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Comparative Analysis of Standard ThuFLEP versus Median lobe-only ThuFLEP: Impact on Antegrade Ejaculation Preservation

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Abstract

Purpose

We aimed to demonstrate the effect of median lobe-only enucleation on antegrade ejaculation (AE) in patients undergoing Thulium fiber laser enucleation of the prostate (ThuFLEP) due to BPO.

Methods

We retrospectively analyzed the patients who underwent ThuFLEP between May 2024 and December 2025 for benign prostatic obstruction (BPO). 84 patients comprised the median lobe–only enucleation group (ml-ThuFLEP), while 68 constituted the standard ThuFLEP group performed using the standart three lobe technique (sThuFLEP). Perioperative and postoperative functional outcomes, as well as postoperative ejaculation statuses of the patients, were evaluated and compared.

Results

In both groups, regarding Qmax [26 (6) vs. 25 (5), p: 0.156], IPSS [7 (4) vs. 6 (4), $p > 0.05$], and PVR [4.5 (3.75) vs. 5 (3) ml, $p > 0.05$], no significant difference was found between the two groups at the 6-month postoperative follow-up. The rate of retrograde ejaculation (RE) was significantly lower when medial lobe-only enucleation was performed, in comparison to standart enucleation (for RE; 2.4% vs. 95.6%, respectively; $p < 0.001$).

Conclusion

The median lobe-only ThuFLEP is an effective approach for improving postoperative urinary function while preserving AE in suitable patients. This technique may be proposed for patients who wish to preserve ejaculation after LEP procedure.

Introduction

Lower urinary tract symptoms (LUTS) due to benign prostatic obstruction (BPO) are a health problem that affects 50–75% of men aged 50 and over are known to have a significant impact upon men's quality of life [1, 2]. Over the past ten years, minimally invasive approaches to surgical treatment of BPO have become increasingly popular. First described in 1998, Holmium laser enucleation of the prostate (HoLEP) is currently the most widely used minimally invasive BPO method worldwide [3].

Advancements in laser technology, which have become ubiquitous in the field of endourology, have paved the way for the introduction of various laser types in the arena of BPO surgery and studies have demonstrated the efficacy of these lasers in enhancing postoperative functional outcomes in prostatic

enucleation [4–6]. One of these, the Thulium fiber laser (TFL) was introduced as a novel energy source for laser enucleation of the prostate (LEP) in 2005 and commenced utilisation [7]. Studies show that Thulium fiber laser enucleation of the prostate (ThuFLEP) procedur is as effective and reliable as HoLEP in the surgical treatment of BPO, even in large prostates [8, 9].

Although LUTS shows significant improvement postoperatively, retrograde ejaculation (RE), which is a common adverse effect following LEP [10–12], can be bothersome for sexually active patients [13]. To manage RE, various ejaculation-preserving techniques for different lasers are employed during LEP procedure [14, 15]. However, there is lack on the ejaculation-preserving approach in LEP surgery performed using TFL. In the present study, we aimed to demonstrate the effect of median lobe-only enucleation on antegrade ejaculation (AE) in patients undergoing ThuFLEP due to BPO.

Material and Methods

After obtaining approval from the institutional review board (IRB: 2025/3-2557), we performed a retrospective review of patients who underwent ThuFLEP between May 2024 and December 2025.

Patient selection

A total of 152 patients were included in the study. Patients were eligible for inclusion if they had a maximum urinary flow rate (Qmax) of ≤ 15 mL/s, an International Prostate Symptom Score (IPSS) of ≥ 12, a post-void residual volume (PVR) of > 100 mL, inadequate response to at least 6 months of medical therapy (alpha-blockers and/or 5-alpha reductase inhibitors), recurrent or refractory urinary retention, or bladder stones. Patients with a history of urethral stricture, neurogenic bladder dysfunction, prostate cancer, prior prostatic or pelvic surgery, previous pelvic radiotherapy or postoperative use of alpha-adrenergic antagonists were excluded from the analysis. Among the patients who underwent ThuFLEP, 84 comprised the median lobe–only enucleation group (ml-ThuFLEP), while 68 constituted the standard ThuFLEP group performed using the standart three lobe technique (sThuFLEP). Between two groups, perioperative and postoperative functional outcomes, as well as postoperative ejaculation statuses of the patients, were evaluated and compared. ml-ThuFLEP was performed in carefully selected patients following comprehensive preoperative counseling. Selection was based on preoperative imaging and cystoscopic findings demonstrating predominant median lobe obstruction, including intravesical prostatic protrusion, high bladder neck, or an increased prostatic urethral angle. Patients with obstructing, coapting lateral lobes were not considered suitable for median lobe–only enucleation. In selected cases, ml-ThuFLEP was preferred at the surgeon’s discretion, with consideration of patient preference for preserving AE, particularly among younger and sexually active patients.

