

Operating Room Efficiency and Cost Implications of Thulium Fiber Laser versus Holmium:YAG Laser for Prostate Enucleation: A Targeted Review, Analysis, and Model

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Background

Endoscopic enucleation of the prostate (EEP) is a leading option for the surgical treatment of benign prostatic hyperplasia (BPH).¹ EEP may be accomplished with different energy sources including bipolar electrical energy, holmium: yttrium aluminum garnet (Ho:YAG) laser enucleation of the prostate (HoLEP), thulium:YAG laser enucleation of the prostate (ThuLEP), and thulium fiber laser (TFL) enucleation of the prostate (ThuFLEP).^{1,2} TFL with a wavelength of 1940 nm and a pulsed mode of action decreases the penetration depth during ThuFLEP allowing increased laser energy absorption and immediate vaporization.³ It remains unclear as to whether a particular laser approach to EEP is potentially more efficient in terms of procedure duration and clinical outcomes.

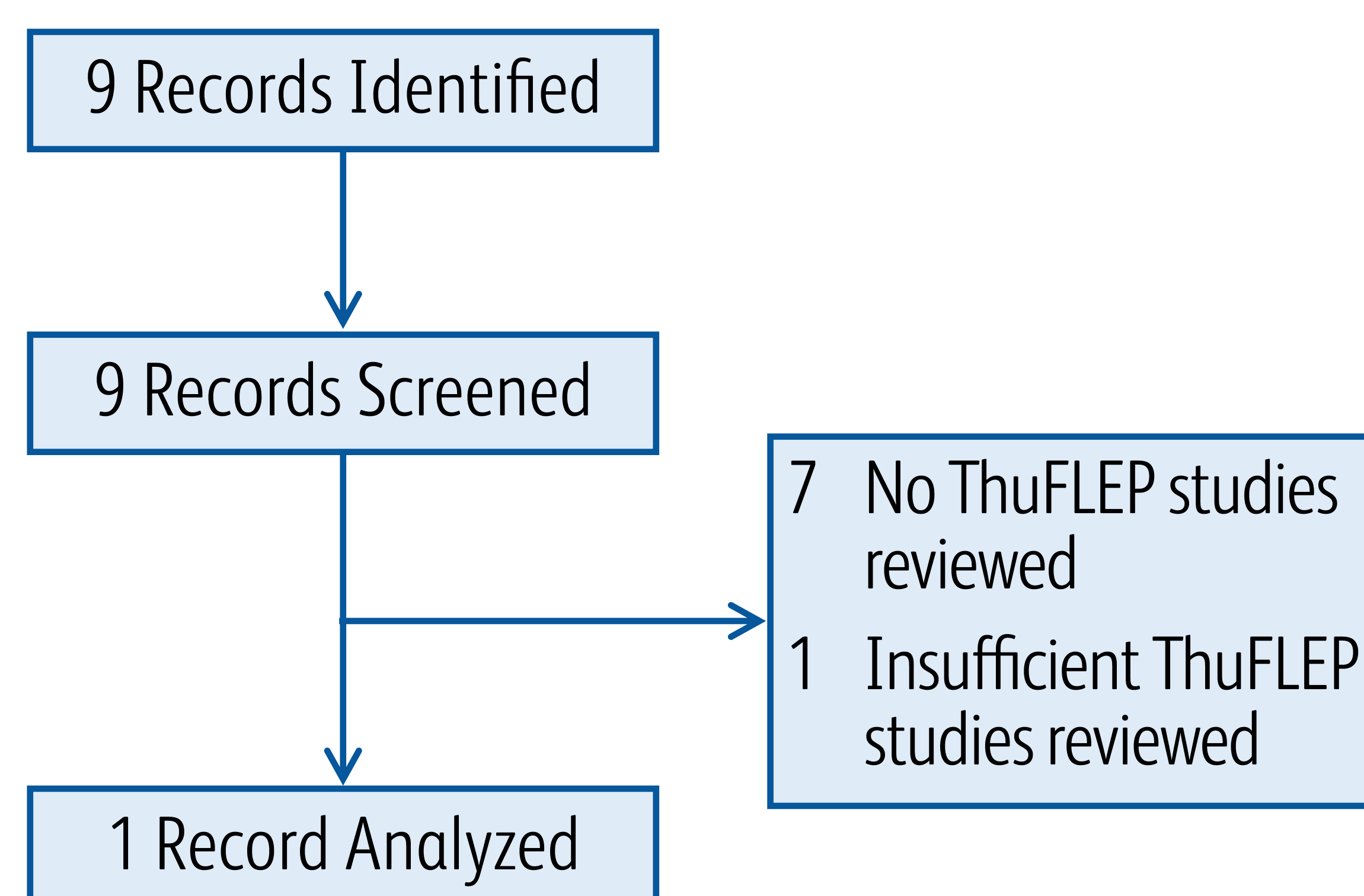
Objective

This review and analysis seeks to determine whether TFL demonstrates greater efficiency in terms of procedure duration and also post-procedure stress urinary incontinence (SUI).

