Original Article

Thirty versus 60-Watt thulium laser enucleation of prostate: Toward the development of low-power anatomical enucleation of the prostate

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Abstract

Introduction: We aimed to study whether using 30 W versus 60 W thulium enucleation of the prostate (ThuLEP) would affect postoperative outcomes in patients with benign prostatic hyperplasia (BPH).

Materials and Methods: We prospectively identified male patients with moderate or severe lower urinary tract symptoms due to BPH. We randomized patients into 30 W (Group 1) or 60 W (Group 2) thulium yag laser with a 550 µm laser fiber and a 26 Fr continuous flow resectoscope. We collected data related to prostate size, enucleation time, morcellation time, laser time, perioperative complications, and 1-year functional outcomes.

Results: A total of 120 patients were included, with a mean age of 67 years and a mean prostate size of 105 g. The preoperative characteristics were similar across both groups. The mean operative time was shorter in the 60 W group, 74 ± 27 vs. 91 ± 33 min in the 30 W group ($P = 0.001$), and the mean laser time was 55 ± 20 in 60 W versus 71 ± 25 in 30 W ($P = 0.0001$). The mean hospital stay was 1 day in both groups and at 1-year follow-up; there was a similar improvement in mean Qmax and International Prostate Symptom Score symptom scores.

Discussion/Conclusion: Both 30 and 60 W ThuLEP provided a safe and comparable outcome with a relatively shorter operative time for the 60 W groups. Perhaps using a 30-W setting would be beneficial in the early learning curve or cases with more bleeding capsular perforators; besides, the financial benefit of manufacturing low-cost low-power devices that may help in the widespread of AEEP.

Keywords: AEEP, benign prostatic hyperplasia, enucleation, laser, thulium, thulium enucleation of the prostate

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Received: 31.12.2022, **Accepted:** 20.03.2023, **Published:** 18.04.2024.

INTRODUCTION

Benign prostatic hyperplasia (BPH) related to lower urinary tract symptoms (LUTS) is common in men after the fourth decade.[1] Although medical treatment can alleviate LUTS in many patients but could be associated with dizziness, orthostatic hypotension, and increased fall risk.[2] Meantime, surgery is recommended for patients who have LUTS refractory to other therapies.[3]

Transurethral resection of the prostate (TURP) is still the most utilized operation for men with prostates

Access this article online	
Quick Response Code:	Website: www.urologyannals.com
	DOI: 10.4103/ua.ua_159_22

How to cite this article: Omar M, Abdullah MM, Moustafa A, Sultan S. Thirty versus 60-Watt thulium laser enucleation of prostate: Toward the development of low-power anatomical enucleation of the prostate. Urol Ann 2024;16:129-32.

30–80 ml,[4] due to the short learning curve,[5] nonexpensive equipment,[6] and the wide safety margin in comparison to other surgical options. While TURP could be a suboptimal solution if the prostate was large[7] and vascular,[8] laser enucleation of the prostate would offer several advantages, including lower risk of bleeding,[9] less catheterization time,[10] and quicker recovery.[11]

Herrmann *et al*.[12] in 2010, introduced thulium enucleation of the prostate (ThuLEP) with 120 W[13] as starting power, then a gradual descent to 90,[14] 70 W[15] ending in 30 W.[16] Besides the financial benefit of manufacturing low-power devices, the low-power setting may have a lower eschar formation, especially in the early learning curve. To our knowledge, no previous trials compared 30 versus 60 W for ThuLEP. In this study, we assessed the safety and efficacy of 30 versus 60-W ThuLEP in patients with BPH.

MATERIALS AND METHODS

Following institutional review board approval, we consented and randomized patients undergoing thulium laser enucleation for prostate for 30 versus 60 W (ThuLEP) in our tertiary institution. We included patients with prostate exceeding 60 g with either urinary retention or unsatisfactory response to medical treatment (International Prostate Symptom Score [IPSS] >18) and excluded those with neurogenic bladder, bladder stones, stricture urethra, or previous prostatic surgery. Laboratory evaluation, including urine analysis and Prostate-specific antigen (PSA) was done, and a Digital Rectal Examination, urine flowmetry, prostate volume by transrectal ultrasound, and postvoid residual (PVR).