Equipment and surgical procedure

All procedures were performed by a single experienced surgeon with substantial expertise in endoscopic prostate enucleation. A TFL (Quanta System,Italy) was used in all cases. Laser settings were

standardized at 60 W for cutting and 30 W for coagulation. A 22-French Tontarra resectoscope (Tontarra Medizintechnik GmbH, Tuttlingen, Germany) was utilized in all procedures.

In the sThuFLEP group, complete anatomical enucleation of the median and both lateral lobes was performed using a standard three-lobe technique, followed by intravesical morcellation.

In the ml-ThuFLEP group, enucleation was limited to the obstructing median lobe. Specifically, the initial incision was initiated approximately 1 to 1.5 cm proximal to the verumontanum and extended cranially while preserving a small apical tissue mound on both sides of the verumontanum to maintain antegrade ejaculation. The lateral lobes were intentionally preserved in this group. Hemostasis was achieved using laser coagulation, and a three-way Foley catheter was placed at the end of each procedure.

Perioperative and postoperative data

Preoperative variables included demographic characteristics, prostate-specific antigen (PSA), prostate volume, maximum flow rate (Qmax), postvoid residual volume (PVR), and International Prostate Symptom Score (IPSS). Prostate volume and PVR were measured by transabdominal ultrasonography. Perioperative data included operative time, tissue removed (g), operative efficiency (g/min), length of hospital stay, and catheterization duration.

The follow-up was scheduled at 1,3 and 6 months postoperatively. Functional outcomes were evaluated by comparing changes in Qmax, PVR, IPSS, and PSA levels relative to baseline values.

Postoperative complications, including capsule perforation, bleeding requiring intervention, urethral stricture, and urinary incontinence, were documented. Urinary incontinence was defined as any involuntary urine leakage reported by the patient at follow-up. Continence was defined as complete dryness. Stress urinary incontinence (SUI) was defined as involuntary leakage occurring during physical exertion, coughing, or sneezing. Urge urinary incontinence (UUI) was defined as involuntary leakage accompanied by or immediately preceded by urgency.

Ejaculation statuses of the patients were assessed by recording the presence or absence of retrograde ejaculation at follow-up visits.

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 26.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were expressed as median and interquartile range (IQR), while categorical variables were presented as frequencies and percentages. Between-group comparisons of continuous variables were performed using the Mann–Whitney U test. Within-group comparisons between baseline and postoperative follow-up values were assessed using the Wilcoxon signed-rank test. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate. P value < 0.05 was considered statistically significant.

Results

Baseline characteristics

A total of 152 patients were included in the analysis, of whom 68 underwent sThuFLEP and 84 underwent ml-ThuFLEP. Patients in the sThuFLEP group were significantly older than those in the ml-ThuFLEP group [62 (8.58) vs. 57.5 (9.75) years, respectively; $p < 0.001$]. Prostate volume was also significantly larger in the sThuFLEP cohort [55 (13) cc vs. 47.5 (16.75) cc, respectively; $p < 0.001$].

Baseline functional parameters demonstrated statistically significant differences between groups (Table 1). Baseline Qmax was lower in the sThuFLEP group than ml-ThuFLEP group [9 (3) vs. 11 (3) ml/sec, respectively; $p < 0.001$]. Similarly, baseline IPSS and PVR were higher in the sThuFLEP group [IPSS: 20 (5) vs. 19 (5), respectively; p: 0.005 and PVR: 55 (55.25) vs. 39 (41) ml, respectively; $p < 0.001$].

