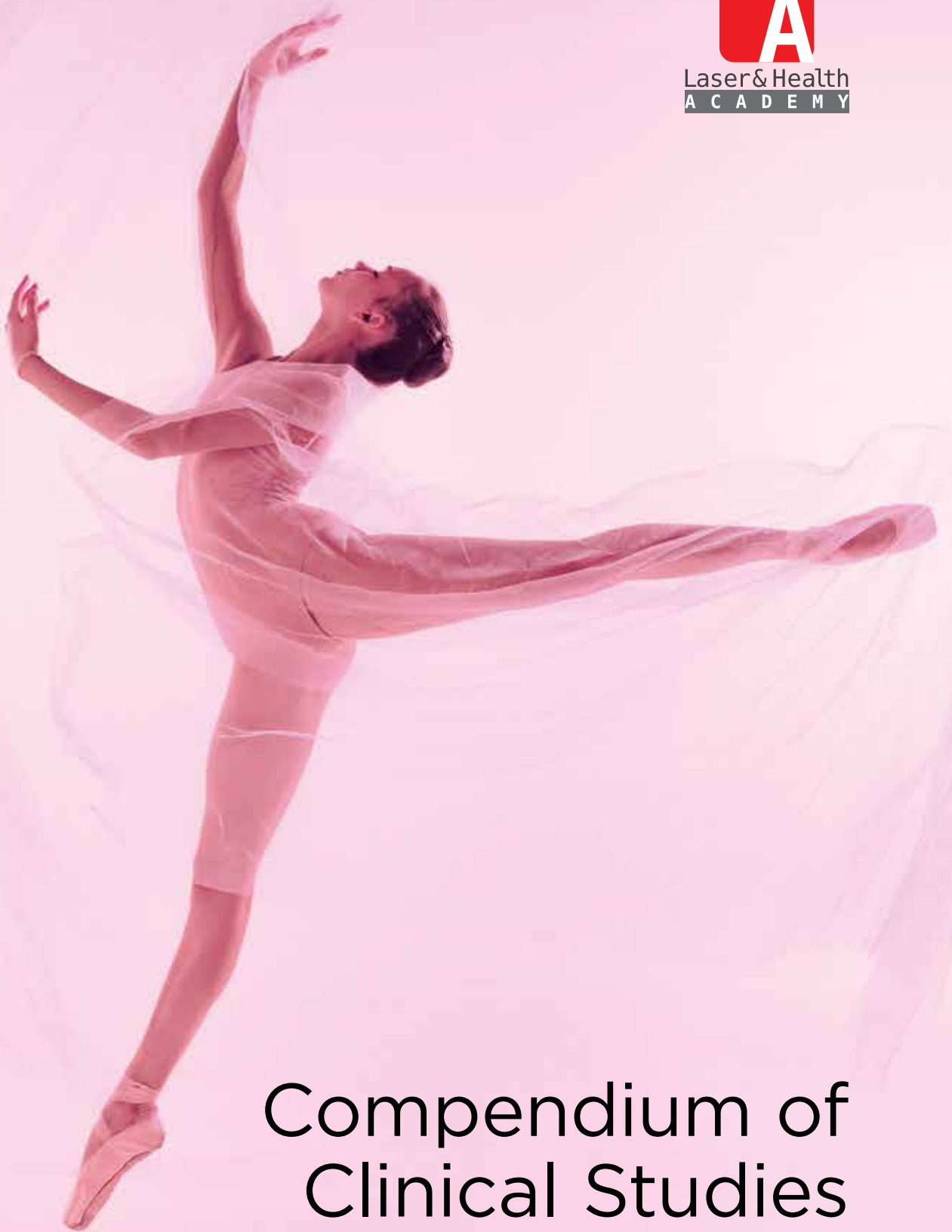




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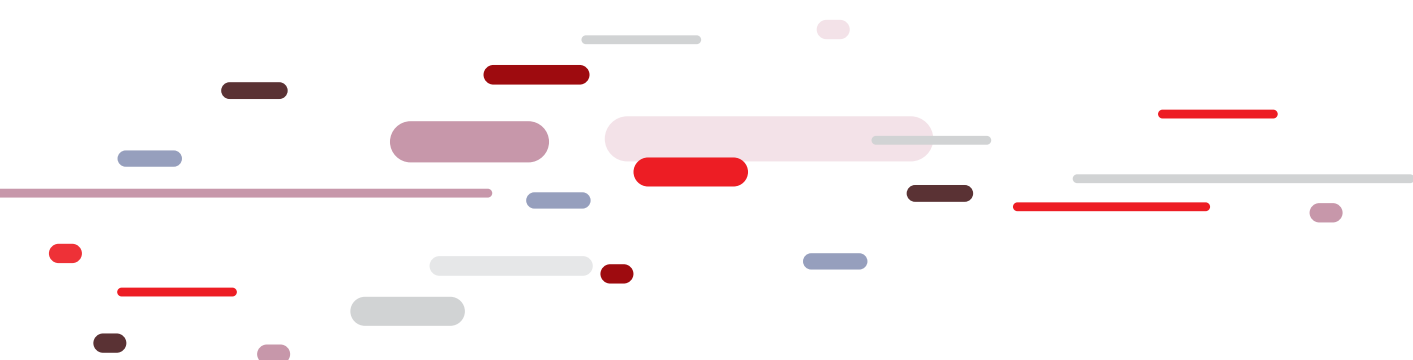


Compendium of Clinical Studies

Er:YAG and Nd:YAG Laser Treatments in Gynecology

May 2024





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- 5 Short Drafts of Selected Scientific Publications
- 65 List of Published Clinical Studies

Foreword

Scientific Evidence Behind Laser Gynecological Treatments

For over a decade, the Laser and Health Academy (LA&HA) has been at the forefront of supporting and conducting numerous scientific studies exploring the safety and effectiveness of laser-based applications, including the notable non-ablative Er:YAG SMOOTH gynecological laser therapy introduced in 2012. Published in esteemed, peer-reviewed international journals, these studies have yielded clinically proven results, showcased in over 65 SCI (Science Citation Index) publications.

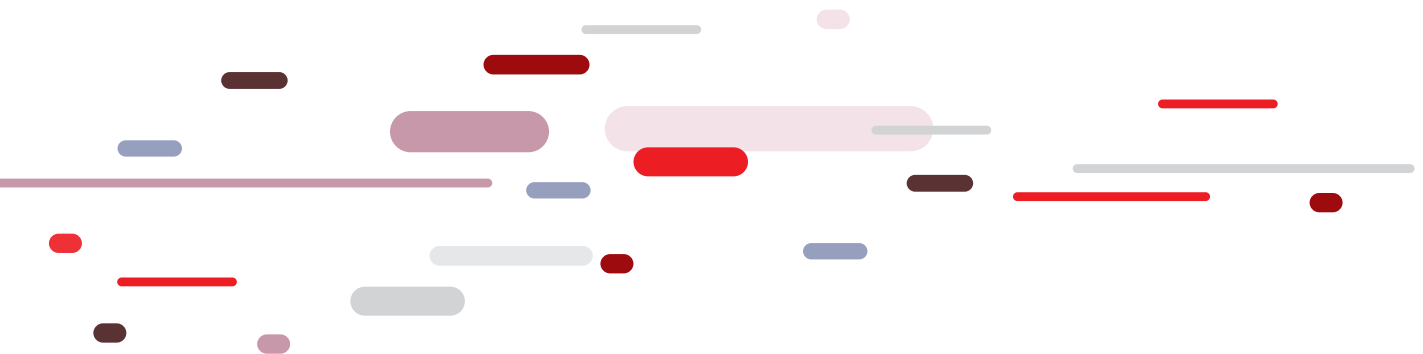
The newly updated compendium compiles the summaries of some of the most impactful published clinical studies that support the safety and efficacy of laser gynecological treatments using non-ablative Er:YAG SMOOTH and Nd:YAG PIANO laser technology. The first part of the compendium contains brief drafts from selected publications, outlining some of the key findings of each study. The second part presents the comprehensive collection of published studies, with QR codes added for easier access to the official online sources.

By encouraging the exchange and dissemination of scientific knowledge among peers, LA&HA strives to facilitate the widespread adoption of evidence-based laser medicine among the healthcare community and the general public. We believe this compendium will help bring crucial scientific evidence one step closer to users.

The LA&HA Clinical Affairs Team

The use of lasers for medical treatments is subject to local regulations, which may vary depending on your region. Please check with the manufacturer whether a specific product or application has been approved or cleared to be marketed in your country.

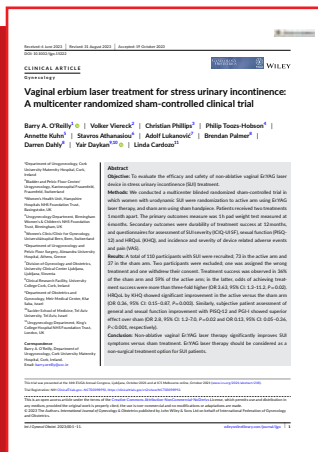
Short Drafts of Selected Scientific Publications



Vaginal Erbium Laser Treatment for Stress Urinary Incontinence: A Multicenter Randomized Sham-Controlled Clinical Trial

Authors: O'Reilly BA, Viereck V, Phillips C, Toozs-Hobson P, Kuhn A, Athanasiou S, Lukanovic A, Palmer B, Dahly D, Daykan Y, Cardozo L

Published in: *International Journal of Gynecology & Obstetrics*, 2023



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1. EXAMINING THE EFFICACY AND SAFETY OF ER:YAG LASER FOR SUI TREATMENT

The aim of this multicenter study was to evaluate the efficacy and safety of non-ablative vaginal Er:YAG laser for the treatment of stress urinary incontinence (SUI).