Methods

A targeted review of systematic reviews published 2020 through early 2026 (PubMed) evaluating no fewer than 5 studies comparing ThuFLEP to HoLEP and reporting total operative time was conducted. Results on operative time reduction were synthesized and incorporated into an economic model to estimate the potential cost savings.

Figure 1: PRISMA Diagram



Search String: (Systematic Review) AND ((Thulium) OR (Thulium Fiber)) AND ((Prostatic Hyperplasia) OR (Benign Prostatic Hyperplasia)) AND (Operative Time)
 Database: PubMed Search Date: 1/7/26 Range: 5 years (1/1/20 – 1/7/26)
 PRISMA: Preferred Reporting System for Systematic Reviews and Meta-Analyses

Table 1: Publication Analysis

Author Analyzed in Spinos ³ Supplementary Table V*	Spinos ³ Reference Number	Values Reported	Operative Time ThuFLEP (minutes)	Operative Time HoLEP (minutes)	Operative Time Difference with ThuFLEP (minutes)	Percentage of ThuFLEP subjects with SUI	Percentage of HoLEP subjects with SUI	SUI Measured at	Difference in SUI Incidence with ThuFLEP
Morozov, et al. ⁴	13	mean	67	76	-9	1.1%	1.7%	6 months	-0.6%
Enikeev, et al. (2022) ⁵	16	mean	60.3	55.9	4.4	2.3%	1.3%	6 months	1.0%
Enikeev, et al. (2018) ⁶	17	mean	104.5	97.1	7.4	3.3%	3.3%	3 months	0.0%
Gauhar, et al. ⁷	21	median	60	65	-5	12.4%	17.2%	Not Specified	-4.8%
Castellani, et al. ⁸	22	median	70	110	-40	5.1%	10.2%	Not Specified	-5.1%

Mean Operative Time Difference: -8.44

*Five additional studies were reported by Spinos³ but were not analyzed: 1 did not analyze operative time, 1 compared ThuFLEP to open procedures, 1 compared ThuFLEP to ThuLEP, and 2 compared ThuFLEP to TURP.

Results

Nine systematic reviews were identified and reviewed. One systematic review (Spinos)³ which examined 12 studies, 5 of which reported total operative time for both ThuFLEP and HoLEP, was analyzed (Figure 1). Operative time differences were aggregated across all included studies to calculate a mean reduction of 8.4 minutes for TFL procedures. This reduction was applied to an economic model based on standard operating room cost assumptions, yielding an estimated per-case cost savings of \$411 (2025 USD). All 5 analyzed studies reported rates of post-procedure stress urinary incontinence (SUI). SUI was the same or lower in patients undergoing ThuFLEP in 4 of the 5 studies.

Discussion

The finding of this analysis – shorter operative time in ThuFLEP procedures performed with TFL, compared to HoLEP procedures performed with a Ho:YAG laser may be due to the features of TFL that permit efficient coagulation and do not require additional hemostasis.¹¹ In addition to the five reviewed studies, others have reported lower rates of SUI with ThuFLEP compared to HoLEP at 6 months (6% vs. 8%), but importantly, those results were not significant (P=0.24).¹² A propensity score-matched analysis of ThuFLEP, HoLEP, and ThuLEP found all three to be safe and effective EEP methods with low complication rates and improvement in functional parameters.¹³

Model

Operative Time Savings	8.4 min.
Cost of OR Time	\$48.91 cost/min.*
Savings per Case with TFL	\$411

*Mean cost of ambulatory OR time⁹ (2014 USD) represented in 2025 USD¹⁰

Conclusions

ThuFLEP, performed with TFL, may reduce total operating room time by approximately 8 minutes per case compared to HoLEP. That time savings represents a \$411 per-case cost savings over HoLEP procedures. In addition, ThuFLEP may be associated with equal or lower rates of post-procedure SUI when compared to HoLEP.

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