



## THULIUM LASER ENUCLEATION OF PROSTATE (THULEP) VERSUS TRANSURETHRAL RESECTION OF PROSTATE (TURP) IN MANAGEMENT OF BENIGN ENLARGEMENT OF PROSTATE

<b>Dr Ram Jaiswal</b>	Senior Resident, Department Of General Surgery, BHRC and BVDUMC, Pune
<b>Dr Suhas Taralekar*</b>	Professor, Department Of General Surgery, BHRC And BVDUMC, Pune *Corresponding Author
<b>Dr D. K. Jain</b>	Professor And Head Of Department, Department Of Urology, BHRC And BVDUMC, Pune
<b>Dr Abhay Kumar</b>	Assistant Professor, Department Of General Surgery, BHRC and BVDUMC, Pune

### ABSTRACT

**INTRODUCTION:** Benign prostatic hyperplasia is the most common non-malignant illness of the prostate, affecting more than 50% of the aged male population. Despite the fact that medical therapy is the first line treatment for BPH, a significant percentage of patients with moderate to severe BPH will require surgical interference. In this study, we compared a new procedure, Thulium Laser Prostatectomy (ThuLEP) with the gold standard treatment, transurethral resection of prostate (TURP).

**AIM AND OBJECTIVES:** To compare the advantage and disadvantage of TURP and ThuLEP in treatment of BEP and feasibility of performing the thulium laser enucleation of prostate for BEP.

**MATERIAL AND METHODS:** This is a prospective study in which we compared 60 patients with symptomatic BPH were treated with ThuLEP and TURP (30 patients each) at tertiary health centre Pune.

**RESULT AND DISCUSSION:** At the 1-month postoperative evaluation, 59 patients (99%) had spontaneous voiding and had significantly improved IPSS, QoL score, maximum urinary flow rate (Qmax), and PVR. The postoperative changes in the IPSS and QoL score, Qmax, PVR and Hb.

**CONCLUSION:** ThuLEP, in compared to TURP, there is not significant decrease in serum haemoglobin levels and sodium level with shorter length of hospital stay, and catheterization time could make it a promising treatment of choice although TURP was superior in terms of operation duration.

### KEYWORDS :

#### INTRODUCTION:

Benign prostatic hyperplasia is the most common non-malignant illness of the prostate, affecting more than 50% of the aged male population.<sup>1</sup> Despite the fact that medical therapy is the first line treatment for BPH, a significant percentage of patients with moderate to severe BPH will require surgical interference.<sup>2</sup>

Transurethral resection of the prostate (TURP) is the best treatment of this illness.<sup>3</sup> Problems with the monopolar system conventionally used for TURP include bleeding; an incidence of TUR syndrome;<sup>4,5</sup> loss of potency; incontinence; stricture development; and infrequent impediments such as bladder perforation and diathermy burns from unwell placed return electrodes used to complete the circuit.<sup>6</sup>

The thulium laser enucleation of the prostate (ThuLEP) technique is a relatively new approach, which was first introduced in 2010 by Herrmann and colleagues.<sup>5</sup> Thulium (Tm:YAG) laser emits laser energy in a continuous-wave manner at a wavelength of 2013 nm, which is close to the absorption peak of water, and thereby, thulium laser demonstrates a shallow tissue penetration, coagulation zone, and necrotic tissue zone providing high surgical safety.<sup>6</sup> Furthermore, physiologic saline is used as the irrigation fluid during ThuLEP, which can decrease the risk of TURP.<sup>7</sup>

Compared with TURP, ThuLEP has demonstrated a similar efficacy in terms of maximum urinary flow rate (Qmax), International Prostate Symptom Score (IPSS), post void residual (PVR), and quality of life (QOL) during postoperative follow-up and similar safety in terms of local complications but with many benefits, such as lower decreases in serum sodium, haemoglobin levels, shorter length of hospital stay, and catheterization time.<sup>3,6,8,9</sup>

In this study, we compared a new procedure, Thulium Laser Prostatectomy (ThuLEP) with the gold standard treatment, transurethral resection of prostate (TURP).

#### AIM AND OBJECTIVES:

##### AIM:

To compare clinical parameters of intra and early postoperative outcomes between thulium laser transurethral enucleation of the prostate (ThuLEP) and transurethral resection of the prostate (TURP) for treating benign enlargement prostate (BEP).