2. 110 PARTICIPANTS IN A BLINDED RANDOMIZED SHAM-CONTROLLED TRIAL

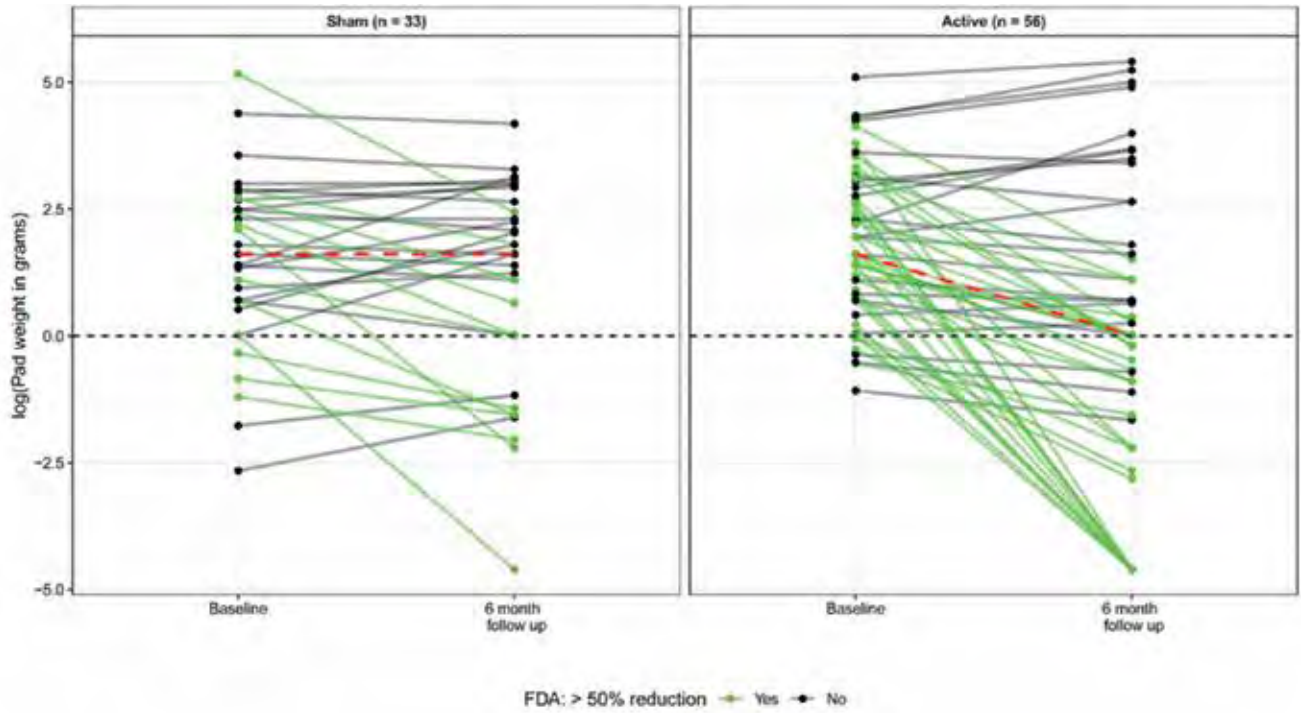
During this multicenter trial 110 participants with SUI were recruited, with 73 in an active arm and 37 in a sham arm. Patients received two treatments (XS Dynamis, Fotona, Slovenia) at 1 month apart. The primary outcome measure was the 1 h pad weight test measured at 6 months. Secondary outcomes were the durability of treatment success at 12 months, and questionnaires that assessed SUI severity (ICIQ-UI SF), sexual function (PISQ-12) and HRQoL (KHQ), and incidence and severity of device-related adverse events and pain (VAS).

3. RESULTS SHOW SIGNIFICANTLY HIGHER IMPROVEMENT IN THE ACTIVE ARM

The primary outcome data obtained from the trial revealed that treatment success was observed in 36% of the sham arm compared to 59% of the active arm that received Er:YAG laser treatment. Subjective patient assessment of general and sexual function improvement with PISQ-12 and PGI-I also showed superior effects compared to the sham (OR 2.8, 95% CI: 1.2–7.0, P = 0.02 and OR 0.13, 95% CI: 0.05–0.36, P < 0.001, respectively).

4. A SUCCESSFUL TREATMENT OPTION FOR SUI PATIENTS

The authors of the study conclude that non-ablative vaginal Er:YAG laser appears to be a safe and effective non-surgical treatment option for SUI, with a superior effect over sham as measured by the primary outcome measure, the 1-h pad weight test.



Treatment success demonstrated as log transformed pad weight at baseline and at 6 months follow-up (FU) in a control and laser arm. Green line – participants with treatment success >50% pad weight reduction from baseline at FU, gray lines – participants without treatment success. Dashed lines identifies the median.

Efficacy and Safety of Intraurethral Er:YAG Laser Treatment in Women with Stress Urinary Incontinence Following Failed Intravaginal Laser Therapy: A Retrospective Study

Authors: Tseng YL & Su CF

Published in: *Lasers in Medical Science*, 2023



OPEN ACCESS



1. EVALUATING INTRAURETHRAL ER:YAG LASER TREATMENT FOR FAILED INTRAVAGINAL THERAPY

This was a retrospective study that included 93 female patients with mild to moderate stress urinary incontinence (SUI) who had completed two courses of intravaginal Er:YAG laser treatment (SP Dynamis, Fotona, Slovenia) between January 2015 and June 2018. Of these patients, 22 (23%) who continued to experience persistent SUI at 4 weeks following the second intravaginal Er:YAG laser treatment were selected to receive intraurethral laser treatment in January 2019.

2. COMPARISON OF PRE- AND POST- INTRAURETHRAL TREATMENT ICIQ-SF SCORES

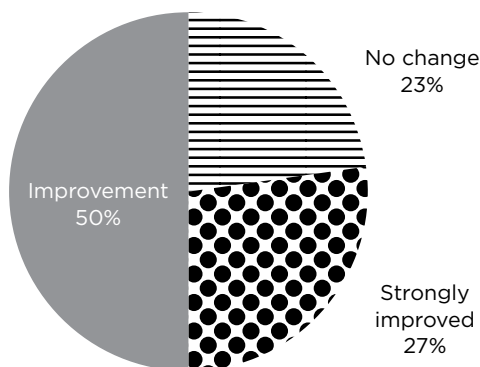
The 22 female patients with persistent SUI received intraurethral Er:YAG laser treatment using Er:YAG SMOOTH technology via a 4-mm cannula with fluence of 1.5 J/cm². Their average age was 47.5 years, with an average of 2 parities and a mean body mass index of 20.97. All patients completed the ICIQ-SF questionnaire before and 3 months after the procedure.

3. MAJORITY OF PATIENTS REPORTED IMPROVEMENT IN SYMPTOMS

Of the patients, 77% reported improvement in symptoms, with 6 reporting strong improvement and 11 reporting improvement. The treatment was well-tolerated, with mild and transient adverse effects such as urinary infection in 1 patient (4.5%) and mild pain in 7 patients (31.8%).

4. A PROMISING ALTERNATIVE FOR PATIENTS WITH PERSISTENT SUI

Intraurethral laser treatment may be helpful for many women with persistent SUI after vaginal laser treatment. Using intraurethral Er:YAG SMOOTH laser treatments to rejuvenate tissues and enhance structural support could be a promising avenue for managing stress urinary incontinence.



Improvement ratio after intraurethral laser treatment

SUI in Postmenopausal Women: Advantages of an Intraurethral + Intravaginal Er:YAG Laser

1. INTRAURETHRAL + INTRAVAGINAL LASER TREATMENT FOR POSTMENOPAUSAL SUI

This study aimed to compare the efficacy of concomitant application of an intraurethral (IU) + intravaginal (IV) non-ablative Er:YAG laser with IV application in improving the symptoms of stress urinary incontinence (SUI) in women.

Authors: Erel CT, Gambacciani M, Ozcivit Erkan IB, Gokmen Inan N, Hamzaoglu Canbolat K, Fideicchi T

2. 122 SUI PATIENTS TREATED WITH ER:YAG LASER (62 WITH IU + IV AND 62 WITH IV ONLY)

This observational retrospective cohort study included 122 SUI patients, 60 women in the IU + IV laser arm and 62 in the IV laser arm. The primary outcome was the International Consultation on Incontinence Questionnaire - Urinary Incontinence Short Form (ICIQ-SF) score at entry and at 3, 6 and 12 months from baseline. The IV Er:YAG laser procedure (SP Dynamis, Fotona, Slovenia) was applied according to the setting for SUI. The IU SMOOTH mode Er:YAG laser was applied according to a procedure previously described by Gaspar and Brandi. Pelvic examination and ultrasound were done and a vaginal smear test was taken before the intervention. SUI was diagnosed by the history and pelvic examination along with the stress and Q-tip test.

Published in: Climacteric, 2023

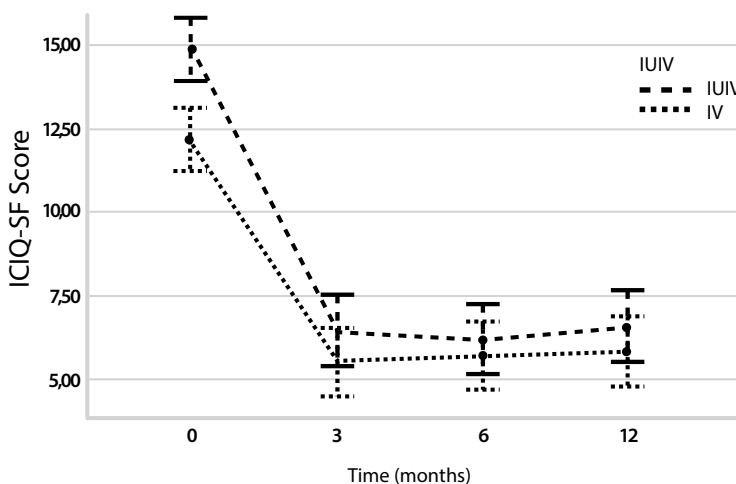


3. CONCOMITANT APPLICATION OF IU + IV ER:YAG LASER SHOWED GREATER IMPROVEMENT

The results of the study showed that significant improvement in SUI symptoms was seen 3 months after the intervention and was sustained until the end of month 12 in both arms. The women who had severe SUI symptoms initially showed greater improvement. A higher number of women who initially had mild to moderate SUI symptoms were dry after treatment. Patients treated with IU + IV Er:YAG laser showed significant improvement in SUI symptoms compared to IV laser only, especially at postmenopausal state ($p = 0.003$).

4. COMBINED IU + IV LASER TREATMENT IS EFFECTIVE FOR POSTMENOPAUSAL SUI

Non-ablative Er:YAG laser appears to be an efficient method for the treatment of SUI. Concomitant application of an IU + IV Er:YAG laser is more effective in relieving SUI symptoms at a postmenopausal state.



Improvement in SUI symptoms in relation to treatment method - ravaginal+intraurethral vs. intravaginal alone



Er:YAG Laser Thermo-Therapy for Female Stress Urinary Incontinence – 18 Months Follow-up

Authors: Novakov Mikic A, Lepes Bingold B, Korosec B, Vizintin Z

Published in: Journal of the Laser and Health Academy, 2022



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Vol. 2022, No.1, www.laserandhealth.com

Er:YAG Laser Thermo-Therapy for Female Stress Urinary Incontinence – 18 months Follow-up

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¹Patnikolka "Novakovic" Ltd., Ljubljana, 1000 Novi Laci, Sesto
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ABSTRACT
Introduction
Stress urinary incontinence (SUI) is a common cause of urinary incontinence affecting a large number of women and significantly influencing the quality of life. In the last decade, vaginal Er:YAG laser therapy was introduced as a minimally invasive treatment option for SUI.
Objective
The purpose of this study was to evaluate the long-term efficacy and safety of erbium laser treatment for female stress urinary incontinence (SUI).
Methods
In this single-center prospective study covering the period from April 2014 to January 2016, we performed non-ablative Er:YAG laser thermal therapy on 132 female patients suffering from stress urinary incontinence. The patients received two laser sessions with a 4-6 week interval. Follow-ups were performed at 3 and 18 months. The assessment of stress urinary incontinence, ICIQ-UI SF and ISI by Klovning questionnaire was used. Patient satisfaction was measured using an 11-point numerical scale. Long-term follow-ups were performed via telephone interviews, in which an additional questionnaire was used to assess the duration of SUI improvement and the patient's willingness to repeat the treatment. Adverse events were registered at each follow-up.
Results
132 patients with SUI were included in the study. The average age was 50.3 years (range 23-75) and average parity 1.9 (range 0-4). At the 3-month follow-up, 19% of the patients were dry and 96.8% had improved ICIQ-UI SF scores. 75% of the patients had the full effect lasting at least 12 months and 24% for at least 18 months. The average duration of improvement was 12.0 months. 85% of the patients were not disappointed when the symptoms started to come back and 97% were satisfied with the treatment (average score at 18 months was 7.9/10; 67% with grades 8-10). 98% of the patients would repeat the therapy. All reported adverse effects were mild and transient.

Key words: Stress urinary incontinence, vaginal Er:YAG laser therapy, long-term efficacy.

