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7U-Thulium Laser Enucleation of the Prostate (7U-ThuLEP): description of the technique

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A B S T R A C T

Objective: To present a modification to the classical ThuLEP technique, called 7U-ThuLEP and to compare its clinical intra- and post-operative outcomes to those of conventional ThuLEP in the treatment of benign prostatic hyperplasia (BPH) and lower urinary tract symptoms (LUTS).

Materials and methods

We performed a multicenter prospective randomized study: 836 patients were enrolled and divided in two groups by simple randomization. 415 patients underwent ThuLEP and 421 7U-ThuLEP. 4 operators from 4 different centers performed both the ThuLEP and 7U-ThuLEP procedures in each center. All operators had a previous experience of at least 250 cases each. All patients were evaluated pre- and post-operatively (at 3, 6 and 12 months) with the International Prostate Symptom Score (IPSS), maximum flow rate (Qmax), post-voiding residual volume (PVR) and PSA. Intra- and peri-operative parameters were also evaluated: enucleated tissue, operating time, blood loss, catheterization time and irrigation volume.

Equipment

To perform both ThuLEP techniques we used a 26 Ch continuous flow laser resectoscope, with a Kuntz element (Karl Storz) and a 12° optical element and a 200 W Thulium:YAG laser (Cyber TM, Quanta System), with a re-usable 800 μm fiber. Energy settings were 120 W for cutting and 35 W for coagulation. A 0° lens nephroscope, with a double in-flow irrigation and the Cyber Blade morcellator (Quanta System) were used for morcellation.

The 7U-ThuLEP technique

The patient is placed into lithotomy position. Sterile gel is inserted into the urethra, then, the resectoscope is introduced under vision into the bladder. A preliminary cystoscopy allows the operator to see if any malignancy of the bladder is present and to mark the two ureteral orifices. The resectoscope is then pulled back into the prostatic urethra where the 7U enucleation technique begins.

1st U: An inverted U-shaped incision is performed around the verumontanum, marking the distal limit of the entire enucleation.

2nd U: A second U-shape is created by incising the prostatic urethra from the bladder neck at 7 o'clock to the prostatic apex, lateral to the verumontanum, joining with the right arm of the 1st inverted U. The incision is performed with a "zig-zag" movement creating a U-shaped valley between the right lobe and the median lobe. It is important that the incision reaches the capsule.

3rd U: A third incision is performed in the same manner of the second one, but between the median lobe and the left lobe, starting from the bladder neck at 5 o'clock to the prostatic apex, joining with the left arm of the first U, creating another U-shaped valley.

4th U: This U-shape is created by enucleating the median lobe between the two previously created valleys. The median lobe is enucleated by lifting it up with the tip of the resectoscope above the verumontanum and firing the laser, proceeding cranially, with the same "zig-zag" movement until the bladder neck is reached.

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5th U: Another incision is performed at 12 o'clock from the bladder neck to the prostatic apex, with the usual "zig-zag" movement, creating another U-shaped valley and separating the lateral lobes at the anterior prostatic commissure. The operator should always keep in mind that the tissue of the anterior part of the prostate is not as deep as the posterior part, in order to avoid any damage to the urinary sphincter.

6th U: A sixth U-shape is created by enucleating the left lateral lobe. An incision is performed from the prostatic apex at 5 o'clock, where the capsular plane was previously identified and is extended cranially in anticlockwise manner towards 1 o'clock. The capsular plane is therefore developed from the prostatic apex in a circumferential way, completing the enucleation of the left lobe once the bladder neck is reached.

7th U: The last U-shape is opposite the previous one and is created by enucleating the right lateral lobe. An incision is performed from the prostatic apex at 7 o'clock, where the capsular plane was previously identified and is extended cranially in a clockwise manner towards 11 o'clock. The capsular plane is developed in the same circumferential way, from the prostatic apex to the bladder neck, allowing the enucleation of the right lobe.

At the end of the procedure a 35 W coagulation is performed. Then, the nephroscope is inserted into the same urethral sheath to allow morcellation with a two way in-flow. At the end of the procedure a 22 Ch Dufour 3-way catheter is placed.

If the third lobe of the prostate is not, or only slightly present, the third and fourth incisions are not required and the adenomatous tissue at 6 o'clock is removed together with the left lateral lobe.

The classical technique

Classical ThuLEP procedures were performed according to the technique described by Herrmann et al [1].

Results

Pre-operative parameters of the patients in each study arm did not show any significant difference. Pre-operative PSA was 2.89 ± 4.78 ng/ml in the 7U-ThuLEP groups vs 3.15 ± 4.21 ng/ml in the standard ThuLEP group ($p = 0.28$); pre-operative prostate volume was 88.23 cc vs 81.85 cc in the 7U-ThuLEP and ThuLEP groups respectively ($p = 0.230$). Compared to standard ThuLEP, 7U-ThuLEP was shorter (46.70 ± 38.72 vs 68.31 ± 41.12 minutes, $p = 0.019$), resulted in less hemoglobin decrease (0.75 vs 1.67 g/dl, $p = 0.048$) and allowed the enucleation of a larger prostatic volume (72.45 vs 51.68 g $p = 0.032$). No significative differences were found regarding catheterization time (2.1 vs 1.9 days, $p = 0.610$), irrigation volume (33.2 vs 31.8 l, $p = 0.569$) and hospital stay (2.8 vs 2.7 days, $p = 0.482$). No significative differences were found during the 12 months follow-up in terms of Qmax, PVR, IPSS, QoL and PSA levels (1.28 ± 2.38 vs 1.62 ± 2.40 ng/ml, $p = 0.31$).

Conclusions

7U-ThuLEP and ThuLEP both relieved LUTS and improved Qmax, PVR, QoL and PSA equally. 7U-ThuLEP was statistically superior to conventional ThuLEP in terms of speed, blood loss and enucleated volume, whereas, catheterization time, irrigation volume and hospital stay showed no significative differences. We believe that breaking ThuLEP down to 7, simple and easily reproducible steps could make ThuLEP easier to learn, faster and safer. Further studies are needed to assess the learning curve of this modified technique for the younger endourologists.

The video related to this article can be found online at: doi:10.1016/j.urolvj.2020.100036.

The following is the video related to this article Video 1.

Reference

[1] T.R. Herrmann, T. Bach, F. Imkamp, et al., Thulium laser enucleation of the prostate (ThuLEP): transurethral anatomical prostatectomy with laser support. Introduction of a novel technique for the treatment of benign prostatic obstruction, World J. Urol. 28 (1) (2010 Feb) 45–51, doi:10.1007/s00345-009-0503-0.