Perioperative outcomes

Perioperative outcomes are summarized in Table 1. Operative time was significantly longer in the sThuFLEP group compared to ml-ThuFLEP [30 (13.5) vs. 10 (5) min, respectively; $p < 0.001$]. The amount of tissue removed was significantly greater in sThuFLEP [34 (13.75) g vs. 13 (6) g, respectively; $p < 0.001$]. However, operative efficiency (g/min) was slightly higher in the ml-ThuFLEP group [1.2 (0.14) vs. 1.1 (0.14), respectively; p:0.006].

Length of hospital stay and catheterization time were both significantly shorter in the ml-ThuFLEP group (1 vs. 2 days respectively for both parameters, $p < 0.001$).

Capsule perforation occurred more frequently in the sThuFLEP group (5.9% vs. 0%, respectively; p:0.024). There were no statistically significant differences in bleeding requiring intervention (0% vs. 1.4%, respectively; $p > 0.05$) or urethral stricture rates (6.5% vs. 1.4%, respectively; $p > 0.05$).

Functional outcomes

Functional outcomes at baseline and 6 months are presented in Table 2 and Fig. 1. Both sThuFLEP and ml-ThuFLEP groups demonstrated significant improvements in all functional parameters at 6 months compared to baseline (all $p < 0.001$).

When comparing postoperative outcomes between groups, Qmax was slightly higher in the sThuFLEP group at 1 month [29 (5) vs. 27 (6) ml/sec, p: 0.036]; however, this difference was no longer observed at 3 months ($p > 0.05$) or 6 months ($p > 0.05$). At 6 months, IPSS [7 (4) vs. 6 (4), $p > 0.05$] and PVR [4.5 (3.75) vs. 5 (3) ml, $p > 0.05$] were not statistically significantly different between the two techniques (Table 1).

RE was markedly more common following sThuFLEP (95.6% vs. 2.4%, respectively; $p < 0.001$). At 6 months, the rate of UUI was higher in the ml-ThuFLEP group compared to the sThuFLEP group (14.9% vs. 4.8%); however, no statistically significant difference was observed ($p > 0.05$). In contrast, no cases of SUI were observed in either group.

Table 1
Comparison of clinical, perioperative, and functional outcomes between sThuFLEP and ml-ThuFLEP

	sThuFLEP	ml-ThuFLEP	p
	median (IQR)	median (IQR)	
Age, yr	62 (8,5)	57,5 (9,75)	< 0.001
Prostate volume, cc	55 (13)	47,5 (16,75)	< 0.001
Baseline Qmax ml/sec	9 (3)	11 (3)	< 0.001
Baseline Qmean ml/sec	5 (2)	6 (2)	0.001
Baseline IPSS	20 (5)	19 (5)	0.005
Baseline PVR, ml	55 (55,25)	39 (41)	< 0.001
Baseline PSA, ng/ml	2 (0,88)	1,2 (0,80)	< 0.001
1-month Qmax ml/sec	29 (5)	27 (6)	0.036
3-month Qmax ml/sec	27 (5)	26 (4,75)	0.076
6-month Qmax ml/sec	26 (6)	25 (5)	0.156
6-month IPSS	7 (4)	6 (4)	0.76
6-month PVR, ml	4,5 (3,75)	5 (3)	0.92
6-month PSA, ng/ml	0,6 (0,53)	0,9 (0,40)	< 0.001
Operative time, min	30 (13,5)	10 (5)	< 0.001
Tissue removed, g	34 (13,75)	13 (6)	< 0.001
Operation efficiency, g/min	1,1 (0,14)	1,2 (0,14)	0.006
Lenght of stay, days	2 (0)	1 (0)	< 0.001
Catheterization time, days	2 (0)	1 (0)	< 0.001
Retrograde ejeculation, n(%)	65 (95,6)	2 (2,4)	< 0.001
Bleeding requiring intervention, n(%)	0 (0)	1 (1,4)	0.36
Urethral stricture, n(%)	4 (6,5)	1 (1,4)	0.12
Capsule perforation, n(%)	4 (5,9)	0 (0)	0.024
6-month UUI, n(%)	3 (4,8)	11 (14,9)	0.06

