Thulium laser enucleation of the prostate (TmLEP) vs. transurethral resection of the prostate (TURP): evaluation of early results

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KEY WORDS

BPH ▶ thulium laser ▶ Revolix™ ▶ TmLEP ▶ TURP ▶ enucleation ▶ morcellation

ABSTRACT

Introduction. The first decade of XXI century is a time of the thulium laser implementation to a benign prostatic hyperplasia treatment.

Objective. The objective of this paper is a comparative assessment of early results thulium laser enucleation of the prostate (TmLEP) versus transurethral resection of the prostate (TURP) in 3-months observation.

Materials and methods. Patients were randomized to BPH surgical treatment: research group (TmLEP – 54 men) or control group (TURP – 52 men). Between 02.2007-09.2009 non-consecutive patients were examined before, one month, and 3-months after surgery. Perioperative data (age, PV, time of surgery, use of laser, morcellation, catheterization, hospitalization, used energy, Hgb loss and removed tissue weight) were assessed. Before and after surgery IPSS, QoL, Qmax and PVR were controlled.

Results. Hemoglobin loss was twice lower during TmLEP than TURP [0.95 ±0.77 (0-3.2) vs. 1.81 ±0.97 (0.1-4.7) g/dl, p <0.0001]. Surgery time TmLEP was longer than TURP [102.2 ±38.7 (25-210) vs. 74.5 ±22.8 (25-140) min, p <0.0001]. Without morcellation time [28.1 ±17.9 (5-80) min], surgery time of both procedures was comparable. Weight of resected tissue was lower in TmLEP than TURP [24.8 ±14.8 (2-65) vs. 34.8 ±14.1 (12-68)g], without consideration of vaporized tissue. In both groups we noticed a distinct improvement in all parameters: IPSS, QoL, Qmax and PVR. Accordingly, to assess differences between groups for these variables the t-Student test was used for independent samples. For other parameters the U Mann-Whitney (dependent variables) and Friedmann tests (dependent variables) were used. A statistical significance of p<0.05 was approved and marked in red. A variability of analyzed parameters were presented as a arithmetic mean (M) and standard deviation (SD) when their distributions were similar to normal and by median (Me) and quartiles (Q1, Q3) for the rest of variables.

Conclusions. The thulium laser enucleation of the prostate is safe and efficient BPH treatment method, comparable to the transurethral resection in 3-months observation. Lack of long-term research does not allow to form wider conclusions.

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a disease that affects almost half of men over 60 years of age. A significant correlation with age causes an increased risk of morbidity in aging societies. An increasing importance of the quality of life as well as patients' self-awareness result in higher expectations concerning healthcare and a visit to a urologist in the early stage of the disease. Some of the patients decline long-term pharmacological treatment and opt for surgery with immediate effects and complete relief of lower urinary tract symptoms (LUTS) secondary to benign prostatic hyperplasia. One of the recent methods of BPH treatment is the removal of the prostate tissue with the use of a thulium laser through enucleation, vaporization, and morcellation. In the present study, we assessed the surgical outcomes of TmLEP versus TURP in terms of pain, hospital stay, complications, and patient-reported outcomes.

MATERIAL AND METHODS

In a prospective, non-consecutive randomized controlled trial, 54 patients underwent TmLEP and 52 patients were subject to TURP in a single center between February 2007 and September 2009. “Non-consecutive” means that not every patient admitted to the hospital with BPH symptoms and operated on endoscopically (TmLEP or TURP) was included in the study; the reason for this is the non-consecutive work pattern of the main researcher. Randomization consisted in preparing a computer-generated list of patients that was well-balanced.

A statistical analysis was conducted with computer software, STATISTICA 8.0 of StatSoft®. The analysis of the normality of distribution revealed that only age, % of resected tissue, retrieval rate, and Hgb before and after surgery have a distribution similar to normal. Accordingly, to assess differences between groups for these variables the t-Student test was used for independent samples. For other parameters the U Mann-Whitney (dependent variables) and Friedmann tests (dependent variables) were used. A statistical significance of p<0.05 was approved and marked in red. A variability of analyzed parameters were presented as an arithmetic mean (M) and standard deviation (SD) when their distributions were similar to normal and by median (Me) and quartiles (Q1, Q3) for the rest of variables.

