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Benign Prostatic Obstruction

Thulium Laser versus Standard Transurethral Resection of the Prostate: A Randomized Prospective Trial

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Abstract

Objective: Thulium laser resection of the prostate-tangerine technique (TmLRP-TT) is a transurethral procedure that uses thulium laser fiber to dissect whole prostatic lobes off the surgical capsule, similar to peeling a tangerine. To our knowledge we report the first prospective, randomized study comparing TmLRP-TT and standard TURP for symptomatic BPH.
Methods: From November 2004 to December 2005, 100 consecutive BPH patients were randomized for surgical treatment with TmLRP-TT ($n = 52$) or TURP ($n = 48$). All patients were preoperatively assessed with subjective symptoms score, International Index of Erectile Function questionnaire, and complete urodynamic evaluation. Preoperative and perioperative parameters at 1-, 6-, and 12-mo follow-up were also evaluated. All complications were recorded.
Results: TmLRP-TT was significantly superior to TURP in terms of catheterization time (45.7 ± 25.8 h vs. 87.4 ± 33.8 h, $p < 0.0001$), hospital stay (115.1 ± 25.5 h vs. 161.1 ± 33.8 h, $p < 0.0001$), and drop in hemoglobin (0.92 ± 0.82 g/dl vs. 1.46 ± 0.65 g/dl, $p < 0.001$), whereas it required equivalent time to perform (46.3 ± 16.2 vs. 50.4 ± 20.7 min, $p > 0.05$). TmLRP-TT and TURP resulted in a significant improvement from baseline in terms of subjective symptoms scoring and urodynamic finding, but no significant difference was found between the two groups. Late complications were also comparable.
Conclusions: TmLRP-TT is an almost bloodless procedure with high efficacy and little perioperative morbidity. TmLRP-TT is superior to TURP in safety and is as efficacious as TURP in 1-yr follow-up. It is a promising technology in the clinical practice field.

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1. Introduction

Transurethral resection of prostate (TURP) is generally considered the gold standard for surgical treatment of benign prostatic hyperplasia (BPH) [1]. Complications and morbidity related to this procedure, such as blood loss, fluid balance disturbances, excessive fluid absorption, incontinence, and erectile dysfunction led to the development and investigation of new techniques. Technological alternatives such as laser treatments may further minimize the risks of this technically difficult procedure [2], and will probably challenge TURP and open prostatectomy [3]. Holmium laser enucleation of the prostate (HoLEP) appears to be a size-independent new gold standard [4]. It allows patients with large prostates who traditionally require open prostatectomy to be treated endoscopically [5]. Potassium-titanyl-phosphate laser vaporization achieves genuine instant tissue ablation, promising durable results. However, its potential has to be confirmed by randomized, controlled, long-term studies in the future [6].

Thulium laser is a new surgical laser, with tunable wavelength between 1.75 μm and 2.22 μm. It may have several advantages over the holmium laser, including improved spatial beam quality, more precise tissue incision, and operation in continuous-wave/pulsed modes [7]. Thulium laser has been proved capable of rapid vaporization and coagulation of prostate tissue [8], whereas cutting and ablation characters are excellent at 50-W energy level. Therefore a thulium laser procedure called ''thulium laser resection of prostate-tangerine technique'' (TmLRP-TT) was designed and performed for the treatment of BPH [9]. To our knowledge we describe the first prospective, randomized trial comparing TmLRP-TT and TURP for urodynamically obstructive BPH at 1-yr follow-up.

2. Patients and methods

2.1. Patients

From November 2004 to December 2005, 100 consecutive BPH patients were randomized to surgical treatment with TmLRP-TT (52 in group 1) or TURP (48 in group 2).

Inclusion criteria were age younger than 85 yr, maximum urinary flow rate (Q_{max}) less than 15 ml/s, postvoid residual (PVR) urine volume less than 150 ml, medical therapy failure, transrectal ultrasound (TRUS) adenoma volume less than 100 g, and urodynamic obstruction (Schäfer grade 2 or greater).

Exclusion criteria were neurogenic bladder; a diagnosis of prostate cancer and any previous prostatic, bladder-neck, or urethral surgery; and the presence of an indwelling catheter.

All patients were evaluated preoperatively by scoring subjective symptoms with the International Prostate Symptom Score (IPSS), quality of life score (QoLs), and the 5-item version of the International Index of Erectile Function (IIEF-5) questionnaires; physical examination with digital rectal examination (DRE); laboratory analysis with total serum prostate-specific antigen (PSA); kidney-bladder ultrasound; and TRUS measurement of prostate volume, PVR volume, Q_{max}, and pressure flow urodynamic assessment.

Both procedures were performed by experienced surgeons.

2.2. Instruments and surgical techniques

2.2.1. TmLRP-TT

All the patients were in lithotomy position, and epidural anesthesia was achieved. An average power of 50-W thulium lasers (LISA laser products OHG, Germany) operated in continuous-wave mode was used for this procedure. The energy was delivered via 550-μm end-firing PercuFib fibers. The laser fibers were introduced via a Karl Storz 26F continuous flow resectoscope. Saline irrigation was used in all cases. The entire procedure is similar to peeling a tangerine; thus, it is called the ''tangerine technique'' (Figs. 1–5). It has been previously described in detail [9].

TURP was performed with the use of a standard tungsten wire loop with a cutting current of 160 W and a coagulating current of 80 W.

At the end of both procedures, a 22F triple lumen catheter was inserted into the bladder. All tissue retrieved from each patient was investigated histologically. For the TURP group only, irrigation was started until hematuria had sufficiently decreased. For both groups, 500 mg levofloxacin was used 1 h before operation and in the postoperative days (once a day). Oculentum aureomycin inunction was rubbed at the external orifice of the urethra until catheter removal (twice a day).

2.3. Assessment

Perioperatively the primary outcomes measured included operative time (time that the resectoscope sheath was within the urethra), resected tissue weight (actual weight of tissue retrieved), hemoglobin decrease, serum sodium decrease, postoperative catheterization time, and postoperative hospital day in the two groups. For each procedure the feasibility of catheter removal and suitability for discharge to home were assessed at 7:00–10:00 AM each postoperative day. More than three doctors who were not aware of the technique used for a particular patient decided catheter removal. Catheters were removed if the urine color was satisfactorily light. If the catheter could not be removed, the patient remained in the hospital another night and was reassessed the following day. All patients were kept 3 d in hospital after catheter removal; meanwhile therapeutic effects and complications were monitored. Postoperatively in the two groups, IPSS, QoLs, Q_{max}, and PVR volume were evaluated at 1, 6, and 12 mo. A pressure flow urodynamic assessment was performed at the 12-mo follow-up. All perioperative and postoperative complications were recorded.