The effect of vaginal erbium laser on the stress-predominant mixed urinary incontinence

Kun-Ling Lin[1], Zi-Xi Loo[1], Yi-Yin Liu [2], Cheng-Yu Long [3]

1.Department of Obstetrics and Gynecology, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan.
2.Department of Obstetrics and Gynecology, Kaohsiung Municipal Hsiao - Kang Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan
3.Department of Obstetrics and Gynecology, Kaohsiung Municipal Hsiao - Kang Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan

Abstract

Purpose:
Our aim was to evaluate of efficacy of the Erbium:YAG laser in the treatment of stress-predominant mixed urinary incontinence.
Materials and Methods:
All consecutive women with stress-predominant mixed urinary incontinence were included in the study and scheduled for vaginal erbium laser treatment. At baseline and six months post-treatment, low urinary tract symptoms and associated questionnaires were evaluated including OABSS, UDI-6, IIQ-7, ICI-Q, POPDI-6, and FSFI and pad test and vaginal perineometry was recorded.
Results:
Among six-seven women with stress-predominant mixed urinary incontinence underwent 3 sessions of treatment. About SUI, twenty-four (24/67) was cured and thirty-eight (26/67) was improved. The efficacy of laser for SUI is 74.6% (50/67). Thirty-nine percent of these patients felt urgency incontinence improved and thirty -three percent of frequency exhibited improvements.
Conclusions:
Er:YAG vaginal laser procedure is efficacious treatment for patients with SUI and partially effective for urgency incontinence among women with stress-predominant mixed urinary incontinence.

Introduction

In 2014, the American Food and Drug Administration FDA approved the indication of the non-invasive, Er:YAG laser in the field of urogynecology. The Er:YAG laser has a SMOOTH mode, which emits laser pulses from the vaginal probe, releasing pulsatile-heat to the vaginal wall to shorten the intermolecular cross-links of collagen, shrinking the collagen fibril, and enhancing collagen production. Furthermore, FDA has announced warnings regarding their use. Therefore, the risks of these devices should be evaluated, and patients should be informed prior to use.
There have been publications on the efficacy of laser therapy in stress incontinence. Overactive bladder (OAB) symptoms may coexist in 21.6–46.9% of patients with urinary incontinence. Previous studies reported that only 50–71% of patients have improved symptoms of OAB or urgency incontinence after sling surgery for SUI one year later. Thus we aimed to evaluate the efficacy of the non-invasive Erbium:YAG laser in the treatment of urgency incontinence in women with stress urinary incontinence.

Methods and Materials

Between April, 2015 and February 2016, 67 consecutive women with stress-predominant mixed urinary incontinence were included. Before and 6 months after treatment, each patient's baseline The characteristic data was collected and a personal interview was conducted using the following battery of questionnaires: Incontinence Questionnaire–Short Form (ICIQ-SF) , Urogenital Distress Inventory 6 (UDI-6), Incontinence Impact Questionnaire 7 (IIQ-7), Overactive Bladder Symptom Score (OABSS) , Pelvic Organ Prolapse Distress Inventory 6 (POPDI-6) and Female Sexual Function Index (FSFI) .
The information gained was used to assess each patient's degree of urinary incontinence and its impact on their quality of life. The vaginal pressure at rest and during contraction and pad test were measured prior to initial treatment and repeated 6 months after laser treatment. The average and maximal pressures and the period of time during contraction were also calculated. If patients did not adhere to their scheduled follow-up appointments, their recordings were excluded from the study.

Table 1. Demographic data (n=) are given as mean ± standard deviation or n (%).

Mean age (years±SD)	44.6 ± 10.0
Mean parity	2.5 ± 0.5
Mean BMI (kg/m2)	23.0 ± 4.0
Pad test(g)	7.8±1.6
Menopause	15 (24.5)
SUI grade	
grade 1	8(19.5)
grade 2	24(70.7)
grade 3	4(9.7%)
Follow up (months)	6

BMI, body mass index
Values are expressed as mean ± standard deviation or numbers

Results

We included 67 patients with a mean age of 40.6± 8.8 years as Table 1. About SUI, twenty-four (24/37) was cured and sixteen (16/67) was improved. Six months after therapy, mean 1-h pad test significantly decreased (P = 0.030).The efficacy of laser for SUI is 74.6% (50/67). Thirty-nine percent of these patients felt urgency incontinence improved and thirty-three percent of frequency exhibited improvements. Significant improvement in OAB symptoms in OABSSS (7.0 ±2.0 ==> 3.5± 2.1,p=0.00) and associated questionnaires were noted post treatment(Table 2). The mean vaginal pressure not significantly improved (P = 0.162) . The total scores of FSFI with lubrication, satisfaction and pain domains were significantly improved (P=0.034)(Table 3).No major adverse effects were noticed. There was no significant difference in vaginal air pressure at rest or during contraction after treatment. The maximal and average vaginal pressure readings obtained during contraction were not significantly increased, and neither was the contraction time after treatment with the Er:YAG vaginal laser. There was a noticeable trend of improvement in post-treatment vaginal pressure, but results were not significant(Table 4).