IPSS: International Prostate Symptom Score; PVR: Postvoid residual volume, PSA: Prostate-specific antigen; Qmax: maximal urinary flow rate; N/A: not applicable; sThuFLEP: standart Thulium fiber laser enucleation of the prostate; ml-ThuFLEP: median lobe–only Thulium fiber laser enucleation of the prostate; UUI: urge urinary incontinence; SUI: stress urinary incontinence

	sThuFLEP	ml-ThuFLEP	p
	median (IQR)	median (IQR)	
6-month SUI, n(%)	0 (0)	0 (0)	N/A

IPSS: International Prostate Symptom Score; PVR: Postvoid residual volume, PSA: Prostate-specific antigen; Qmax: maximal urinary flow rate; N/A: not applicable; sThuFLEP: standart Thulium fiber laser enucleation of the prostate; ml-ThuFLEP: median lobe–only Thulium fiber laser enucleation of the prostate; UUI: urge urinary incontinence; SUI: stress urinary incontinence

Table 2
Changes in urinary and biochemical parameters from baseline to 6 months after sThuFLEP and ml-ThuFLEP

PSA (ng/ml)	Baseline	6th month	p
sThuFLEP	2 (0,88)	0,6 (0,53)	< 0.001
ml-ThuFLEP	1,2 (0,80)	0,9 (0,40)	< 0.001
IPSS			
sThuFLEP	20 (5)	7 (4)	< 0.001
ml-ThuFLEP	19 (5)	6 (4)	< 0.001
PVR (ml)			
sThuFLEP	55 (55,25)	4.5 (3,75)	< 0.001
ml-ThuFLEP	39 (41)	5 (3)	< 0.001
Qmax (ml/sec)			
sThuFLEP	9 (3)	26 (6)	< 0.001
ml-ThuFLEP	11 (3)	25 (5)	< 0.001

IPSS: International Prostate Symptom Score; PVR: Postvoid residual volume, PSA: Prostate-specific antigen; Qmax: maximal urinary flow rate; sThuFLEP: standart Thulium fiber laser enucleation of the prostate; ml-ThuFLEP: median lobe–only Thulium fiber laser enucleation of the prostate

Discussion

Although the LEP procedure has become more widespread and offers encouraging results in terms of urinary function, RE remains a significant problem for sexually active patients [16]. Consequently, ejaculatory preservation techniques are of paramount importance for patients. In this study, we could demonstrate that in patients who underwent ThuFLEP due to BPO, postoperative urinary function at 6 month has improved and the rate of RE was significantly lower when medial lobe-only enucleation was performed, in comparison to total lobe enucleation (for RE; 2.4% vs. 95.6%, respectively; $p < 0.001$).

Despite the long-standing consensus that the primary anatomical structure implicated in RE is the bladder neck, and that inadequate bladder neck closure during ejaculation leads to RE, a study by Vernet et al. concluded that the bladder neck is not a significant contributing factor [17]. Vernet et al. utilised endorectal ultrasound videos to visualise the prostate, bulbar urethra, and bladder neck at the time of ejaculation during real-time masturbation. The images obtained revealed that the muscle tissue surrounding the verumontanum and its proximal portion plays a significant role in directing the ejaculate distally during ejaculation. The findings of studies that have demonstrated that postoperative RE is not solely due to insufficiency at the bladder neck provide important insights into the anatomical structures that require attention during enucleation and the strategies that should be followed [18].

Given that HoLEP has become the most popular BPO procedure in recent years, it is not surprising that the vast majority of studies in the literature are based on HoLEP's ejaculation-preserving modification. In a very recent systematic review, data from a total of 1,657 patients who underwent HoLEP in 10 studies were analyzed. The study demonstrated that modified HoLEP techniques performed to preserve ejaculation provide significantly more AE compared to conventional HoLEP [19]. Additionally, it was reported that selective median lobe enucleation provides the highest AE protection in anatomically suitable patients. In another systematic review comprising 1877 men in 15 studies (12 HoLEP procedures, 3 ThuLEP procedures), the incidence rates of RE were compared between ejaculation-preserving LEP and standard LEP, and notwithstanding the technique applied, the rate of RE in LEP was determined to be 71.3% ± 16.1% with standard techniques and 27.2% ± 18.1% with modified techniques that preserve ejaculation ($p < 0.001$) [20].