Introduction
Stress urinary incontinence, usually defined as involuntary urinary leakage during physical exertion that occurs without abdominal stress, is a common condition affecting between 7% to 30% of women in their reproductive period and significantly influencing their quality of life [1,2].
It is recommended to treat stress urinary incontinence initially with non-surgical therapies, such as weight reduction, hormonal substitution, physiotherapy, pelvic floor exercises or the use of pessaries [3]. If non-surgical treatments do not result in improvement within 3-6 months, surgical treatment is such as mid-urethral sling procedure and transvaginal mesh-polypropylene mesh mid-slings (MMS) can be considered. Surgical therapies are very effective but are associated with serious and long-term adverse events and complications. ICIQ-UI questionnaire option are reported especially by younger active women seeking non-surgical therapies.
In the past decade, vaginal Er:YAG laser therapy has been established as a minimally invasive treatment option for stress urinary incontinence. Several studies have reported that the non-ablative Er:YAG

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1. ASSESSING THE LONG-TERM EFFICACY AND SAFETY OF ER:YAG TREATMENT FOR SUI

The purpose of this study was to evaluate the long-term efficacy and safety of erbium laser treatment for female stress urinary incontinence (SUI), which has gained popularity over the last decade as a minimally invasive treatment option.

2. 132 FEMALE SUI PATIENTS ANALYSED AFTER 3 AND 18 MONTHS

This single-center prospective study evaluated non-ablative Er:YAG laser thermal therapy performed on 132 female patients suffering from stress urinary incontinence. The average age was 50.3 years (range 23-75) and average parity 1.9 (range 0-4). The patients received two laser sessions (SP Dynamis, Fotona, Slovenia) with a 4-6 week interval. Follow-ups were performed at 3 and 18 months. For assessment of stress urinary incontinence, ICIQ-UI SF and ISI by Klovning questionnaires were used. Patient satisfaction was measured using an 11-point numerical scale.

3. RESULTS SHOWED SIGNIFICANT IMPROVEMENT AND HIGH PATIENT SATISFACTION

Average ICIQ-UI SF score at baseline was 12.3, which decreased to 5.19 at the 3-month follow-up (improvement of 7.1 points). At the 3-month follow-up, 19% of the patients were dry and 96.8% had improved ICIQ-UI SF scores. 75% of the patients had the full effect lasting at least 12 months and 24% for at least 18 months. The average duration of improvement was 12.0 months. 85% of the patients were not disappointed when the symptoms started to come back and 97% were satisfied with the treatment (average score at 18 months was 7.9/10; 67% with grades 8-10). 98% of the patients would repeat the therapy. All reported adverse effects were mild and transient.

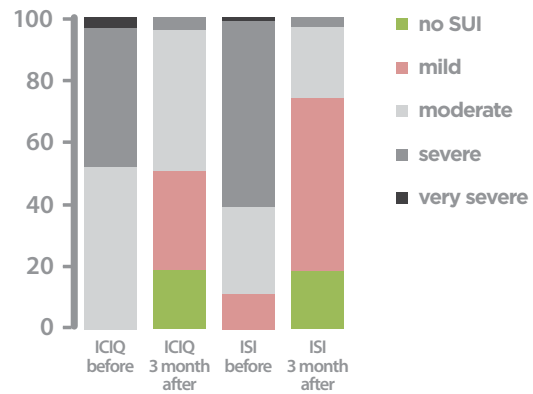
4. FOTONA SMOOTH® ERBIUM LASER IS EFFECTIVE FOR TREATING FEMALE SUI

The study confirmed that Erbium laser treatment is efficacious for the improvement of female SUI with no major adverse effects noted. Patient discomfort during the treatment was minimal and satisfaction was very high. Non-ablative Er:YAG laser could be considered as a first line treatment option, especially for younger patients in their reproductive period seeking to improve their quality of life.



Improvement in outcome measures comparing ICIQ-UI SF and ISI. Data is presented as the percentage of patients with a corresponding improvement rate (n=number of patients).

Outcome measurement	ICIQ-UI SF		ISI - Klovning	
	3-month (n=126)	3-month (n=126)	3-month (n=105)	18-month (n=105)
Dry (%)	19	19	23.8	
Significantly improved (%)	59.5	46.8	41	
Improved (%)	18.3	29.4	24.7	
Not improved (%)	3.2	4.8	9.5	
Worse (%)	0	0	1	



Comparison of the severity of SUI symptoms improvement based on ICIQ-UI SF and ISI scores

Vaginal Er:YAG Laser for Treatment of Stress Urinary Incontinence: Optimization of Treatment Regimen for a Sustained Long-Term Effect

Authors: Gaspar A, Koron N,
Silva J, Brandi H

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Published in: *Lasers in Medical Science*, 2022



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1. ASSESSING THE LONG-TERM EFFICACY AND SAFETY OF ER:YAG LASER TREATMENT OF SUI

This prospective uncontrolled study was conducted to assess the long-term efficacy and safety of non-ablative Er:YAG laser treatment of Stress urinary incontinence (SUI), a common health problem that affects roughly 35% of women in the reproductive period.

2. FORTY-THREE SUI PATIENTS UNDERWENT THREE SESSIONS OF INCONTILASE®

The patients received three consecutive non-ablative Er:YAG laser (XS Dynamis, Fotona, Slovenia) treatments with 20-day intervals between sessions following the IncontiLase® protocol. The efficacy of laser treatment was assessed by 1-h pad test, 24-h pad test, 3-day voiding diary, and ICIQ-UI SF questionnaire at multiple follow-ups. Statistical analysis was performed using one-way repeated measures ANOVA. Patients were questioned about discomfort during treatment and any adverse events following the laser procedures.

3. RESULTS SHOW A SIGNIFICANT IMPROVEMENT OF SUI SYMPTOMS

All outcome measures showed a significant change over a period of the entire clinical trial. The eighteen-month follow-up revealed a fading of the effect, which was alleviated by single-session maintenance treatments every 6 months. There were no serious adverse events reported during the study. All reported side effects were mild and transient.

4. NON-ABLATIVE ER:YAG LASER IS AN EFFICACIOUS AND SAFE OPTION FOR TREATMENT OF SUI

The results of this study show that application of non-ablative Er:YAG laser for SUI treatment significantly improves SUI symptoms. High improvement rates and patient satisfaction can be maintained with single-session maintenance treatments performed every 6 months.

Improvement in outcome measures at three different time points (follow-ups). Data is presented as the percentage of patients with a corresponding improvement rate (n = number of patients).

Outcome Measure	ICIQ-UI SF			1-h pad test		
	All (n = 43)	Group 1 (n = 28)	Group 2 (n = 15)	All (n = 43)	Group 1 (n = 28)	Group 2 (n = 15)
6-month FU						
Dry ^a (%)	14	19	7	0	0	0
Improved ^b (%)	81	81	80	21	4	53
Not improved ^c (%)	5	0	13	79	96	47
Worse ^d (%)	0	0	0	0	0	0
Dry or improved (%)	95	100	87	21	4	53
12-month FU	(n = 43)	(n = 28)	(n = 15)	(n = 43)	(n = 28)	(n = 15)
Dry ^a (%)	14	18	7	0	0	0
Improved ^b (%)	53	54	13	40	25	67
Not improved ^c (%)	33	28	80	60	75	33
Worse ^d (%)	0	0	0	0	0	0
Dry or improved (%)	67	72	20	40	25	67
36-month FU	(n = 34)	(n = 21)	(n = 13)	(n = 34)	(n = 21)	(n = 13)
Dry ^a (%)	76	90	54	0	0	0
Improved ^b (%)	24	10	46	50	38	69
Not improved ^c (%)	0	0	0	50	62	31
Worse ^d (%)	0	0	0	0	0	0
Dry or improved (%)	100	100	100	50	38	69

ICIQ-UI SF International Consultation on Incontinence Questionnaire—Urinary Incontinence Short Form, FU follow-up

^a1-h pad test < g, or ICIQ-UI SF score = 0

^bIf improvement at the follow-up was ≥ 50%

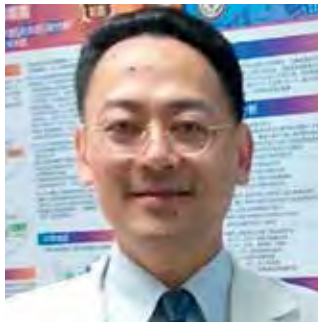
^cIf improvement at the follow-up was < 50%

^dIf improvement at the follow-up was negative (relative to baseline)

Changes in Sexual Function and Vaginal Topography using Transperineal Ultrasound after Vaginal Laser Treatment for Women with Stress Urinary Incontinence

Authors: Long C-W, Wu P-C, Chen H-S, Lin K-L, Loo Z, Liu Y, Wu C-H

Published in: *Scientific Reports*, 2022



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1. ASSESSING THE EFFECTS OF ER:YAG VAGINAL LASER TREATMENT FOR SUI

This study aims to assess the changes in sexual function and vaginal topography using 3-D transperineal ultrasound in stress-incontinent women treated with Er:YAG vaginal laser.

2. A 6-MONTH STUDY USING VAGINAL TOPOGRAPHY AND 3-D TRANSPERINEAL ULTRASOUND

Two hundred and twenty women with stress urinary incontinence (SUI) treated with Er:YAG laser (FotonaSmooth XS, Fotona, Slovenia) were recruited. Assessment before and 6 months after the treatment included vaginal topography using 3-D transperineal ultrasound and sexual function using female sexual function index questionnaire (FSFI).

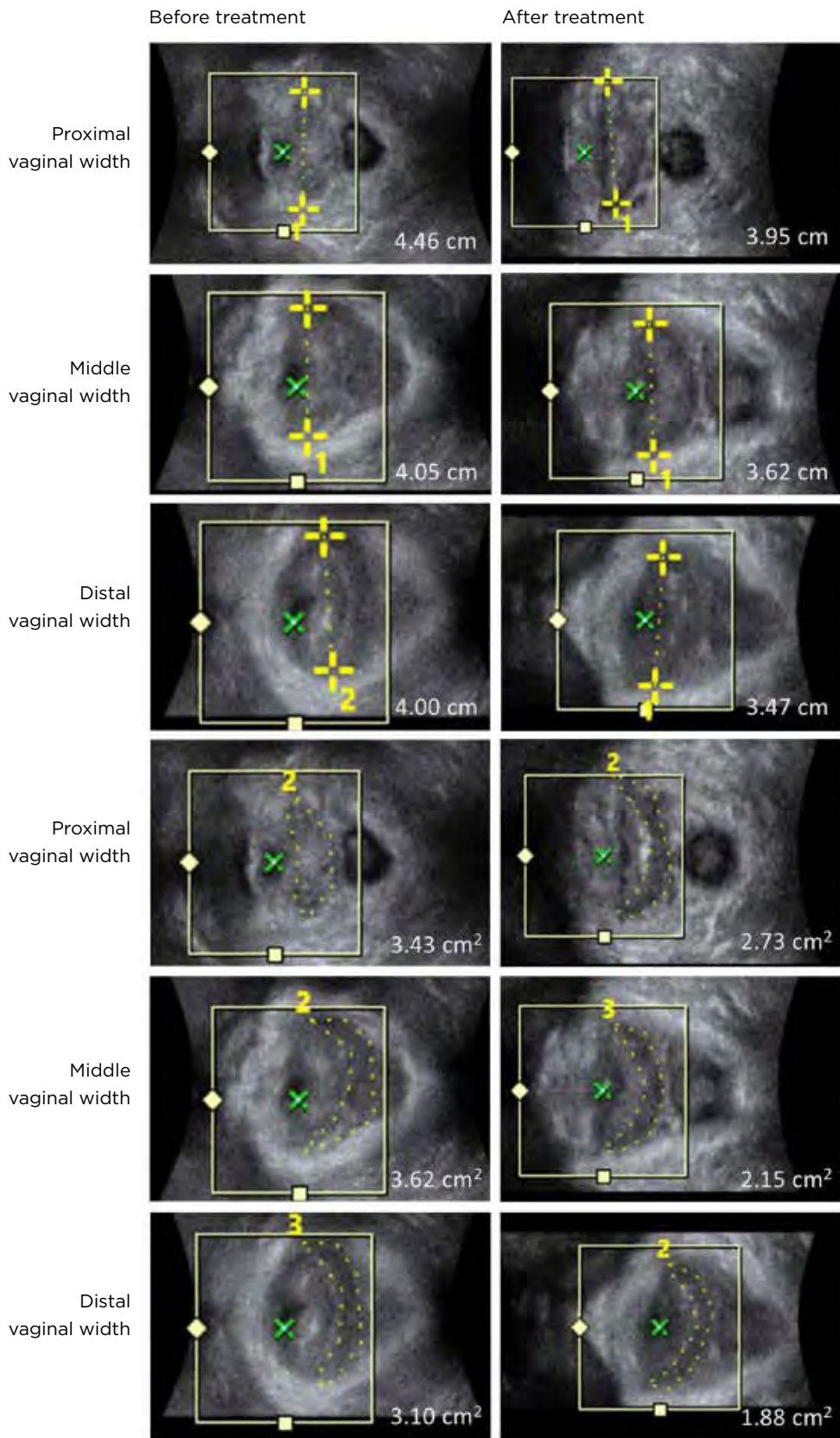
3. RESULTS SHOW SYMPTOMATIC IMPROVEMENT IN 74% OF WOMEN