Table 2. Questionnaires from baseline before and 6 months post laser treatment

n=67	Baseline	6 months post laser	*P*-value
OABSS	7.0±2.0	3.5±2.1	.000
UDI-6	5.9±2.7	2.7±2.3	.000
IIQ-7	7.4±4.1	2.4±2.3	.000
ICIQ	9.0±4.9	5.1±4.1	.007
POPDI	5.8±4.8	2.5±3.6	.003

Values are expressed as mean ± standard deviation or numbers
*Statistical significance; Paired t-test.

Table 3 Changes in scores of Female Sexual Function Index (FSFI) before and after treatment

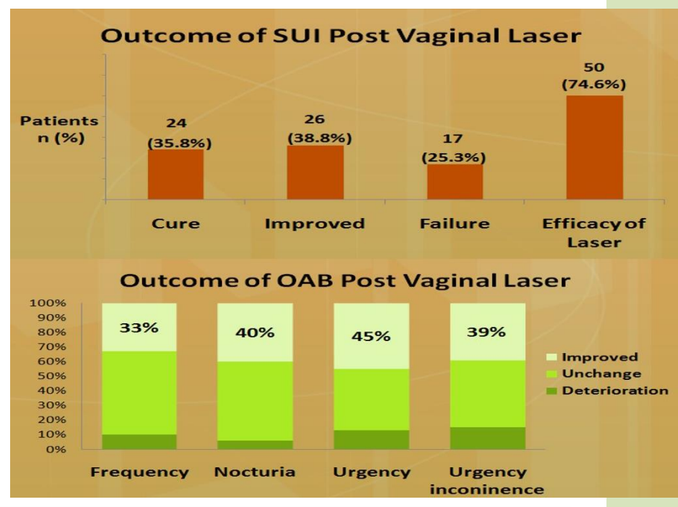
n=67	Baseline	6 months post laser	*P*-value
FSFI	19.9.0± 8.1	22.4± 9.4	0.034*
Desire (1,2)	3.0± 1.1	3.5± 1.7	0.065
Arousal (3-6)	3.1± 1.2	3.1± 1.5	1.000
Lubrication (7-10)	3.5± 1.8	4.2± 1.8	0.031*
Orgasm (11-13)	3.3± 0.9	3.4± 1.1	0.091
Satisfication (14-16)	3.3± 1.9	3.9± 1.9	0.029*
Pain (17-19)	3.68± 1.8	4.43± 1.7	0.024 *

*significant difference;
Data are given as median (range) or mean ± standard deviation.
Paired t-test

Table 4 perineometer at baseline and 6 months after treatment

Perineometry	Baseline (n = 41)	3-month follow-up (n = 31)	P value*
Resting (mmHg)	32.6±12.6	35±19.0	0.136
Contraction			
Maximal (mmHg)	58.6±21	60.3±25.5	0.691
Average (mmHg)	40.4±15.8	47.3±21.0	0.162
Duration (seconds)	27.9±16.0	29.9±22.5	0.549

Values are expressed as mean ± standard deviation or numbers
*Statistical significance; Paired t-test.



Discussion

In comparison to other studies, our OABSS and POPDI scores were significantly decreased. Women with SUI usually have OAB problem and most parous women demonstrated some degree of cystocele. The mechanism has been investigated that funneling of the proximal urethra urine enters the proximal urethra and then produces sensory stimulation resulting in a reflex of bladder contraction with OAB. Based on the hypothesis ,the cure of SUI can be related the improvement of urgency incontinence.
The dryness of vaginal wall of genitourinary symptom of menopause can resulted to urinary frequency or urgency. The vaginal laser had the collagenensis effect of vaginal wall and further moisture of the vagina was found. Our reports demonstrated the collage remodeling made lubrication and pain domains of FSFI significantly improve.
Due to SUI often being related to pelvic floor muscle dysfunction, we were inquisitive about a possible application using the Er:YAG laser to increase pelvic muscle tone. Disappointingly, the assessed muscle tone did not show significant increase after treatment. The synergistic benefit may be achieved with a combined treatment regimen using the Er:YAG laser in combination with pelvic muscle exercises, thereby allowing for a different mechanism for SUI improvement.

Conclusions

Er:YAG vaginal laser procedure is a minimal invasive procedure and seems to be a efficacious treatment for patients with SUI and partially effective for urgency incontinence among women with stress-predominant mixed urinary incontinence.

References

1. Schimpf, M. O. et al. Sling surgery for stress urinary incontinence in women: a systematic review and metaanalysis. American journal of obstetrics and gynecology 211, 71.e71-71.e27, doi:10.1016/j.ajog.2014.01.030 (2014).
2.H. Abrahamse, "Regenerative medicine, stem cells, and low- level laser therapy: future directives," Photomedicine and Laser Surgery, vol. 30, no. 12, pp. 681-682, 2012.
3. Y.-W. Tien, S.-M. Hsiao, C.-N. Lee, and H.-H. Lin, "Efects of laser procedure for female urodynamic stress incontinence on pad weight, urodynamics, and sexual function," International Urogynecology Journal, vol. 28, no. 3, pp. 469–476, 2017.
4. G. Geirsson and M. Fall, "Refex interaction between the proximal urethra and the bladder: A clinical experimental study," Scandinavian Journal of Urology, vol. 33, no. 1, pp. 24– 26, 1999.
5. Abrahamse, H. Regenerative medicine, stem cells, and low-level laser therapy: future directives. Photomedicine and laser surgery 30, 681-682, doi:10.1089/pho.2012.9881 (2012).