In light of the recent surge in interest surrounding LEP, various approaches aimed at preventing ejaculation have gained prominence [19]. One of these procedures, median lobe enucleation is based on the isolated resection of the middle lobe, which is known to cause obstruction, while preserving the lateral lobes and ensuring that the structures surrounding the verumontanum remain intact. In a retrospective study by Press et al. aimed at preserving ejaculation, the authors performed "selective laser enucleation of the median lobe" [14]. In cases undergoing HoLEP, the mucosa above the verumontanum is incised, and the two lateral incisions are connected to each other. The median lobe is then removed retrograde along the capsular plane and directed towards the bladder. The remaining mucosal attachments at the bladder neck are cut, thereby freeing the median lobe. The study demonstrated that ejaculation was preserved in approximately 90% of the men. The authors posit that the preservation of the lateral lobes is instrumental in ensuring the preservation of paracolicular and supracolicular tissue, thereby preventing disruption of the ejaculatory anatomy. In another study, Depaquit et al. performed median lobe enucleation in 55 patients who underwent HoLEP and reported a de novo RE rate of 12.5% [21]. The present study is consistent with these findings; an AE rate of over 90% was demonstrated following ThuFLEP with median lobe enucleation. However, it is important to note that the energy source used in our study differs from those used in these studies.

There is a lack of studies investigating ejaculation outcomes following ThuLEP and ThuFLEP. In a study, a comparison has been conducted on the outcomes of ejaculation-sparing ES-ThuLEP and ES-ThuFLEP

procedures [22]. Accordingly, in both the 3-month and 6-month follow-ups, the rate of AE after ES-ThuLEP was 81.0% while it was 81.5% after ThuFLEP, and no significant difference was observed between the two groups. In the ejaculation-preserving technique utilised in this study, the initial incision was shifted approximately 1.5 cm cranially from the verumontanum. The incision was then extended towards the lateral lobes, leaving a small cluster of prostate tissue at the apex on either side of the verumontanum. Trama et al. performed ejaculatory-preserving surgery on patients who had undergone ThuLEP [15]. A 1-cm Omega-shaped incision was made at the cranial end of the verumontanum, after which the incision was extended towards the two lateral lobes. A small amount of tissue from the lateral lobes was preserved at the level of the prostatic apex near the verumontanum, in order to ensure the integrity of the ejaculatory muscles and to keep the verumontanum beneath the sphincter. It was anticipated that this would facilitate the passage of semen into the bulbar urethra. The study observed that ejaculation was preserved in 94% of patients at the 12-month postoperative follow-up. In another study, ES-ThuLEP was shown to effectively preserve ejaculation in more than two-thirds of 283 patients while improving urinary function [23].

It should be noted that the results of this study demonstrate that the efficacy of median lobe enucleation in this study was comparable to that of standard enucleation. While improvements were observed in outcomes such as Qmax [26 (6) vs. 25 (5), $p > 0.05$], IPSS [7 (4) vs. 6 (4), $p > 0.05$] and PVR [4.5 (3.75) vs. 5 (3) ml, $p > 0.05$] at 6 months postoperatively with both techniques, no significant difference was found between the two groups. Furthermore, SUI, a significant concern following LEP, was not observed in any patient at the 6-month follow-up. Therefore, it is important to emphasise that performing ml-ThuFLEP in suitable patients to preserve AE does not imply compromising on functional outcomes.

To the best of our knowledge, our study is one of the few to investigate post-ThuFLEP RE; however, it is important to note the limitations of our study. First of all, the present study is retrospective in nature and is a single-surgeon study. Furthermore, the number of patients in the study is small, and the follow-up period is relatively short. It should also be noted that data on some functional outcomes such as IPSS or PVR at the 1- and 3-month postoperative periods are missing. Nevertheless, we believe that our functional outcomes at the 6-month postoperative period and our rates of antegrade ejaculation can be considered adequate in light of the focus of our study.

