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Original Article

Effect of non-ablative laser treatment on overactive bladder symptoms, urinary incontinence and sexual function in women with urodynamic stress incontinence

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ABSTRACT

Objective: To investigate the effects of non-ablative laser treatment on overactive bladder (OAB) syndromes, stress urinary incontinence and sexual function in women with urodynamic stress incontinence (USI).

Materials and methods: Between April 2015 and June 2015, consecutive patients with USI with OAB syndromes underwent two sessions of Erbium:YAG laser treatment in a tertiary hospital. Patients received validated urological questionnaires, urodynamic studies, 1-h pad test and measurement of vaginal pressure before, one and three months after laser treatment. Questionnaires at 12 months were completed by telephone interview. Adverse effects and patients' satisfaction were also assessed.

Results: We included 30 patients with a mean age of 52.6 ± 8.8 years. Three months after therapy, mean 1-h pad test significantly decreased (P = 0.039). Significant improvement in OAB symptoms in four questionnaires were noted at three months post treatment, but not sustained for 12 months in two of them. Three months after therapy, mean vaginal pressure significantly improved (P = 0.009). Of 24 (82.7%) sexually active patients, 62.5% (15/24) and 54.2% (13/24) of their sexual partners reported improved sexual gratification three months later. No major adverse effects were noticed.

Conclusions: Erbium:YAG laser treatment can resolve USI and coexistent OAB symptoms three months after therapy. Sexual experience is also improved. However, repeated laser therapy may be necessary after six months.

Introduction

Urinary incontinence (UI) is a common disorder that affects women of various ages and impacts all aspects of life. Overactive bladder (OAB) symptoms may coexist in 21.6–46.9% of patients with UI [1]. To date, one of the most effective and popular procedures for the surgical treatment of stress urinary incontinence (SUI) is the tension-free midurethral slings (TVT). However, TVT is not without complications. Hemorrhage, bladder injury, urethral injury, vascular injury, pelvic hematoma, urinary retention, de novo OAB, vaginal erosion, or bladder/urethral erosion after surgery have all been reported [2]. Another drawback is the lack of effectiveness in women with stress-predominant mixed UI. Some of these patients may not experience significant improvement in OAB symptoms after incontinence surgery. It has been reported that only 50–71% of patients have improved symptoms after one year [3].

Laser therapy is a relatively minimally invasive procedure and has been utilized in stimulation of wound healing since 1973 [4]. After treatment of lesions in lower genital tract by laser ablation, many patients reported an unexpected side effect: vaginal tightening. This situation improved their sexual experience. Salvatore S. et al. reported significant improvement of sexual function and quality of life after laser pulsation [5]. SMOOTH-mode Erbium:Yttrium–Aluminum-Garnet (Erbium:YAG) laser was proven to shrink the vaginal wall by stimulating neocollagenesis [6,7]. The IncontiLase protocol was reported to be efficacious and safe for SUI in women. Using the proper dosage of Smooth Mode

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(250 ms) the temperature at the vaginal mucosa reaches 60–63 °C, the optimal temperature for the process of shortening collagen fibers and stimulating neocollagenesis and angiogenesis [7].

Although there have been publications on the efficacy of laser therapy in stress incontinence, to our knowledge, none have discussed its effects on OAB symptoms in SUI patients [8,9]. We hypothesize that laser therapy may slightly increase the entire urethral pressure, including proximal urethral pressure, and in turn resolve OAB symptoms due to reduction of the bladder reflex response in SUI patients [10]. Thus we aimed to evaluate the efficacy of the non-invasive Erbium:YAG laser in the treatment of OAB symptoms and urinary incontinence in women with urodynamic stress incontinence (USI).

Subjects and methods

Between April, 2015 and July 2015, 30 consecutive women with OAB symptoms with UI diagnosed with USI were invited to undergo Erbium:YAG laser treatment in a tertiary hospital, and signed informed consent. We performed general and obstetric history taking, urinalysis, pelvic examination applying the Pelvic Organ Prolapse (POP) – Quantification system, and a voiding diary. Patients with a urinary tract infection, pelvic organ prolapse greater than ICS (International Continence Society) stage II, pregnancy, hematuria, childbirth within one year, abnormal vaginal bleeding, damage of vaginal fascia, history of spinal cord injury, post radical hysterectomy, stroke, autoimmune disease, and 1-h pad test greater than 50 g were all excluded from the study. All included patients received evaluations, including six validated urological questionnaires, pelvic examination, 1-h pad test, urodynamic testing (including stress test), and measurement of vaginal pressure with a perineometer before, one month, and three months after laser treatment. At 12 months post-laser follow-up, the same questionnaires were completed by a telephone interview.

