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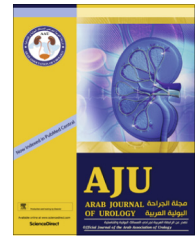


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**PROSTATIC DISORDERS**  
**MINI-REVIEW**

# A review of thulium laser vapo-enucleation of the prostate: A novel laser-based strategy for benign prostate enlargement



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## KEYWORDS

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Urinary tract symptoms;  
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**Abstract** Thulium laser vapo-enucleation of the prostate is the latest addition to the arsenal of minimally invasive therapies available for the surgical treatment of lower urinary tract symptoms secondary to benign prostate hyperplasia. The potential advantages include smoother vaporisation, a clearer visual field and the option of both continuous-wave and pulsed modes, which also potentiate the haemostatic properties of this endoscopic method. Short-term results show that it yields significant improvements in both subjective and objective outcomes, with a strong safety

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## ABBREVIATIONS

HoLEP, holmium laser enucleation of the prostate;  
 PVP, photo-selective vaporisation of the prostate;  
 ThuVEP, thulium laser vapo-enucleation of the prostate;  
 $Q_{\max}$ , maximum urinary flow rate;  
 PVR, postvoid residual urine volume;  
 QoL, quality of life

profile. Large-scale randomised studies with a longer follow-up are warranted to determine the durability of this laser procedure.

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## Introduction

Therapeutic options for symptomatic BPH have changed significantly over recent decades. Thulium ( $^{69}\text{Tm}$ ) technology, along with a catalogue of other laser-based systems, including holmium laser enucleation of the prostate (HoLEP) and photo-selective vaporisation of the prostate (PVP) has formed an integral part of this surgical development. As such, laser treatments have increasingly become the subject of discussion and debate among the urological community. With continued advances in the technology underlying these substitute endoscopic methods, this family of laser therapies aims to challenge conventional, monopolar TURP procedures as the standard treatment. The long-term efficacy of TURP is not in question, as its efficacy for alleviating BPH symptoms is nearly 90%. However, it has limitations, as it is associated with an overall immediate morbidity rate of  $\approx 11\%$  [1]. To establish its position as a leading intervention for LUTS secondary to BPH, an emerging technique must be shown to yield durable outcomes and maintain a strong safety profile.

In this mini-review we give an overview of thulium laser vapo-enucleation of the prostate (ThuVEP), a technique introduced as a minimally invasive treatment for benign prostate enlargement.

## Technical aspects

A key strength of ThuVEP is the versatile laser technology that it uses. Its tuneable, centre wavelength equals the peak absorption rate of water in tissue (1.92 mm) [2]. In theory, this allows for rapid incision and a clearer visual field. This cited advantage also potentiates its haemostatic properties, and to this effect it is commonly reported as a 'bloodless procedure' due to its efficiency at arresting intraoperative bleeding through coagulation

[2]. The technique is multi-modal, operating in both continuous-wave and pulsed mode [3]. The former allows the smoother vaporisation of tissue and restricts the collateral destruction of neighbouring structures. Pulsed mode can be selected as an alternative for precision cutting, e.g. bladder neck contractures.

## Efficacy and durability

To date there has been only one randomised control trial conducted with this technique. That Chinese trial compared the clinical efficacy of ThuVEP with HoLEP [4]. At 3 months of follow-up the IPSS, maximum urinary flow rate ( $Q_{\max}$ ) and postvoid residual urine volume (PVR) were all significantly improved ( $P < 0.05$ ), and there was no significant difference when these improvements were compared with results in the HoLEP group. Bach et al. [5] reported the results from a cohort study of 90 patients with LUTS secondary to BPH. Across the sample, the mean age at surgery was 71.3 years and the mean prostate volume was 118.59 mL (range 80–200). At the 12-month follow-up there were significant improvements in both the subjective and objective outcome measures of disease status, i.e., before vs. after surgery, mean IPSS 23.46 vs. 4.74 ( $P < 0.001$ ), quality of life (QoL) score 4.31 vs. 1.04 ( $P < 0.001$ ),  $Q_{\max}$  3.84 vs. 26.2 mL/s ( $P < 0.001$ ) and PVR 178.9 vs. 16.45 mL ( $P < 0.001$ ). Given the results of this study and others, in which patients had large adenomas, ThuVEP has been promoted as a 'size-independent' procedure [5]. Netsch et al. [6] recently published the first long-term data on patients treated with ThuVEP. Of the original 124 patients, 39 (31.5%) were re-assessed after 48 months and there were significant improvements in the IPSS, QoL score,  $Q_{\max}$  and PVR ( $P < 0.001$ ). None of these patients had repeat intervention(s) for the recurrence of prostatic tissue. This latter study supports the potential long-term

durability of ThuVEP, but the results of other studies with long-term data are warranted to support this.

### Safety and effect on sexual function

Gross et al. [7] published findings from a large, prospective, single-institution ThuVEP series of 1080 patients, and reported an overall morbidity rate of 16.9%. Clavien Grade I complications occurred in 20.8% of the total sample, the most frequent of which was acute urinary retention (9%). Of the total sample, 24.6% had a large prostate volume (> 80 mL) and in the sub-analysis of this group there was no difference in the overall number of complications compared with the group having smaller prostates. This finding would support the feasibility of ThuVEP as a treatment for large prostate burdens. Reduced thermal damage enables resected tissue samples to be collected for histological analysis, as it leaves only a very thin carbonised layer on the surface of samples. It also minimises scar formation and stricture recurrence. Irrigation with saline 0.9% reduces the incidence of hypotonic hypervolaemic TUR syndrome [2].

The preservation of sexual function is a key determinant in selecting the surgical pathway for patients with LUTS secondary to BPH, especially in younger men. Rassweiler et al. [8] reported retrograde ejaculation in 53–75% of men after TURP. Because of the heterogeneity among other contemporary studies, which have not used validated tools to enable a longitudinal assessment of sexual function, a comprehensive understanding of ThuVEP in this important disease aspect is awaited.

### Learning curve and cost efficacy

The learning curve for ThuVEP is considered to be favourable. Netsch et al. [9] conducted the first study evaluating the learning curve for ThuVEP, using a mentor-based approach, and concluded that the overall operative efficiency was reached after 8–16 operations. The bare-ended quartz fibres (costing ≈450 euros) for ThuVEP can be re-used, which adds to the low running costs of this laser system [10]. Given the financial pressures across many national-health systems, the recovery of costs in this way might prove to be pivotal for institutions in deciding whether to invest in a new technique such as ThuVEP.

### Conclusion

ThuVEP is a developing, high-performance technique which has gained increased attention for its positive effects on urinary symptoms. It carries notable and theoretical advantages, with potential feasibility in elderly patients with multiple comorbidities. Large-scale randomised trials using standardised endpoints, disease status variables and validated grading systems for reporting complications are warranted to determine its long-term durability.

### Conflict of interest

None.

### Source of funding

None.

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