Conclusions

The median lobe-only ThuFLEP is an effective approach for improving postoperative urinary function while preserving AE in suitable patients. This technique may be proposed for patients who wish to preserve ejaculation after LEP procedure. Multicenter, large-scale prospective studies involving a broader patient population and a longer follow-up period are necessary to more clearly establish the generalizability of these results.

Declarations

Funding: No funding was received.

Conflicts of interest: The authors have no conflicts of interest to declare.

Availability of data and material: The raw data is with the corresponding author and can be provided on request.

Code availability: Not applicable for this section.

Authors' contributions: Y.O.A. took part in the study design and supervision, while K.Y.Y. and E.G. collected the data and wrote the first manuscript draft. M.E.A. shaped the article to its final form, proof-reading and rearranging for better flow.

Ethics approval: Approval was obtained from Istinye University Faculty of Medicine Institutional Review Board (Approval Number ID: 25-57). The procedures used in this study adhere to the tenets of the Declaration of Helsinki**.**

Consent to participate (include appropriate statements): Not applicable for this section**.**

Consent for publication: Not applicable for this section.

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Figures

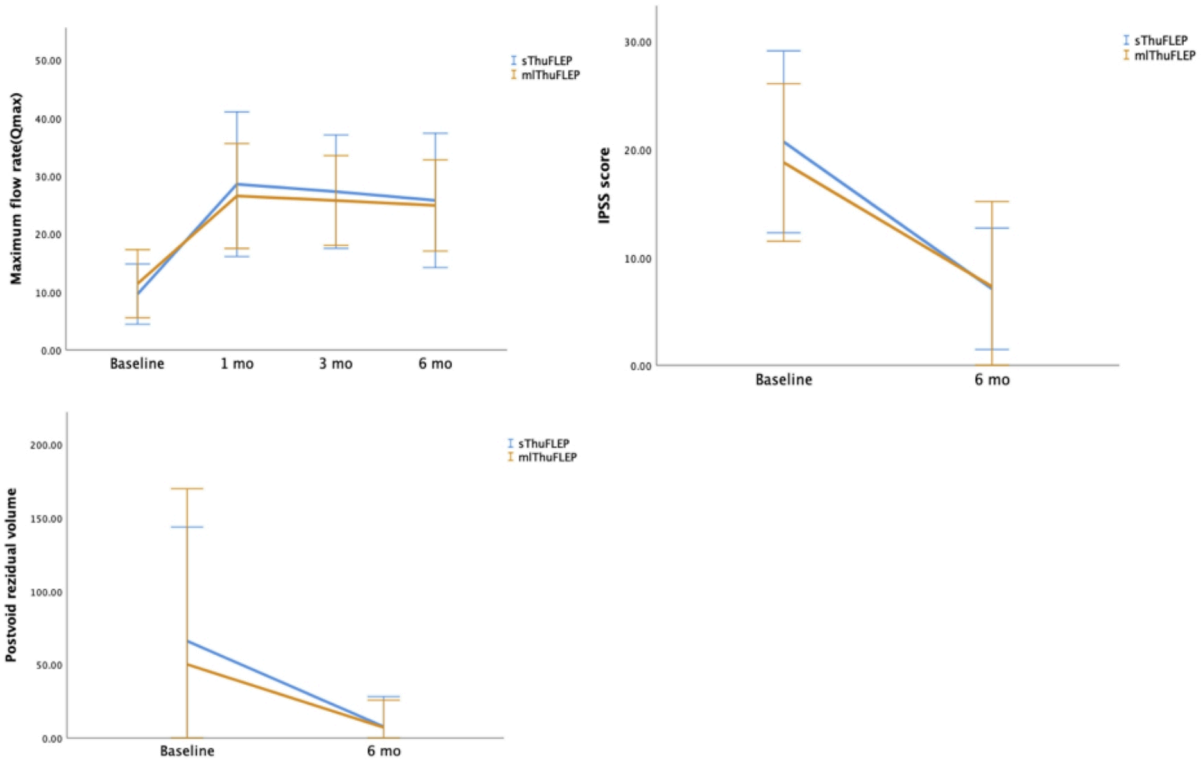


Figure 1

Changes in Qmax, IPSS, and PVR in the sThuFLEP and ml-ThuFLEP groups over time.