##### OBJECTIVES:

To compare the advantage and disadvantage of TURP and ThuLEP in treatment of BEP and feasibility of performing the thulium laser enucleation of prostate for BEP.

#### MATERIAL AND METHODS:

This is a prospective study in which we compared 60 patients with symptomatic BPH were treated with ThuLEP and TURP (30 patients each) between September 2017 and August 2019 at Bharati hospital and Research center, Pune.

#### INCLUSION CRITERIA:

1. Prostate volume >50ml
2. Qmax <15ml/s (Uroflometry)
3. International Prostate Symptom Score (IPSS) >15
4. Post-void residual (PVR) >20% of pre-void volume

#### EXCLUSION CRITERIA:

1. Prostate volume <50ml
2. Qmax >15ml/s
3. Post-void residual (PVR) <20% of pre-void volume
4. Neurogenic bladder, associated strictures, associated bladder stones, and operations by other surgeon.

5. Ca. Prostate.

**STUDY METHODOLOGY:**

Informed written consent was taken from all patients. All patients included in the study were evaluated as per the proforma. In all patients, a detailed history was taken and physical examination was done. Laboratory investigations were carried out as per requirement. These included hemogram, renal function tests, blood sugar level, coagulation profiles and urinalysis with urine culture and sensitivity.

We were compared intra-operative and early post-operative data of the outcome of patients who underwent ThuLEP and TURP. For all patients, we evaluated postoperatively with regards to blood loss, catheterization time, irrigation volume, hospital stay and operative time, International prostate symptom score, quality of life score, serum sodium, digital rectal examination, prostate volume, degree of intravesical prostatic protrusion, maximum flow rate, post-void residual volume and prostate-specific antigen (PSA) level will obtain pre- and postoperatively and complications (e.g. transfusion rate, incontinence, infection and urethral stricture).

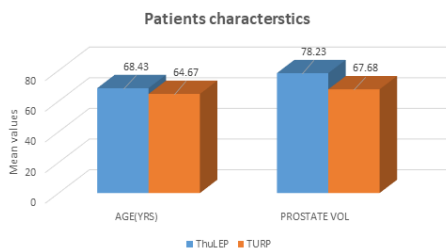
**RESULTS:**

In all, 60 patients with symptomatic BPH were treated with ThuLEP and TURP (30 patients each) between September 2017 to August 2019 at our institute.

**PATIENTS' CHARACTERISTICS:**

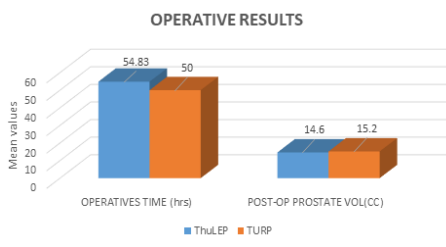
All the patients met the inclusion criteria for IPSS, QoL score and had confirmed BOO obstruction. In all patient had a significant PVR confirmed on uroflowmetry or urodynamics.

The mean SD of age in ThuLEP and TURP were 68.43 (± 7.30 yrs) and 64.67(± 7.29 yrs); mean SD of prostate volume were 78.23 (±19.80) ml and 67.68(±18.63) ; mean (SD, range) respectively.



**OPERATIVE RESULTS**

The mean (SD, range) operative time in ThuLEP and TURP were 54.83 (9.30, 40–70) min and 50.00 (10.67, 30-75) min respectively. The mean SD of volume of enucleated tissue were 14.6 (± 3.67) and 15.2 (± 1.94) cc respectively.



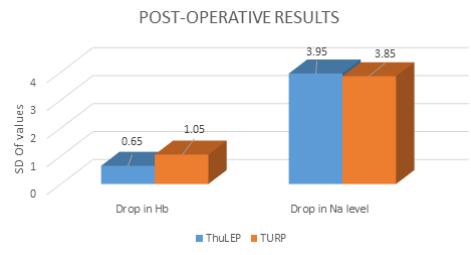
**POSTOPERATIVE RESULTS**

At the 1-month postoperative evaluation, 59 patients (99%) had spontaneous voiding and had significantly improved IPSS, QoL score, maximum urinary flow rate (Q<sub>max</sub>), and PVR. The postoperative changes in the IPSS and QoL score, Q<sub>max</sub>, PVR and Hb are listed in Table. All these variables

significantly changed after ThuLEP and TURP. IPSS and QoL score improved, Q<sub>max</sub> increased, and PVR decreased. The mean (SD, range) catheterisation time in ThuLEP and TURP were 38.90 (10.47, 24–48) hrs and 48.80 (4.38, 48-72) hrs respectively. The mean SD of duration of hospital stay in ThuLEP and TURP were 60.41(± 12.20) hrs and 72.80(± 4.38) hrs respectively.