A total of 50 women with complete data showed that the symptomatic improvement was noted in 37 (74%) women. After the Er:YAG vaginal laser treatment, a significantly decreased width and cross-sectional area in the proximal, middle, and distal vagina were found in women with SUI. Nearly all of the domains of FSFI improved significantly after the vaginal laser treatment, except sexual desire.

4. ER:YAG VAGINAL LASER TREATMENT PRODUCES FAVORABLE ANATOMICAL CHANGES

The study shows that following Er:YAG vaginal laser treatment, the anatomical changes of vaginal shrinkage and an improvement of female sexual function were both noted. The favorable outcome of sexual function partly related to the tightening of the vagina, as evidenced by the measurements of the 3-D transperineal ultrasound.





The sequential images of vaginal width and area of a same patient before and after treatment at different levels of vagina

Comparison of Urethral Sling Surgery and Non-ablative Vaginal Er:YAG laser Treatment in 327 Patients with Stress Urinary Incontinence: A Case-matching Analysis

Authors: Okui NP, Miyazaki H, Takahashi W, Miyauchi T, Ito C, Okui M, Shigemori K, Miyazaki Y, Vizintin Z, Lukac M

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Published in: *Lasers in Medical Science*, 2021



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1. FIRST PS ANALYSIS COMPARING TVT AND VAGINAL ERBIUM:YAG LASER TREATMENT (VEL)

This study, published in *Lasers in Medical Science*, retrospectively compared tension-free vaginal tape (TVT) and non-ablative vaginal Erbium:YAG laser treatment (VEL) by propensity score (PS) analysis in women with SUI. No previous PS analysis studies have investigated urethral sling surgery using polypropylene TVT and VEL for SUI.

2. STUDY EXAMINED A LARGE NUMBER OF PATIENTS AT SEVERAL FACILITIES

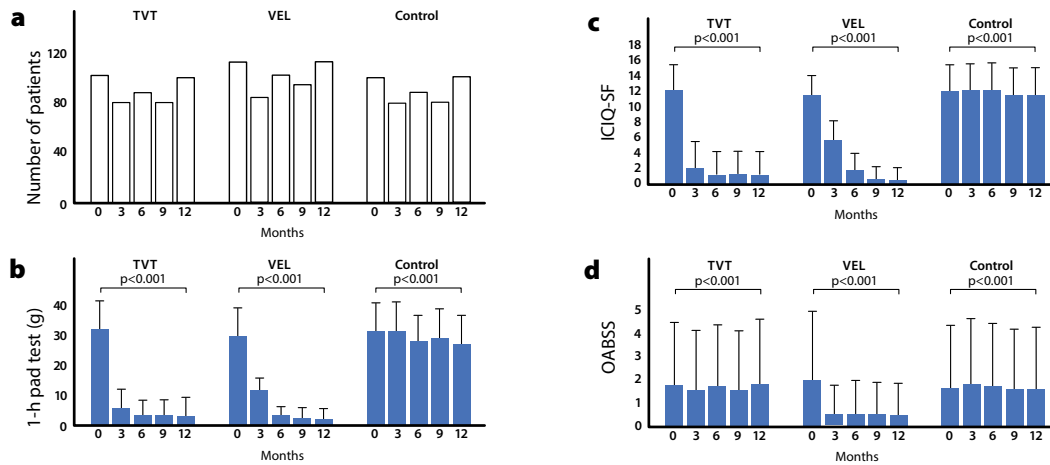
The study analyzed 102, 113, and 112 patients in the TVT, VEL, and control groups, respectively. The subjects were patients between 35 and 50 years of age at the time of treatment who (1) underwent TVT surgery, (2) received VEL treatment (XS Dynamis, Fotona, Slovenia) or (3) were placed under observation with no treatment (control) for SUI at several facilities, within a period of 15 years between 2004 and 2019. The choice of treatment type (VEL or TVT) was up to the patients after the consultations, at which they were informed in detail about both options.

3. RESULTS SHOW SIGNIFICANT IMPROVEMENT

Compared with the control group, the TVT and vaginal erbium laser VEL groups exhibited significant improvement in the 1-h pad test and ICIQ-SF. In the PS analysis, the TVT and VEL groups similarly improved in the 1-h pad test and ICIQ-SF. As for the OABSS, the VEL group showed significantly greater improvement than the TVT group.

4. A VIABLE OPTION FOR SUI TREATMENT

The results of this study demonstrate that vaginal Erbium:YAG laser (VEL) is a viable option for patients desiring SUI treatment. VEL may be an option for patients with both SUI and OAB symptoms, as TVT can worsen urinary urgency and frequency, and VEL could represent an option for patients who are concerned about artificial implants.



Treatment in the TVT and VEL groups. (a) The number of patients at 0, 3, 6, 9 and 12 months in three groups. (b-d) The change over time for the 1-h pad test, ICIQ-SF, and OABSS. There was a significant difference between the start of treatment and 1-year post-treatment in the TVT and VEL groups. No significant difference was observed in the control. e-g Comparison between TVT and VEL with respect to changes in outcomes from pretreatment (0 months) to post-treatment (1 year). Only OABSS was significantly different between the two groups. The Mann-Whitney U test was used to compare the three groups at 1 and 12 months post-treatment.

Er:YAG Laser Treatment of Urinary Incontinence After Failed TOT/TVT Procedures

Authors: Erel CT, Carazo Fernandez LD, Inan D, Makul M

Published in: *European Journal of Obstetrics and Gynecology and Reproductive Biology*, 2020



1. EVALUATING THE USE OF ER:YAG LASER FOR SUI AFTER FAILED TOT/TVT PROCEDURES

This study was performed to determine if non-ablative Er:YAG laser treatment can improve the symptoms of SUI patients who had previously experienced failed TOT/TVT procedures.

2. A RETROSPECTIVE STUDY WITH DATA FROM TWO OBSTETRICS AND GYNECOLOGY DEPARTMENTS

The retrospective study included 25 women with persistent SUI after failed TOT/TVT operations and 25 women who previously did not receive either any type of surgical or non-invasive treatment for SUI.

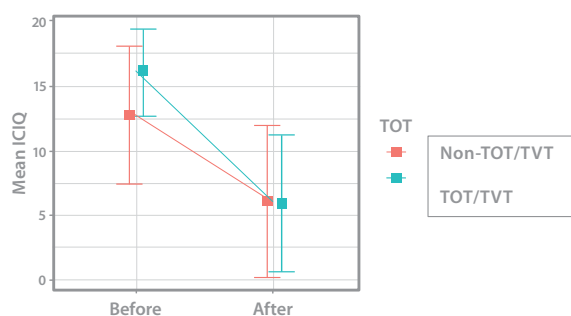
2940 nm Er:YAG laser (SP Spectro Dynamis, Fotona, Slovenia) was used in the treatment procedure for SUI. The patients were evaluated on the basis of ICIQ-UI SF before and after the procedure. According to the differences in the ICIQ-UI SF before and after, the percentage of improvement was graded as “good responders” ($\geq 50\%$) or “poor responders” ($< 50\%$). The duration of the treatment effect was evaluated in follow-ups with relation to maximum improvement time (MIT) and total improvement time (TIT).

3. RESULTS SHOW SIGNIFICANT IMPROVEMENT

The SUI patients who previously had failed TOT/TVT operations had a significantly higher initial ICIQ-UI SF score ($p = 0.013$). Non-ablative Er:YAG laser treatment significantly and similarly improved the severity of SUI symptoms in both groups ($p = 0.000$ for failed TOT/TVT group and $p = 0.001$ for the non-TOT/TVT group, respectively). The women who were good responders were younger ($p = 0.012$) and had fewer years in menopause ($p = 0.011$). The effect of Er:YAG laser treatment lasted longer among the SUI women in the good responders group ($p = 0.000$ for MIT and $p = 0.000$ for TIT, respectively).

4. A PROMISING OPTION FOR SUI PATIENTS WITH FAILED TOT/TVT PROCEDURES

Non-ablative Er:YAG SMOOTH mode laser is an alternative choice of treatment for the SUI patients who previously had failed TOT/TVT procedures. Its effect lasts longer especially in younger and early postmenopausal women.



Mean ICIQ-SF scores in the TOT/TVT and non-TOT/TVT groups before and after the non-ablative Er:YAG laser treatment

Predictive Factors for the Efficacy of Er:YAG Laser Treatment of Urinary Incontinence

1. DETERMINING THE PREDICTIVE FACTORS FOR ER:YAG LASER TREATMENT OF UI

The aim of this study was to determine the efficacy and predictive factors for the success of Er:YAG laser treatment in patients with urinary incontinence (UI).

2. EIGHTY-TWO PATIENTS TREATED AND EVALUATED BY ICIQ-SF AND KHQ-UI

Eighty-two patients with UI were treated by Er:YAG laser (SP Spectro Dynamis, Fotona, Slovenia) in this cohort study. The patients were evaluated by ICIQ-UI SF and KHQ before and after the procedure. Improvement was categorized as: none (0–25%), mild (26–50%), moderate (51–75%), or high (76–100%). The duration of the treatment effect was evaluated at follow-up in relation to the maximum improvement time (MIT) and total improvement time (TIT).

3. RESULTS SHOW SIGNIFICANT IMPROVEMENT, ESPECIALLY WITH YOUNGER PATIENTS

Forty-two patients were determined to have SUI and 40 patients MUI. The mean ICIQ-UI SF and KHQ scores significantly improved after the procedure ($p < 0.0001$). The SUI patients responded to the laser treatment significantly better ($p < 0.008$). Younger women had significantly better results ($p < 0.008$), while premenopausal women ($p < 0.032$) and women in the early postmenopausal years ($p < 0.032$) also saw a positive response to the Er:YAG laser treatment. Women with a lower BMI had greater improvement ($p < 0.011$). The total laser energy expenditure during the sessions may also be a predictive parameter for the success of Er:YAG laser treatment of UI ($p = 0.059$). MIT and TIT were significantly longer among the patients in the high-improvement group.

