cases. *Shigemura et al.* (24) reported that surgeons' experience beyond 20 procedures significantly reduced SUI at three months. *Elshal et al.*'s prospective study also noted a significant decrease in SUI rates after 20 procedures (12).

Limitations

We acknowledge certain limitations of our research; it is a single-center study with a small sample size, which may restrict the generalizability of our findings. Additionally, the study involved retrospective data for the supervisor, which may introduce bias and confounding variables. However, it involved prospective data collection for both fellows. Larger prospective studies are needed to effectively validate findings and compare traditional *versus* top-down HoLEP techniques.

Conclusions

Our findings suggest that implementing the top-down HoLEP technique in a supervised educational program ensures safety and comparable outcomes to experienced supervisors, regardless of trainees' familiarity with conventional HoLEP. This approach accelerates learning and demonstrates potential in urological training. Further research is needed to validate its efficacy and safety across diverse clinical settings.

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