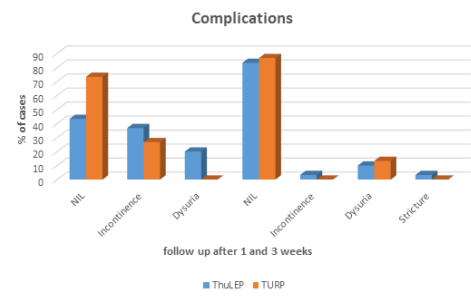
	ThuLEP	TURP
Q <sub>max</sub>	13.03 ± 0.89 ml/sec	9.31 ± 1.720mins
PVR	-128.33 ml	-129.06 ml
IPSS	14.80 ± 2.06	13.60 ± 2.44
Resection Time	54.83 ± 9.30mins	50.0 ± 10.67 mins
Catheterization time	38.90 ± 10.47 Hrs	48.80 ± 4.38 Hrs
Duration of hospitalization	60.41 ± 12.20 Hrs	72.80 ± 4.38 Hrs

There were significant Na drop when comparing the preoperative sodium values in both ThuLEP and TURP. The mean postoperative Hb among the cases is significantly lower compared to mean preoperative Hb in both ThuLEP and TURP.



**COMPLICATIONS**

Distribution of incidence of complications at post-op 1-week follow-up is significantly higher in ThuLEP group compared to TURP Group (p-value<0.05). Distribution of incidence of complications at post-op 3-week follow-up among the cases studied did not differ significantly between two study groups (P-value>0.05).



**DISCUSSION:**

BPH is a frequent disease affecting older men, often resulting in troublesome symptoms, and also a decrease in quality of life. Medical treatment is typically the first-line direction for BPH but surgery is necessary by 20 percent of patients.<sup>10</sup>

Transurethral resection of the prostate (TURP) is the typical process of operation of BPH and also a massive number of data was collected over the decades demonstrating its effectiveness and safety. TURP involves an electrical current flowing from an active electrode to the prostate and through the body before exiting via a return electrode placed on the skin. The use of hypo-osmolar irrigation fluids, i.e. glycine, sorbitol or mannitol solutions, which are molecularly inert, optically clear and non-conductive is required. Such solutions place the patient at risk of dilutional hyponatraemia and TUR syndrome, which is characterised by metabolic abnor m

alities, cardiovascular problems and neurological irregularities and is associated with a risk of mortality of up to 40%.<sup>11</sup> Based on a study of 3885 patients, Mebust et al. reported a 2% incidence of TUR syndrome during M-TURP.<sup>12</sup> The Agency for Health Care Policy and Research report gives the morbidity rate associated with transurethral resection of prostate (TURP) to be 7% to 43%.

Thulium laser is a continuous wave laser (compared with pulsed holmium laser) which includes a wave-length like holmium laser. Thulium laser has powerful, excellent hemostatic properties and constant wave pattern assists in generating clean and quicker cuts of prostatic tissue. Many techniques Use for thulium laser prostatectomy are known as ablation, resection and enucleation.

Bach et al. in Hamburg, Germany, thulium laser vapor-enucleation (ThuLEP) has been performed on 88 patients. The conventional prostatic volume was  $61.3 \pm 24.0$  cc, resection-time had been  $72 \text{ second} \pm 26.6$  and laser-time had been  $32.4 \pm 10.1$  min. The voiding parameters improved appreciably, early complications were minimal with 27 percent of individuals undergoing short-term dysuria. The specific same category compared ThuLEP in 70 W and 120 W<sup>13</sup> and found that 120 W accentuates the effectiveness of ThuLEP joined into the ratio of resected tissue with the enucleation/operation efficiency.<sup>14</sup> When comparing 120 W and 200 W components in 28 patients with 60-70 grams prostate, they found equivalent safe and Efficacious clinical effects together with both elements at 12-month follow up.