Through spinal anesthesia and by a single surgeon (M.O) with a long experience in ThuLEP surgeries were done using Revolix DUO® Thulium laser unit (Lisa laser, Katlenburg-Lindau, Germany), 550 μm RigiFib (Lisa laser, Katlenburg-Lindau, Germany), and a 26 Fr continuous flow resectoscope. Group 1 energy setting of (30 W) and Group 2 of (60 W) and we used a Storz morcellator (Karl Storz GmbH and Co., Tuttlingen, Germany) for morcellation.

After evaluation of the bladder and marking below both ureteric orifices, 5 and 7th o'clock incisions were made till the verumontanum, while with Bi-lobar hyperplasia, we neither connect between them nor enucleate the median lobe. Then, the distal inverted U-shaped incision is made to separate the prostate mucosa from the sphincteric one. The capsular plane is identified at 5 and 7th o'clock near the apex by a mechanical insinuation of the scope below the lobe and separating the adenoma from the capsule running from down up and from distal to bladder neck. Separation of the mucosal strip was done early to protect the sphincter.

Intra-operative variables such as operative time (enucleation time + morcellation time), prostate weight, hemoglobin drop, and postoperative outcomes were obtained. Perioperative and postoperative complications were reported, and postoperative follow-up of Q max, LUTS, and PVR was done for 1 year.

Our primary objective was to compare the safety and efficacy of utilizing 30 versus 60-W power during ThuLEP.

The Statistical Package for the Social Sciences (SPSS) version 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) was used for statistical analysis. Categorical data were presented in numbers and percentages and analyzed using the Chi-square test, whereas continuous data were mentioned in medians and ranges and compared using nonparametric tests (Mann–Whitney U and Paired Wilcoxon Signed-Rank tests). The test was considered statistically significant if the $P \leq 0.05$.

RESULTS

One hundred and twenty patients successfully consented, randomized, and equally allocated into 30 W (Group 1) or 60 W (Group 2) ThuLEP with similar preoperative characteristics [Table 1]. The mean operative time was shorter in the 60 W group 74 ± 27 vs. 91 ± 33 min in the 30 W group ($P = 0.001$) and the mean laser time was 55 ± 20 in 60 W versus 71 ± 25 in 30 W ($P = 0.0001$).

Other operatives and postoperative findings, including morcellation time and hemoglobin drop, were comparable in both groups [Table 2]. Brown eschar formation was perceived as peanut color in the lower power group compared to the brown color in the other group. Mild capsular perforation, during enucleation, was recorded in two patients in the 60 W group and one patient in the 30 W ($P = 0.7$). Only one case in the 30 W group underwent a blood transfusion, while the incidence of utilizing bipolar coagulation to control bleeding was 3% in 30 W group versus 5% in 60 W group ($P = 0.7$). For all included patients, the recorded hospital stay was 24 h, and the catheter was removed 1 day after surgery. No patients required readmissions or further surgical interventions. Meantime postoperative hemoglobin was not significantly different within both groups ($P = 0.2$).

At 1-year follow-up, both groups showed similar improvement in Q-max (19 ± 3.6 vs. 20 ± 3.3), IPSS (4.4 ± 1.9 vs.

Table 1: Patient's characteristics and preoperative data

	ThuLEP 30 W	ThuLEP 60W	*P*
Age years, median (range)	67±8	67±9	0.5
BMI, median (range)	28±7	27±12	0.1
Diabetes mellitus, *n* (%)	8 (13)	8 (13)	1
Hypertension, *n* (%)	11	9 (15)	0.6
Prostate size grams, median (range)	106±38	105±37	0.8
Hemoglobin, median (range) (g/dL)	13.3±0.8	13.5±0.7	0.2
IPSS, median (range)	30±4	28±2.6	0.4
Qmax, median (range) (mL/s)	4.4±2.2	4.6±2	0.6
PVR, median (range) (mL)	357±173	374±180	0.7
PSA, median (range) (ng/dL)	3.6±1.8	4±2.3	0.4

BMI: Body mass index, IPSS: International Prostate Symptom Score, PVR: Postvoid residual, PSA: Prostate-specific antigen, ThuLEP: Thulium enucleation of the prostate

Table 2: Postoperative data comparison of thulium enucleation of the prostate 30W and thulium enucleation of the prostate 60W