4. ER:YAG LASER IS A SAFE AND EFFECTIVE TREATMENT FOR UI

Er:YAG laser treatment of the symptoms of UI, especially SUI, is more efficacious and of longer duration for younger, premenopausal or early postmenopausal women with normal BMI.

Authors: Erel CT,
Inan D, Mut A

Published in: *Maturitas*, 2020



Er:YAG Laser in Hysterectomized Women with Stress Urinary Incontinence: A VELA Retrospective Cohort, Non-inferiority Study

Authors: Erel CT,
Fistonc I, Gambacciani M,
Oner Y, Fistonc N

Published in: *Climacteric*, 2020



OPEN ACCESS



1. FIRST PS ANALYSIS COMPARING TVT AND VAGINAL ERBIUM:YAG LASER TREATMENT (VEL)

Many studies have confirmed the efficacy of Er:YAG SMOOTH® laser in the treatment of SUI, however, this retrospective cohort, non-inferiority study offers the first published data on laser treatment of SUI in hysterectomized women.

2. A MULTICENTER VELA STUDY CONDUCTED AT THREE OBSTETRICS/GYNECOLOGY CLINICS

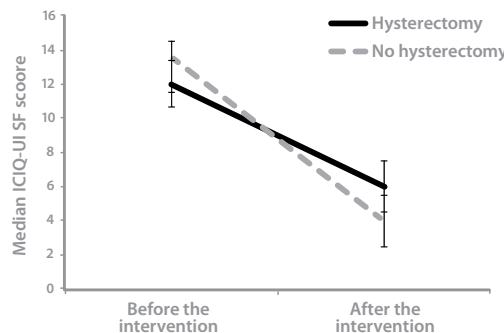
In this real-world, retrospective cohort study performed in Turkey, Croatia and Italy, a consecutive sample of 35 hysterectomized and 34 non-hysterectomized patients with SUI were treated with Er:YAG SMOOTH® laser (SP Spectro Dynamis, Fotona, Slovenia). All three centers are members of VELA (Vaginal Er:YAG SMOOTH® Laser Academy), which defined the criteria, procedures, the common informed consent form and instruments for measuring clinical outcomes.

3. RESULTS SHOW SIGNIFICANT IMPROVEMENT

The results of this study supported the hypothesis of non-inferiority of intravaginal Er:YAG SMOOTH® laser treatment efficacy on the symptoms of SUI in hysterectomized women compared to its already proven efficacy in non-hysterectomized patients. The primary outcome was median reduction of SUI symptoms measured by the International Consultation on Incontinence Questionnaire—Urinary Incontinence Short-Form (ICIQ-SF). In hysterectomized patients, the ICIQ-SF was reduced by 5 points (95% confidence interval 3-8; $p < 0.001$), a reduction of 45% (95% confidence interval 36-67%).

4. A VIABLE OPTION FOR SUI TREATMENT IN HYSTERECTOMIZED WOMEN

Based on the results of this study, Er:YAG SMOOTH® laser treatment appears to improve the symptoms of SUI in hysterectomized women to approximately the same degree clinically as in non-hysterectomized women.



The median ICIQ-SF scores in hysterectomized and non-hysterectomized women before and after the Er:YAG SMOOTH® treatment. ICIQ-SF, International Consultation on Incontinence Questionnaire—Urinary Incontinence Short-Form.

Er:YAG Laser Treatment of Female Stress Urinary Incontinence: Midterm Data

1. EXAMINING EFFECTS OF SUI SEVERITY AND NUMBER OF LASER INTERVENTIONS

This study examined how incontinence severity at baseline and the number of laser interventions may affect the treatment success rate, and whether the effect of laser therapy was obvious 6 months and 2 years after the final laser intervention.

Authors: Kuszka A, Gamber M, Walser C, Kociszewski J, Viereck V

Published in: *International Urogynecology Journal*, 2020

2. THREE STAGES OF SUI TREATED WITH THE INCONTILASE® PROTOCOL

Fifty-nine women, 32 with SUI I, 16 with SUI II, and 11 with SUI III were treated using an Er:YAG laser following the IncontiLase® protocol (Dynamis, Fotona, Slovenia). Therapy included five laser sessions with a 1-month interval between sessions. Objective (1-h pad test) and subjective data (International Consultation on Incontinence Questionnaire—Urinary Incontinence Short Form [ICIQ-UI SF], Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire [PISQ-12]) were assessed at baseline, after two and four laser sessions and 6 months and 2 years after the fifth laser session.



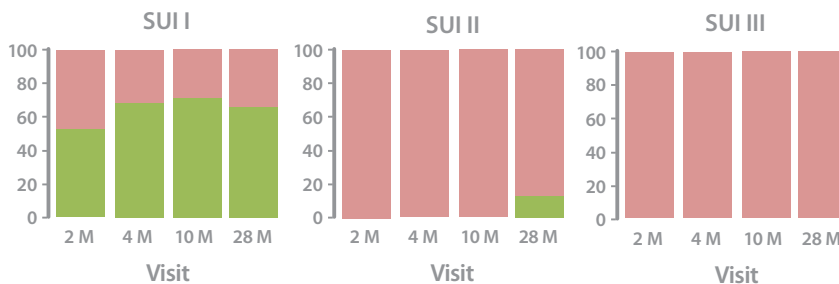
3. RESULTS SHOW IMPROVEMENT FOR SUI I AND SUI II

The results of this study show that objective cure/improve rates for mild SUI I were 69%, 78%, 91%, and 78% after two, four, and five laser sessions at the 6-month and 2-year follow-ups. Subjective cure rates (ICIQ-UI SF) also improved: 53%, 69%, 72%, and 66%, as well as sexual function (PISQ-12). For SUI II, objective cure/improve rates were 31%, 63%, 69%, and 50%, with a subjective cure rate of 13% at the 2-year follow-up. For SUI III, only one patient had an objective improvement after two and four laser sessions.



4. INCONTILASE® IS A SUSTAINABLE SOLUTION FOR MOST CASES OF SUI

Intravaginal laser therapy led to cure/improvement for SUI I and SUI II, but not for severe SUI III. The outcome was better after four to five laser sessions than after two laser sessions. Follow-up data 6 months and 2 years after the final laser intervention showed sustainability of the treatment.



International Consultation on Incontinence Questionnaire—Urinary Incontinence Short Form (ICIQ-UI SF) score. Subjective cure rates [%] are shown for patients with initial SUI I, SUI II or SUI III at the following time points: 1 month after two laser sessions (2 M), 1 month after four laser sessions (4 M) and 6 months and 2 years after the fifth laser session (10 M and 28 M). M month, green cured (ICIQ-UI SF < 5), red not cured (ICIQ-UI SF > 5).



Efficacy and Safety of Non-ablative Vaginal Er:YAG Laser Treatment as a Novel Surgical Treatment for Overactive Bladder Syndrome: Comparison with Anticholinergics and β 3-adrenoceptor Agonists

Authors: Okui NP

-

Published in: *World Journal of Urology*, 2019



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1. IMPROVEMENT OF OAB SYMPTOMS

According to this large study with 150 patients, Er:YAG laser protocol (Dynamis, Fotona, Slovenia) demonstrated comparable efficacy to anticholinergics (fesoterodine, 4 mg) or β 3-adrenoceptor agonists (mirabegron, 25 mg). Compared to both medicines, the Er:YAG laser was the only therapy to promote vaginal cell synthesis and improve VHIS scores.

2. BETTER VAGINAL HEALTH STATUS

Er:YAG laser therapy has been shown to significantly improve the vaginal tissue and its overall health status.

3. DIFFERENT SAFETY PROFILE

There have been no adverse effects reported in the laser group, but there were some observed in the pharmacotherapy groups. Mouth dryness, associated with the use of medications for example, led to a desire to change the treatment in up to 22% of patients.

4. NEW INSIGHTS INTO MECHANISMS OF ACTION

The results of the laser group may indicate the presence of a relationship between the vaginal condition and OAB, which from a different perspective can be considered a pathway that closely connects the vagina and bladder via the OAB mechanism. Er:YAG laser therapy can improve OAB symptoms through a different mechanism than that involved in pharmacotherapy.

Non-ablative Er:YAG Laser Therapy Effect on Stress Urinary Incontinence Related to Quality of Life and Sexual Function: A Randomized Controlled Trial

1. FIRST EVER RANDOMIZED CONTROLLED TRIAL OF INCONTILASE®

TREATMENT

The study presents the first ever randomized controlled trial which evaluates the efficacy and safety of non-ablative Er:YAG laser therapy as an alternative, non-invasive treatment of SUI and the improvement of sexual gratification in parous women.

2. STUDY EXAMINES A LARGE NUMBER OF PATIENTS

114 premenopausal parous women with SUI were randomized in two groups of 57 women: a laser intervention group and a placebo group. Both groups were treated according to the IncontiLase® clinical treatment protocol for SUI developed by Fotona, with an Er:YAG laser, except that there was no energy output when treating the placebo group and patients were not aware of this fact. At baseline and 3 months after treatment, patients were clinically examined, answered questionnaires for SUI severity and sexual function assessment, and their pelvic floor muscle function was assessed with perineometry. ICIQ-UI SF was used as the primary outcome measure. PISQ-12 and FSFI were used to assess the sexual function. Patients were monitored for discomfort and side-effects during treatment and in the follow-up period.

3. RESULTS SHOW SIGNIFICANT IMPROVEMENT IN THE LASER GROUP

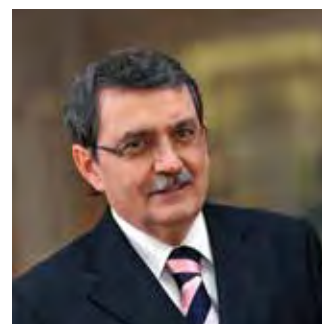
3 months after treatment the ICIQ-UI SF ($p < 0.001$), PISQ-12 ($p = 0.014$) and FSFI ($p = 0.025$) scores collected were significantly more improved in the laser group than in the placebo control group. 21% of laser-treated patients were completely dry at follow-up (ICIQ-UI SF = 0), compared to only 4% of the placebo control patients. No serious adverse effects were observed or reported.

4. INCONTILASE® IS A MINIMALLY-INVASIVE SAFE TREATMENT ALTERNATIVE FOR SUI

The results of this randomized trial reveal that a single session of IncontiLase® treatment improves the impact of SUI symptoms on quality of life and sexual function in premenopausal parous women significantly better than a placebo treatment.

Authors: Blaganje M,
Scepanovic D, Zgur L,
Verdenik I, Pajk F,
Lukanovic A

Published in: *European Journal of Obstetrics and Gynecology and Reproductive Biology*, 2018



OPEN  ACCESS



Preliminary Outcome of Non-ablative Vaginal Er:YAG Laser Treatment for Female Stress and Mixed Urinary Incontinence

Authors: Su C-F, Chen G-D,
Tsai H-J

Published in: Taiwanese
Journal of Obstetrics and
Gynecology, 2019



OPEN ACCESS



1. A COMPARISON OF VAGINAL ERBIUM TREATMENT RESULTS FOR SUI AND MUI

This prospective study presents a preliminary result to compare the clinical efficacy of patients with stress urinary incontinence (SUI) and mixed urinary incontinence (MUI) using minimally invasive Er:YAG vaginal laser.