According to Almusafir et al.<sup>15</sup>, Ebeid et al. and Kumar A. the average age group for TURP are  $64 \pm 7$  which is similar to our study i.e.  $64.67 \pm 7.29$ . Yang et al. has reported significantly maximum age of 76.10 years while Swiniarski et al.<sup>16</sup> has similar age group to our study.

A prolonged resection time (> 90 min) is an important factor contributing to fluid absorption and the subsequent complications.

According to Engler et al.<sup>17</sup>, the shorter duration of surgery using the monopolar approach. Madduri et al.<sup>18</sup> attributed the significantly longer time taken in Bipolar Groups to the considerably larger size of the gland. Zhang et al.<sup>19</sup> compared ThuLEP with HoLEP in 131 patients. ThuLEP demanded an extended operation time (72.4 vs. 61.5 minutes,  $P = 0.034$ ). Swiniarski et al. and Rausch et al.<sup>20</sup> have reported longer operative time for ThuLEP

Ebeid et al.<sup>21</sup>, Madduri et al.<sup>22</sup> and Abdaleh et al.<sup>23</sup> also reported a larger baseline size of prostate in the Bipolar group. In accordance with other research reported in the literature, the expression prostate size varied from 38 to 67 cc for its Monopolar group and also for its Bipolar category it varied from 53 to 77cc. Similar to our study Iacano et al.<sup>24</sup>, Zhang et al., Rausch et al., also reported the larger baseline size in the ThuLEP. Moreover, our study reiterates the view of Swiniarski et al. that there is a surgeon "preference" for operating on the larger gland using ThuLEP technology.

All the studies reported a significant improvement in Q max, the most important objective measure of the outcome of surgery, post operatively. Similar to our study, several studies reported that there is no significant difference in the increase in Q max between the two TURP and ThuLEP

The minimum – maximum range of pre-op IPSS in ThuLEP Group and TURP Group was 20 – 32 and 22 – 30 respectively. Distribution of mean post-op IPSS among the cases studied is significantly higher in ThuLEP group compared to TURP group ( $P$ -value<0.05). Several studies Iacano et al., Zhang et al.,

reported significant improvement in IPSS of patirnt in the ThuLEP

In TURP, perioperative bleeding is one of the most important complications, which leads to clot retention and anemia.<sup>25</sup> Transfusion requirements are reported as 2.9 % in TURP operations, but this incidence increases to 9.5 % when the weight of resected prostatic tissue exceeds 60 g.<sup>26,27</sup> Thulium laser provide excellent hemostasis with minimal injury to the pericapsular tissues. Good hemostasis and little haemoglobin loss could give hope that BPH patients with blood coagulation disorders or those taking anticoagulants could be operated on with the use of thulium laser. In our study, comparing the two groups, the drop in haemoglobin is more significant in TURP compared to ThuLEP. The same observation was made by Xia et al. and Shao et al.

A considerable amount of irrigation fluid is absorbed into the systemic circulation via prostatic sinuses and perivascular areas in almost all TURP cases. This makes an acute decrease in serum Na<sup>+</sup> concentrations causing dilutional hyponatremia in 2% of patients undergoing TURP.<sup>28</sup> The drop in sodium level is not statistically significant either within the groups or among the groups in ThuLEP

In our study, distribution of incidence of complications at post-op one-week follow-up is significantly higher in ThuLEP group compared to TURP Group ( $p$ -value <0.05). Distribution of incidence of complications at post-op 3-week follow-up among the cases studied did not differ significantly between two study groups. Larger prostate may be safely treated and decrease the threat of complications in ThuLEP.<sup>29</sup> The only noticeable difficulties are stress urinary incontinence and dysuria.

In our study, the minimum – maximum range of duration of hospital stay in ThuLEP Group and TURP Group was 24 – 48 Hrs and 48 – 72 Hrs respectively. Bozzini et al.<sup>30</sup> reported that the duration of hospital stay was determined by various factors i.e. the presence of clots and the requirement for a longer catheterization time in TURP could have led to longer hospital stay in compare to ThuLEP.

## CONCLUSION:

In view of above conclusions, compared with TURP, ThuLEP demonstrated a similar efficacy in terms of Qmax, International Prostate Symptom Score (IPSS), post void residual (PVR), and quality of life (QOL) during postoperative follow-up and similar safety in terms of local complications. Compared to TURP there is not significant decrease in serum haemoglobin levels and sodium level with shorter length of hospital stay, and catheterization time could make it a promising treatment of choice although TURP was superior in terms of operation duration.

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