	ThuLEP 30 W	ThuLEP 60 W	*P*
Operative data			
Enucleated tissue weight (g)	74±38	70±37	0.3
Morcellation time (min)	15.9±7.9	13.8±7.3	0.1
Laser time (min)	71±25	55±20	0.0001
Operative time (min)	91±33	74±27	0.0012
Preoperative hemoglobin (g/dL)	13.3±0.8	13.5±0.7	0.2
Preoperative hemoglobin (g/dL)	11.7±0.9	12±0.9	0.1
Intraopérative complications, *n* (%)			
Capsular perforation	1 (2)	2 (3)	0.7
Bleeding (bipolar coagulation)	2 (3)	3 (5)	
Blood transfusion, *n* (%)	1 (2)	0	0.3
One-year follow-up data			
IPSS	4.4±1.9	4.2±1.4	0.8
Qmax (mL/s)	19±3.6	20±3.3	0.7
PVR median	23±16	27±14	0.1
Stress incontinence (1st 3 months), *n* (%)	3 (5)	4 (7)	0.2
IIEF-5	15.2±3.1	14.8±4.81	0.1

IPSS: International Prostate Symptom Score, PVR: Postvoid residual, ThuLEP: Thulium enucleation of the prostate, IIEF: International Index of Erectile Function

4.2 ± 1.4), PVR (23 ± 16 vs. 27 ± 14), International Index of Erectile Function-5 (IIEF-5) (15.2 ± 3.1 vs. 14.8 ± 4.81), and incidence of first 3 months stress incontinence (5% vs. 7%) in both 30 and 60 W group, respectively, with insignificant *P* value [Table 2].

DISCUSSION

Since the introduction of the anatomical endoscopic enucleation of the prostate and it continued to be the most efficient, durable, and sustainable solution for patients with a large prostate and obstructive symptoms.[17] The steep learning curve and unfamiliar orientation with a nonmentored start are the most important avoidable pitfalls to avoid frustration. Another big step was the need for expensive laser devices and a morcellator. ThuLEP has proved to be an equally tolerated alternative for holmium laser and comparable results.[18] Undergoing updates for the most efficient power setting during ThuLEP; with less power setting, may help to make the surgery more cost-effective by offering laser companies solutions to provide cheaper lower power laser devices.

Previously, Omar *et al*.[16] proved the feasibility of using low-power thulium (30 W) in ThuLEP. In our clinical trial, we tried to examine whether using 30 versus 60-W ThuLEP would affect intraoperative or postoperative outcomes in patients with BPH. Previously, Hermann *et al*.[12] limited the use of 30-W power for coagulation or superficial incision near the distal margin of the adenoma. In our study, the utilization of such low-power revealed a significantly longer operative (about 15 min longer surgery) in comparison with the 60-W group.

The low-power setting (30 W) in our practice may be beneficial for beginner surgeons, providing a less brown eschar that may obscure the enucleation plane that would make the enucleation progress easier for those starting the ThuLEP curve. Moreover the same time, it provides the same setting for both coagulation and cutting, which does not need to be changed if the surgeon does not have the double-pedaled laser foot switch.

The incidence of intraoperative capsular perforations ($P = 0.7$) or the need for blood transfusion ($P = 0.3$) was not affected by the different utilized power in both groups. The same incidence of capsular perforation is explained by the interrupted laser release of fibrous attachments between the capsule and adenoma, by either 30- or 60-W power would not lead to perforations that usually happens due to loss of 3D orientation.

The postoperative stress incontinence in the first 3 months was 5% in the 30 W group versus 7% in the 60 W group ($P = 0.2$). Hence, using the relatively higher power (60 W ThuLEP) when dealing with the mucosal strip did not show a significant difference in the postoperative continence and this may be related to the direction of the fiber, limited thulium Yag penetration depth (=0.2), and the distance that we leave from the mucosal strip away from the sphincter.

The theoretical concerns regarding the laser power and erectile dysfunction were not proved in our study since our results should no difference ($P = 0.1$) between 30 and 60-W thulium over the change of IIEF-5 score at 12-month follow-up compared to baseline.

CONCLUSION

The 60-W ThuLEP proved to have a shorter operative

time while providing the same postoperative outcomes as the 30-W one. Perhaps using a 30-W setting would be beneficial in the early learning curve or cases with more bleeding capsular perforators; besides, the financial benefit of manufacturing low-cost, low-power devices that may help in the widespread of AEEP.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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