2. TWENTY PATIENTS UNDERWENT ER:YAG SMOOTH TREATMENT

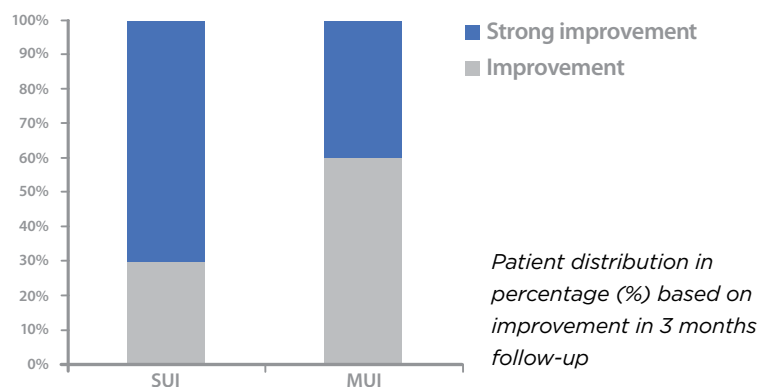
A total of 20 patients were included (10 patients with SUI and 10 patients with MUI) who underwent treatment using a 2940 nm Er:YAG laser (XS Dynamis, Fotona, Slovenia) with a special SMOOTH mode in an outpatient office without anesthesia or postoperative medications. All patients completed two sessions of treatment with an interval time of 28 days. At pretreatment and 3 months after the completion of two therapy sessions, the patients were asked to answer ICIQ-SF questionnaires. All the results were compared by Student's t test with two-way analysis of variance between the two groups.

3. RESULTS SHOW SIGNIFICANT IMPROVEMENT

A total of 20 patients presented with SUI symptom relief and improvement with treatment satisfaction. All 10 patients with SUI reported improvement after vaginal laser treatment, 70% with marked improvement and 30% with improvement. All 10 patients with MUI also had improvement, 40% with marked improvement and 60% with improvement. There was no statistically significant difference in the treatment outcome between the two groups.

4. A SAFE AND EFFECTIVE OPTION FOR SUI AND MUI TREATMENT

Vaginal Erbium laser provides vaginal collagen remodeling and synthesis that may repair and restore the pelvic floor function. Despite the sample size limitation and short follow-up, this procedure presented a good and a safe clinical outcome in patients with SUI and MUI by assessment of ICIQ-UI SF questionnaires.



Baseline ICIQ-UI Score, Body Mass Index, Age, Average Birth Weight, and Perineometry Duration as Promising Predictors of the Short-Term Efficacy of Er:YAG Laser Treatment in Stress Urinary Incontinent Women: A Prospective Cohort Study

1. NEW PREDICTIVE MODEL FOR ASSESSING EXPECTED RESULTS OF SUI LASER TREATMENT

Dr. Ivan Fistonic et al. developed a new predictive model which will help practitioners assess the expected result of SUI laser treatment. The model identifies four key pre-intervention predictors which effect short-term Er:YAG outcomes.

Authors: Fistonic I & Fistonic N

Published in: Lasers in Surgery and Medicine, 2018

2. METHOD

An analysis was performed on a sample of 84 female patients ranging in age from 30 to 70 who suffered from SUI. The patients were treated with a 2940 nm wavelength Er:YAG Fotona laser. In a three-step protocol (30 days in between), the laser irradiation was applied to the anterior vaginal wall, the entire circumference of the vaginal canal, and the vestibule area.

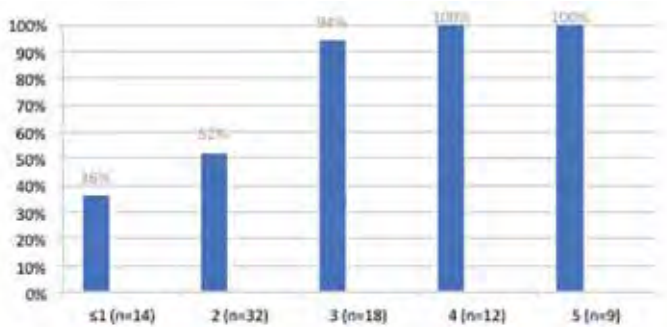


The analyzed predictors were: patient age, body mass index, number of births, average birth weight, last delivery weight, menopausal status, pelvic floor muscle strength (PFMS) of the pelvic diaphragm, adequacy of anatomic support to the bladder neck and urethro-vesical angle measured by Q-tip elevation, and ICIQ-UI baseline, pre-intervention value.

3. RESULTS IDENTIFY FOUR KEY PREDICTORS EFFECTING OUTCOME

The study reveals that age, body mass index, Q-tip elevation, and ICIQ-UI values prior to treatment are the four predictors that can be used to assess the outcome of laser treatment for SUI in female patients.

The effects of laser treatment were evident by an absolute change in the ICIQ-UI SF score and a relative decrease of 30% in the ICIQ-UI score 2-6 months after the treatment. The association between the Q-tip test and treatment outcomes was moderated by age. Q-tip was a significant predictor for patients between 44 and 53 years of age.



Number of positive predictors



IncontiLase® is an Effective and Durable Non-invasive Treatment for Stress Urinary Incontinence – Study of 175 Women with a 12-month Follow-up

Authors: Bizjak Ogrinc U, Sencar S, Lenasi H

Published in: *Lasers in Surgery and Medicine*, 2015



Lasers in Surgery and Medicine 47(487-497) (2015)

Novel Minimally Invasive Laser Treatment of Urinary Incontinence in Women

Uzka B. Ogrinc, MD, PhD,* Sabina Sencar, MD, PhD, and Helena Lenasi, MD, PhD*
*Znanstveno-raziskovalno središče Jozefine Župančič, University of Ljubljana, Faculty of Medicine, Institute of Urology, Ljubljana, Slovenia

Background and Objective: Urinary incontinence (UI) is an important and common clinical condition in women. The aim was to evaluate the effectiveness of the novel minimally invasive laser treatment (IncontiLase®) in women with stress urinary incontinence (SUI) and mixed urinary incontinence (MUI). The aim was to evaluate the effectiveness of the novel minimally invasive laser treatment (IncontiLase®) in women with stress urinary incontinence (SUI) and mixed urinary incontinence (MUI). The aim was to evaluate the effectiveness of the novel minimally invasive laser treatment (IncontiLase®) in women with stress urinary incontinence (SUI) and mixed urinary incontinence (MUI).

Study Design/Methods and Results: We included 175 women with SUI or MUI who were treated with IncontiLase® laser treatment. The study included 175 women with SUI or MUI who were treated with IncontiLase® laser treatment. The study included 175 women with SUI or MUI who were treated with IncontiLase® laser treatment.

Conclusion: The results of our study have shown that the novel minimally invasive laser treatment (IncontiLase®) is an effective and durable non-invasive treatment for stress urinary incontinence in women.

Key words: IncontiLase® laser treatment, stress urinary incontinence, mixed urinary incontinence

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OPEN ACCESS

1. PUBLISHED IN HIGH-IMPACT PEER-REVIEWED LASER MEDICINE JOURNAL

Lasers in Surgery and Medicine is the official journal of the American Society for Laser Medicine and Surgery (ASMLS) – it publishes the highest quality research and clinical manuscripts on the use of lasers in medicine and biology.

2. LARGE GROUP OF TREATED PATIENTS

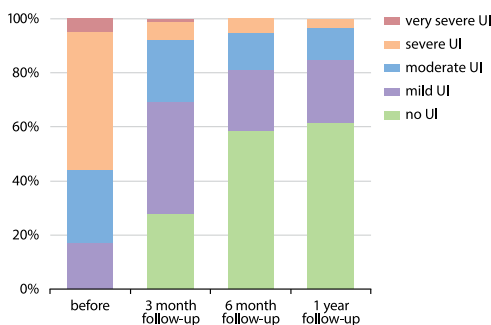
The prospective trial included 175 patients, who received 2-3 sessions of IncontiLase® treatment (SP Spectro Dynamis, Fotona, Slovenia) and were followed up to 12 months post-treatment. The study assessments included ICIQ questionnaire and ISI incontinence severity index determination, patient satisfaction questionnaire and VAS pain scale.

3. EXCELLENT RESULTS

One year after the IncontiLase® treatment, 62% of patients were free of symptoms of urinary incontinence. Results were even better in patients with pure stress urinary incontinence - 77% of these patients were dry 1 year after treatment.

4. INCONTILASE® IS A HIGHLY EFFICIENT AND SAFE METHOD FOR PATIENTS SUFFERING FROM STRESS URINARY INCONTINENCE

Patients with mixed urinary incontinence also get relief in stress symptoms, so it could be used in conjunction with overactive bladder therapy.



The effect of IncontiLase® therapy on the improvement of the grade of urinary incontinence (UI). Figure shows the distribution of patients (in %) with regard to the grade of incontinence (mild, moderate, severe, very severe) before treatment, at 2 months, six months and one year after the procedure.

Effects of Laser Treatment for Female Urodynamic Stress Incontinence on Pad Weight, Urodynamics, and Sexual Function

1. PUBLISHED IN HIGH IMPACT PEER-REVIEWED UROGYNECOLOGY JOURNAL

The International Urogynecology Journal is the official journal of the International Urogynecological Association (IUGA). It covers active topics on urogynecology and pelvic floor disorders and presents interdisciplinary coverage of all aspects of the field.

Authors: Tien Y-W, Hsiao S-M, Lee C-N, Lin H-H

Published in: International Urogynecology Journal, 2017

2. METHODOLOGY

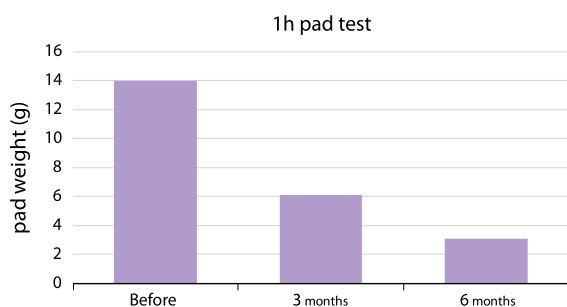
Thirty-two patients with mild, moderate, and severe SUI were treated once (XS Dynamis, Fotona, Slovenia) and followed for 3 and 6 months. Urodynamic studies, LUTS, and sexual function questionnaires (PBCC, USS, KHQ, and others) were assessed before and after the treatment.

3. OUTSTANDING RESULTS

Thirty-five women underwent the IncontiLase® procedure. Among the 28 women with baseline pad weights >1 g, 11 (39.3%) were objectively cured and 11 (39.3%) had improved. Among the 18 women with mild SUI, nine (50%) were cured and five (27.8%) had improved. Among the ten women with baseline pad weight >10 g, two (20%) were cured and six (60%) had improved. Data gained from different questionnaires also shows significant improvements. 40% of the partners of these patients reported improved sexual function.

4. CLINICALLY MEANINGFUL IMPROVEMENT IN SUI SYMPTOMS

Compared to surgical procedures, the IntimaLase® procedure seems to be very effective in the treatment of SUI and is not associated with any severe adverse effects. Further studies should be performed to assess the long-term sustained efficacy of this minimally invasive therapy.



Pad weights at baseline and 3 and 6 months after therapy

Non-ablative Er:YAG Laser for the Treatment of Type III Stress Urinary Incontinence (Intrinsic Sphincter Deficiency)

Authors: Gaspar A & Brandi H

Published in: Lasers in Medical Science, 2017



OPEN ACCESS



1. NEW TREATMENT OPTION FOR TYPE III STRESS URINARY INCONTINENCE (SUI)

This pilot study aimed to determine the safety and efficacy of the IntimaLase® treatment for managing the symptoms of type III stress urinary incontinence (intrinsic sphincter deficiency) in women.