The six validated objective questionnaires were as following: the Overactive Bladder Symptom Score (OABSS) for assessment of OAB, the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-SF) for assessment of UI, the short form of the Urogenital Distress Inventory (UDI-6) for assessment of UI, the short form of the Incontinence Impact Questionnaire (IIQ-7) for assessment of quality of life related to UI, Pelvic Organ Prolapse Distress Inventory (POPDI-6) for assessment of symptoms related to POP, and A short form of the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12) for assessment of sexual matters related to urinary symptoms. Patients also rated vaginal loosening or desiccation from a scale of 0–4, respectively from no loosening/desiccation, mild, moderate, severe, and very severe. Visual analog scale (VAS) for pain was recorded during therapy. Adverse effects and patients' satisfaction were also assessed. The ethics committee of our university hospital approved the study protocol (No. 201600739B0).

Treatment consisted of two sessions, four weeks apart using the Erbium:YAG laser. After adequate antiseptic procedure, the patients were placed in the lithotomy position. A specially designed laser speculum was introduced into patient's vagina as a guide. Circular and angular adapters were used to project 2940-nm Erbium:YAG laser (XS Dynamis, Fotona, Slovenia) beam to the full circumference of the vaginal wall and to the anterior vaginal wall. The laser was set in Smooth Mode, and was used from distal vagina to proximal vagina with 5 mm intervals. The laser speculum was rotated 10° twice during the procedure to avoid wire masking of the Erbium:YAG laser beam. The angular adapter was then used for sub-vesicle and sub-urethral tissue. The laser speculum was rotated 10° again and then the angular adapter was rotated five degrees twice bilaterally. Finally, urethral and vaginal outlets were treated with another adapter in a figure of eight. During the laser intervention, patient discomfort and treatment tolerability, as well as potential adverse events, were monitored. No anesthesia was used before or during the session. Patients were instructed to avoid intercourse the first three days after each session of Erbium:YAG laser treatment. Outpatient follow-ups were performed at one week, four weeks, and three months after first treatment.

Statistical analysis was completed using SPSS version 20. Fisher's exact test was used to assess categorical data, and Student's *t* test was applied to evaluate continuous variables. Mann–Whitney test was performed to assess continuous variables. To compare preoperative and postoperative responses to individual questions, generalized McNemar's test was performed. A p value of <0.05 was considered statistically significant.

Results

30 patients were included in this study. The mean age was 52.6 ± 8.8 years. Patient characteristics are shown in Table 1. Twelve months after completing two sessions of Erbium:YAG laser treatment for SUI, 2 (6.8%) patients were very satisfied with the efficacy, 16 (55.2%) patients were satisfied, 8 (26%) remained unchanged, and 4 (13.8%) patients were dissatisfied [Fig. 1]. Three months after laser therapy, mean 1-h pad test decreased from 13.2 ± 17.7 g to 6.1 ± 11.6 g (P = 0.039) [Table 2], indicating that Erbium:YAG laser could improve the severity of UI. OABSS symptom scores were significantly improved at three months follow-up (P = 0.027), especially in the symptom of urinary frequency (Q1, P = 0.001). However, the symptom scores were not sustained at 12 months follow-up [Table 2]. When compared with ICIQ-SF and UDI-6 symptom scores before laser therapy, the symptom scores all showed significant improvement at three

Table 1
Patient characteristics.

	N = 30	
	Mean ± SD	Range
Age	52.6 ± 8.8	(38–69)
BH (cm)	158.4 ± 6.2	(147–170)
BW (kg)	61.6 ± 9.8	(44.1–88.5)
BMI	24.5 ± 3.3	(18.9–33.5)
Parity	2.5 ± 0.9	(1–5)
1-hr Pad test (gm)	13.2 ± 17.7	(1.9–34.0)
Urodynamic measurements N = 30 (100%)		
MFR (mL/s)	20.2 ± 8.3	(9.2–40.0)
Voided volume (mL)	485.3 ± 108.6	(313–753)
RU (mL)	17.8 ± 19.4	(0–81)
MCC (mL)	416.2 ± 70.5	(302–552)
MUCP (cmH_2O)	56.2 ± 20.2	(23–99)
FL (mm)	22.8 ± 5.7	(14–36)
Pdet Qmax (cm H_2O)	20.95 ± 9.5	(10–41)
Sexual activity N = 24 (80.0%)		
Vaginal Pressure	26.6 ± 11.0	(3–53)
Vaginal Loosening	1.2 ± 1.2	(0–4)
Vaginal Desiccation	1.6 ± 1.5	(0–4)

SD = standard deviation; BH = Body High; BW = Body weight; BMI = Body Mass Index; 1-hr Pad test = 1 h Pad test; MFR = maximal flow rate; RU = residual urine; MCC = maximal cystometric capacity; MUCP = maximal urethral closure pressure; FL = functional length; PdetQmax = detrusor pressure at maximum flow. The Loosening(L) and Desiccation(D) are: 0 = no L/D; 1 = mild L/D; 2 = moderate L/D; 3 = severe L/D; 4 = very severe L/D; These scores were obtained by patients statements.