Before surgery, all required examinations, anamnesis, and physical, laboratory, and graphic studies were conducted. All patients underwent a urological examination with digital rectal examination and prostate volume evaluation by transrectal ultrasound, upper and lower urinary tract ultrasound, and prostate specific antigen (PSA) blood level. Only uroflowmetry of urodynamic pressure-flow studies was performed. Additionally IPSS, QoL, Qmax, and PVR were determined, which was also checked during the clinical control one and three months after the surgery. The inclusion criteria were: IPPS >7, Qmax <5 ml/s, and the clinically confirmed BPH. The exclusion
criteria were: previous surgical treatment for BPH, prostate cancer, and LUTS resulting from conditions other than BPH. Patients with indwelling catheter were not excluded from research.

TmLEP enucleation procedures were performed using the "mushroom" technique with the thulium laser Tm:YAG Revolix® of LisaLaser at 70 W maximum power and continuous wave of 2.013 μm. The laser fiber was a multiple use optical fiber RigiFib® of LisaLaser. Each time the fiber was used, the tip used previously was cut off until the unchanged spot and the fiber sheath that was removed was ~1-2 mm length from the tip. Morcellation was performed with a Wolf morcellator in the oscillating mode cutting knife rotation of 750/min. All TmLEP procedures were performed with a 26F resectoscope using continuous flow of irrigation fluid (normal saline solution). Monopolar TURP was performed in a classical way with the use of a Wolf 26F resectoscope and Gyrus diathermia. TmLEP and TURP procedures were performed by three experienced surgeons (1 – TURP, 1 – TmLEP, 1 – TURP and TmLEP). After the surgery, indwelling catheterization with the 22F catheter was applied, which was sustained until hematuria receded and clear urine appeared. Irrigation was not a standard procedure after the surgery except in the case of intensive postoperative bleeding in which permanent irrigation was applied and, in addition, a transfusion of two blood units. All peri- and postoperative complications were recorded.

RESULTS

Perioperative data

One hundred and six patients were included in the research: 54 underwent TmLEP (based group) and 52 underwent TURP (control group). Indwelling catheter was present in: 17 – TmLEP and 19 – TURP. All perioperative data are presented in Table 1.

During the control check-up before the surgery and one and three months after the surgery the following parameters were examined: IPSS, QoL, Qmax, and PVR. Results of these characteristics are shown in Table 2. Statistically significant correlations between groups of IPPS and Quality of Life are presented on Fig. 1.

During the research all complications were recorded in both groups. Perioperative complications were noticed during hospitalization; postoperative complications were noticed during the control check-up one and three months after the surgery (Table 3).

DISCUSSION

The first paper about the clinical results of the use of the thulium laser was written by Xia et al. [1], but he reports the use of a 50W power laser. In recent years there were a few research projects assessing the safety and effectiveness of the use of the thulium laser in BPH treatment. On the basis of these publications the first international consensus paper summarizing the initial experience with the thulium laser has been published [2]. The thulium laser can be used in various procedures of removing prostatic tissue: from "pure" vaporization through vaporesection and vapoenucleation to enucleation. In this paper the enucleation technique was investigated, but the authors are aware that the procedure is always vapoenucleation with a varied proportion of vaporization and enucleation intensity. What can be observed is the lack of standardization in research on the thulium laser, and all of them are characteristically specific of basic principle, as well as inclusion and exclusion criteria. Until now the effectiveness of the thulium laser was compared with TURP [3, 4] or HoLEP [5], but mostly it was assessed without confrontation analysis or by conducting the analysis inside the checked group by dividing patients into subgroups depending on prostate volume [6] or indwelling catheter presence.
LEP is a newly launched operation procedure, which surgeons have just learned and may still be on the learning curve, but certainly not on the initial part of it. Many years of experience and a large number of TURPs has allowed for a certain standardization of this procedure. Hence, the two procedures have to be treated differently as far as experience is concerned. On the other hand, individual predispositions and preferences of the operating surgeon determine the speed and manner of performing the operation. To make a detailed analysis we should compare the time of TmLEP and TURP as performed by a particular surgeon, after finishing the learning curve and reaching a stable level of results without statistically significant changes in the long-term observation. The vaporization process in the TmLEP technique could explain differences concerning the weight of the resected tissue. Accordingly, it seems justified to remark that the name of the procedure describes the technique rather than the presence or lack of vaporization.