2. METHODOLOGY

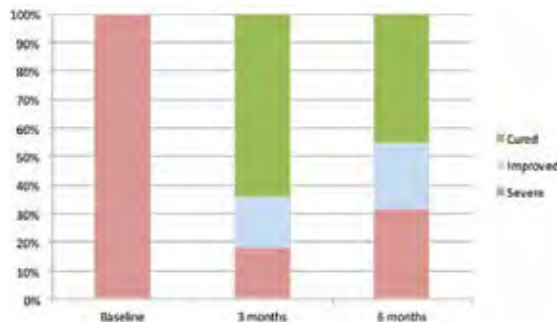
Twenty-two patients having diagnosed ISD participated in the study and were treated with the laser (SP Spectro Dynamis, Fotona, Slovenia) throughout the whole length of the urethra through a specially designed cannula. Treatment consisted of two laser sessions with a 3-week interval in-between. Therapeutic efficacy was assessed by the ICIQ-SF questionnaire for determining incontinence severity and quality of life, and the 1-h pad test for objective measure. Patients were followed for 6 months.

3. VERY PROMISING RESULTS

According to the ICIQ-SF questionnaire, 64% of patients were cured and 18% had improved at 3 months post-treatment, while at 6 months 46% were cured and 23% had improved. No change in SUI stage was observed in 18% at 3 months and 32% at 6 months. Importantly, however, even those patients that saw no improvement in their SUI stage had a slight improvement in their absolute ICIQ-SF scores. Furthermore, according to the Pad test, clinical improvement was shown in 82% of patients at 3 months and in 50% of patients at 6 months after the treatment.

4. NON-ABLATIVE ER:YAG TECHNOLOGY SEEMS TO WORK ALSO FOR TYPE III SUI

This study suggests that IntimaLase® treatment is a safe and efficacious alternative for patients with type III stress urinary incontinence. Future controlled studies will confirm this data and evaluate the long-term effects.



Patient distribution (in %) based on SUI improvement rates at 3 and 6 months following intraurethral Er:YAG laser treatment

How do SMOOTH™ Treatments Affect the Vaginal Mucosa? This Paper Gives Mechanistic Data Along with Clinical Evidence in Patients with Stress Urinary Incontinence

1. INTERDISCIPLINARY APPROACH - PHYSICS AND MEDICINE WORKING HAND IN HAND TO SHOW INCONTILASE® MODE OF ACTION

The paper, published in a high-impact medical laser journal, combines computer modelling of the Fotona SMOOTH® thermal pulsing effect, confirms the numerical calculations using *in vivo* thermal camera imaging, and presents data from a pilot study of 31 patients suffering from stress urinary incontinence, proving that the delivery of gentle thermal pulsing to the vaginal wall's mucosa can improve the symptoms of stress urinary incontinence.

2. SMOOTH™ PULSES GENTLY HEAT THE VAGINAL MUCOSA TO THE IDEAL TEMPERATURE

Numerical modelling and *in vivo* thermal camera measurements showed that SMOOTH™ laser pulses warm up the vaginal wall mucosa to peak temperatures up to 65°C, which is ideal for collagen remodeling and strengthening of the tissue, without damaging the epithelium.

3. CLINICAL STUDY IN PATIENTS WITH STRESS URINARY INCONTINENCE

The pilot clinical study used the IncontiLase® protocol (Dynamis, Fotona, Slovenia), which delivers SMOOTH™ pulses to the vaginal canal using a patented pulsing sequence, with an emphasis on the anterior vaginal wall. One treatment session was performed and the results were evaluated up to 6 months after treatment. ICIQ questionnaire, perineometry and post void residual volume were among the study assessments.

4. PILOT CLINICAL STUDY HAS SHOWN SIGNIFICANT AND CLINICALLY MEANINGFUL IMPROVEMENT IN INCONTINENCE SYMPTOMS AFTER INCONTILASE® TREATMENT

Significant improvement of urinary incontinence symptoms was seen at all follow-ups. Patients also had significantly improved voiding function.

Authors: Fistonc N, Fistonc I, Gustek SF, Bilajac Turina IS, Marton I, Vizintin Z, Kazic M, Hreljac I, Perhavec T, Lukac M

Published in: *Lasers in Medical Science*, 2016



Lasers Med Sci (2016) 31:1033–1040
 ORIGINAL ARTICLE

Minimally invasive, non-ablative Er:YAG laser treatment of stress urinary incontinence in women—a pilot study

Nikola Fistonc¹, Ivan Fistonc¹, Srdica Fistonc Galicki², Lea Senj Bliznac Turkalj³, Jagod Marjan⁴, Zdenka Vilina⁵, Marko Kozic⁶, Irena Hreljac⁷, Tadej Perhavec⁸, Matjaz Lukac⁹

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Abstract The study presents an assessment of effectiveness of active and a pilot clinical study of efficacy and safety of the Er:YAG laser for the treatment of stress urinary incontinence (SUI). The subject of this study is a treatment of SUI with a 20W and Er:YAG laser, operated in a special SMOOTH mode designed to increase temperature of the vaginal mucosa up to maximally 65 °C without ablating the epithelium. Numerical modelling of the temperature distribution within mucosa shows following its treatment with the SMOOTH mode. *In vivo* study was performed in order to determine the appropriate range of laser parameters. The laser treatment parameters were defined according to the results of the numerical modelling of the vaginal mucosa using a thermal camera. To investigate the clinical efficacy and safety of the SMOOTH mode Er:YAG laser SUI treatment, a pilot clinical study was performed. The study included 31 female patients suffering from SUI. Efficacy was evaluated at 1, 2, 3, and 6 months post treatment. ICIQ-UI questionnaire was collected as a primary trial outcome. Secondary outcomes included perineometry and residual urine volume measurements at 1, 2, 3, 4, 5, and 6 months post-treatment.

Keywords Stress urinary incontinence · Er:YAG laser · Minimally invasive SUI therapy

Introduction
 Female stress urinary incontinence (SUI) is significant public health problem, with estimated prevalence rates ranging from 8–12 % of adult women [1].

The SUI treatment option for SUI in public, laser muscle retraining (PMR), which produces good results, but often fails to achieve consistent long-term improvement because of poor patient compliance and lack of support and practice [2–4]. Traditional surgical approaches such as mesh or synthetic autologous and allogeneic vaginal repair have been largely replaced with laser therapy, including only repositioning sutures, which have demonstrated the superior effect of treated SUI among patients [5–8]. While traditional sling procedures are highly effective, they are associated with adverse events and complications such as bleeding, bladder pain, urinary incontinence, infection, pelvic pain [9]. In contrast, single incision perineoplasty, mesh, non-slings have been introduced and have become very popular [10] due to the

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Springer



A Study of the Objective Benefits and Safety of Er:YAG Laser in the Treatment of Genitourinary Syndrome of Menopause

Authors: Avul Z & Guven CM

Published in: *Lasers in Medical Science, 2023*

1. EXAMINING THE EFFICACY AND SAFETY OF ER:YAG LASER FOR GSM TREATMENT

The aim of this study was to evaluate changes in vaginal pH and epithelium maturation after Er:YAG laser treatment, and to assess its safety and efficacy on the symptoms of genitourinary syndrome of menopause (GSM).

2. DATA USED FROM PATIENTS WHO OPTED FOR AN ESTROGEN FREE ALTERNATIVE

This was a retrospective study conducted between November 2019 and April 2022 that included 32 women diagnosed with GSM, with a mean age of 59.72 ± 5.66 years, who had not benefitted from lubrication treatment and could not or would not use estrogen. The patients had received three sessions of Er:YAG laser (SP Dynamis, Fotona, Slovenia). Vaginal maturation index (VMI), maturation value (MV) and vaginal pH values of the patients before and after laser treatment were compared. Post-procedural complications and symptoms were also evaluated.

3. GSM-RELATED SYMPTOMS DECREASED SIGNIFICANTLY

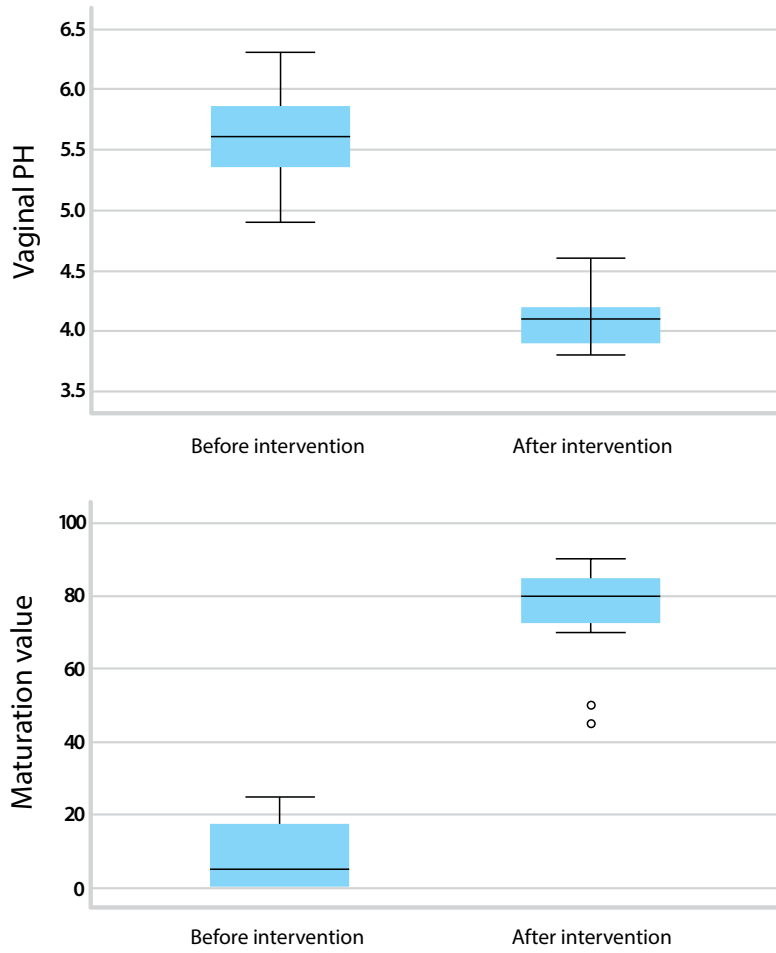
The study found a significant improvement in VMI, MV and vaginal pH at follow-up (5 months after treatment). After laser therapy, there was a significant decrease in vaginal pH ($p < 0.001$) and the proportion of parabasal cells in VMI ($p < 0.001$), while there was a significant increase in MV ($p < 0.001$) and the proportion of superficial cells in VMI ($p < 0.001$). In 84.4% of the patients, GSM-related symptoms regressed completely or decreased to a tolerable level.

4. ER:YAG LASER OFFERS AN EFFECTIVE TREATMENT ALTERNATIVE FOR GSM PATIENTS

Vaginal Er:YAG laser treatment offers a safe and effective alternative treatment method in a population of women with GSM who do not want to or cannot use estrogen therapy.