What deserves attention is the statistically significant hemoglobin loss, which was approximately twice as low in TmLEP than TURP ([0.95 ± 0.77 g/dl (0-3.2) vs. 1.81 ± 0.97 g/dl (0.1-4.7)]. The same observation was made by Xia et al. [3] and Shao et al. [5]. Good hemostasis and little hemoglobin 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. This issue needs further detailed investigations. Catheterization time in the research and control groups respectively was 2.1 ±0.9 (1–5) days and hospitalization time was 3.6 ± 0.9 (2–7) vs. 3.5 ± 0.8 (2–6) days. The catheter inside the urinary bladder depends more on patient’s temporary disposition then the PVR volume is assessed subjectively by an urologist. This might be the factor responsible for the statistically significant improvement or deterioration was observed in further controls several months after the surgery. It could suggest that the improvement that patients feel after BPH surgical treatment will remain at a satisfactory level for at least one year. There is lack of evidence that would allow for the assessment of the efficacy of BPH thulium laser treatment longer than 16.5 months [13].

If Q_{max} assessment is done by electronic device and depends more on patient’s temporary disposition then the PVR volume is assessed subjectively by an urologist. This might be the factor responsible for the statistically significant improvement or deterioration was observed in further controls several months after the surgery. It could suggest that the improvement that patients feel after BPH surgical treatment will remain at a satisfactory level for at least one year. There is lack of evidence that would allow for the assessment of the efficacy of BPH thulium laser treatment longer than 16.5 months [13].
THULIUM LASER ENUCLEATION OF THE PROSTATE (TMLEP) VS. TRANSURETHRAL RESECTION OF THE PROSTATE (TURP): EVALUATION OF EARLY RESULTS

Complications recorded during and after the operation are typical for endoscopic BPH treatment. In the TURP group, blood transfusion was required twice, but postoperative bleeding in both groups was at a similar level. Complications typical for the TmLEP include injury of the bladder mucosa, which is usually caused during morcellation of enucleated tissue by incidental aspiration of the bladder wall. The significant percentage of retrograde ejaculation is an important and relevant factor when it comes to reducing patients' quality of life after endoscopic interventions. It concerns such an important domain of life as sexual life, therefore informing patients about the possibility of retrograde ejaculation is compulsory for each surgeon. Comparing thulium laser to other operative laser techniques reveals fairly promising results as regards the quantity and quality of peri- and postoperative complications [15]. The irritative symptoms that we recorded are typical for LUTS: frequency, urgency, dysuria, nocturia, and odynuria. Stress urinary incontinence noticed after the surgery (four in TURP group vs. one in TmLEP group) is one of the possible complications after BPH. The cause of this is mostly associated with bladder overactivity (which existed prior to the operation), the healing process of the operation wound in prostate gland, or with the infection that occurred in some cases.

The three-month observation was undertaken because that period is the shortest time to evaluate the long-term effects of the operation. After reviewing papers assessing outcomes of endoscopic BPH treatment, results achieved after three months are mostly preserved. Authors know that the time of the observation is relatively short, but this is a preliminary paper of a long observation schedule, so focusing on long-term observation is our main objective.

**CONCLUSIONS**

In short-term observation, TmLEP is a safe and efficient method for the treatment of BPH. The efficiency and durability of clinical improvement felt by patients is very good. Compared to TURP, it has twice as low Hgb loss, which could make it a promising treatment of choice for patients with low Hgb level before the surgery. The time of surgery is, however, longer in TmLEP than TURP. At this time, the lack of long-term studies does not allow for wider conclusions. More multicenter RCT assessing the thulium laser in BPH treatment during a long-time observation period are desirable.

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**REFERENCES**


Table 3. Perioperative and postoperative complications

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