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Vaginal pH and maturation value before and after laser treatment

The Er:YAG Vaginal Laser for Management of Women with Genitourinary Syndrome of Menopause (GSM)

Authors: Lin K-L, Chou S-H, Lou Z-X, Liu Y-Y, Cheng J-C, Long C-Y

Published in: *Lasers in Medical Science*, 2022



OPEN ACCESS

1. INVESTIGATING THE EFFECTS OF ER:YAG LASER ON GSM AND THE SEXUAL FUNCTION OF POSTMENOPAUSAL WOMEN

This retrospective study of sixty-four postmenopausal women with GSM measured the effects of three sessions of vulvovaginal erbium laser treatment (XS Dynamis, Fotona, Slovenia).

2. MULTIPLE SYMPTOMS ASSESSED WITH 12 MONTH FOLLOW-UP

A baseline and post-treatment vaginal status was assessed by measuring vaginal pH, patients' subjective vulvovaginal atrophy (VVA) symptoms, which included dryness, dyspareunia, itching, and burning. The urinary response to treatment was assessed using ICIQ-SF, UDI-6, IIQ-7, OABSS, and POPDI-6. Sexual function was evaluated using the Female Sexual Function Index (FSFI) before and after vulvovaginal laser therapy. Patient follow-ups were scheduled for 12 months after treatment. A total of sixty-four patients were enrolled in the study.

3. SIGNIFICANT IMPROVEMENT OBSERVED IN THE PERCENTAGE OF NEGATIVE SYMPTOMS

The study noted significant improvement in dryness, dyspareunia, itching, burning and in lower urinary tract symptoms evaluated with ICIQ-SF, UDI-6, IIQ-7, OABSS, and POPDI-6 ($P < 0.05$). Patients' overall satisfaction regarding their sexual life, assessed via Female Sexual Function Index (FSFI), showed significant improvement in its six domains of sexual function ($P < 0.05$). The pH level of vaginal secretions significantly decreased.

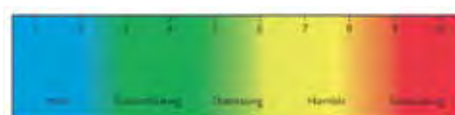
4. ER:YAG VAGINAL LASER IS A SAFE AND EFFICACIOUS THERAPY FOR POSTMENOPAUSAL WOMEN

The Er:YAG vaginal laser procedure is associated with a significant improvement in GSM symptoms and sexual function of postmenopausal women. No long-term complications were found up to 1-year post-treatment.

GSM symptoms before and 12 months after vulvovaginal laser

GSM associated symptoms (n=64)	Pre-treatment	Post-treatment	P values
Dryness	64(100)	3(4.7)	<0.001*
Burning	48(75)	4(6.3)	<0.001*
Irritation	42(65.6)	2(3.1)	<0.001*
Dyspareunia	32(50)	4(6.3)	<0.001*
Frequency	39(60.9)	5(7.8)	<0.001*
SUI	28(43.7)	3(4.7)	<0.001*
Total distress	7.83±1.4	2.4±0.9	<0.001**

Data are given as n (%) or mean ± standard for the VAS scale. SUI: stress urinary incontinence; Total distress: average of VAS scores with dryness, burning, irritation, and dyspareunia
*McNemar's Test
**Statistical significance; Paired t-test



Visual analog scale for symptom intensity

Quality of life questionnaires from baseline before the intervention and 12 months post-treatment

(n=64)	Baseline	12 months post laser	P values*
ICIQ-SF	8.2±5.9	6.8±5.4	0.013*
UDI-6	28.6±18.3	22.9±17.0	0.006*
IIQ-7	25.8±24.9	20.9±22.6	0.005*
OABSS	4.5±3.4	3.1±2.9	0.001*
POPDI-6	4.7±4.5	3.9±4.1	0.037*

Values are expressed as mean ± standard deviation
*Statistical significance; paired t-test

Changes in scores of Female Sexual Function Index (FSFI) before and after treatment with erbium laser and pH values of vaginal secretion

	Pre-treatment	Post-treatment	P
FSFI (n = 64)	17.8±9.7	27.6±6.6	<0.05*
Desire (1,2)	2.6±1.4	3.3±0.9	<0.05*
Arousal (3-6)	2.6±1.6	3.3±1.1	<0.05*
Lubrication (7-10)	3.0±1.8	4.2±1.2	<0.05*
Orgasm	3.0±1.8	4.2±1.4	<0.05*
Satisfaction	3.2±1.9	4.5±1.4	<0.05*
Pain	3.2±2.0	4.8±1.4	<0.05*
pH	8.6±1.2	6.3±0.9	<0.05*

* Significant difference
Data are given as mean ± standard deviation Paired t-test

Efficacy of Two Laser Treatment Strategies for Breast Cancer Survivors with Genitourinary Syndrome of Menopause

Authors: Okui NP,
Okui M, Kouno Y, Nakano K,
Gambacciani M

Published in: *Cereus*, 2023



1. EVALUATING VEL VS. VEL+ND:YAG FOR PAIN IN BREAST CANCER SURVIVORS WITH GSM

The aim of this study was to compare the effectiveness of vaginal Er:YAG SMOOTH mode laser (VEL) treatment with a combined Nd:YAG laser + VEL treatment (Fotona, Slovenia) over time, with respect to therapeutic targets for pain in breast cancer survivors with GSM.

2. MORE THAN 200 WOMEN WHO RECEIVED EITHER VEL OR VEL+ND:YAG WERE ENROLLED

This retrospective, case-control study targeted sexually active breast cancer survivors who reported GSM with vulvodynia and dyspareunia. Propensity score (PS)-matching analysis was used to compare two-year postoperative data retrospectively. Symptoms were assessed using the visual analog scale (VAS) for vulvodynia before and after laser treatment for one, three, six, 12, and 24 months after completion. Female Sexual Function Index (FSFI) and Vaginal Health Index Score (VHIS) were also assessed.

3. RESULTS SHOW GREATER IMPROVEMENT FROM COMBINED TREATMENT

Comparing the two groups, the results confirmed that VEL+Nd:YAG treatment of the vaginal vestibule and vaginal opening reduced superficial vulvar pain more effectively, extensively, and over a longer period than VEL. FSFI improved significantly in the VEL+Nd:YAG group and persisted for two years. VHIS improved equally in both groups and was not significantly different. The VAS values in the VEL+Nd:YAG group and the VEL group decreased from the pre-treatment to 3.79 ± 0.63 ($p < 0.001$ vs. baseline) and 5.56 ± 0.89 ($p < 0.001$ vs. baseline) after the third treatments, respectively. After 24 months, the VAS value in the VEL+Nd:YAG group and the VEL group was at 4.43 ± 1.38 ($p < 0.001$ vs. baseline) and 5.56 ± 0.89 ($p < 0.001$ vs. baseline), respectively.

4. AN EFFECTIVE NOVEL TREATMENT FOR BREAST CANCER SURVIVORS WITH GSM

The study showed that VEL and Nd:YAG combination treatment is effective as a novel treatment for GSM with superficial vulvar pain and dyspareunia in breast cancer survivors. Over two years, the combination treatment was more effective than VEL alone. Combination therapy had no significant adverse events.

Short-Term Effects of an Erbium/Neodymium Laser Combination in Superficial Dyspareunia: A Pilot Study

1. A NOVEL COMBINATION LASER THERAPY FOR SUPERFICIAL DYSPAREUNIA

This prospective pilot study aimed to evaluate the effects of combining Nd:YAG laser with vaginal erbium laser (VEL), as a non-ablative photothermal therapy for superficial dyspareunia in postmenopausal women (PMW) suffering from genitourinary syndrome of menopause (GSM).

2. SINGLE VS. DUAL TREATMENT COMPARED BEFORE AND AFTER 3 SESSIONS

Two groups of sexually active PMW reporting superficial dyspareunia were selected: one (15 patients, VEL) was treated using an Er:YAG laser (XS Fotona SMOOTH; Fotona, Ljubljana, Slovenia) with a wavelength of 2940 nm; in the other group (15 patients, VEL + Nd:YAG), this treatment was followed by Nd:YAG laser (Fotona SP Dynamis, PIANO mode) treatment. Treatment consisted of three laser applications at 30-day intervals. Symptoms were assessed before, after each laser application and after 1 and 3 months from the end of the treatment, using the subjective visual analog scale (VAS) for superficial dyspareunia.

3. THE VEL + ND:YAG GROUP SHOWED GREATER IMPROVEMENT

The results of this study showed that both groups achieved a rapid and significant improvement of superficial dyspareunia over time ($p < 0.001$) independently from age and years since menopause. The VEL + Nd:YAG group showed a greater improvement of superficial dyspareunia ($p < 0.001$); this difference was evident since the first treatment and remained stable over time.

4. COMBINING ND:YAG WITH VEL OFFERS BENEFITS FOR TREATING SUPERFICIAL DYSPAREUNIA

The addition of Nd:YAG to the vaginal erbium laser (VEL) protocol may induce greater improvement of superficial dyspareunia in postmenopausal women with GSM.

Authors: Gambacciani M & Fidecicchi T

Published in: Climacteric, 2022



OPEN ACCESS

Short-term effects of an erbium/neodymium laser combination in superficial dyspareunia: a pilot study

M. Gambacciani¹ and T. Fidecicchi²

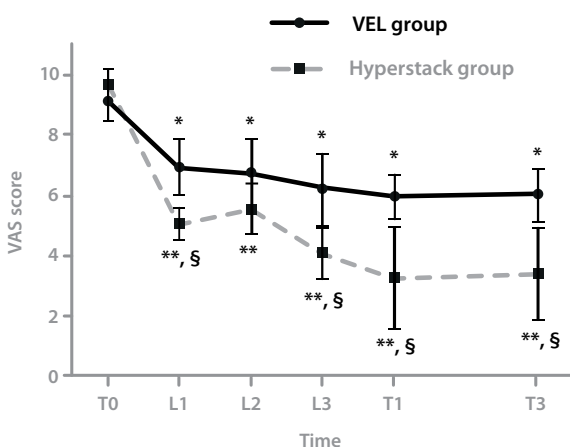
¹Università e Ospedale S. Giovanni Clinical Center, P.O. Italy; ²Department of Obstetrics and Gynecology, P.O. Italy

Abstract
 Objective: This prospective pilot study aimed to evaluate the effects of associating a neodymium:yttrium-aluminum-garnet (Nd:YAG) laser with vaginal erbium laser (VEL) in non-ablative photothermal therapy for superficial dyspareunia (SD) in postmenopausal women (PMW).
 Methods: Two groups of sexually active PMW reporting superficial dyspareunia were selected: one (15 patients, VEL) was treated using an Er:YAG laser (XS Fotona SMOOTH; Fotona, Ljubljana, Slovenia) with a wavelength of 2940 nm; in the other group (15 patients, VEL + Nd:YAG) this treatment was followed by Nd:YAG laser (Fotona SP Dynamis, PIANO mode) treatment. Treatment consisted of three laser applications at 30-day intervals. Symptoms were assessed before, after each laser application and after 1 and 3 months from the end of the treatment, using the subjective visual analog scale (VAS) for superficial dyspareunia.
 Results: Both groups showed a rapid and significant improvement of superficial dyspareunia over time ($p < 0.001$) independently from age and years since menopause. The VEL + Nd:YAG group showed a greater improvement of superficial dyspareunia ($p < 0.001$); this difference was evident since the first treatment and remained stable over time.
 Conclusions: The addition of Nd:YAG to VEL may induce greater improvement in superficial dyspareunia in PMW with GSM.

Introduction
 Dyspareunia is the most bothersome symptom in sexually active women suffering from genitourinary syndrome of menopause (GSM). Dyspareunia may be chronic and generally responsive to general and systemic treatments associated with estrogen deficiency, dyspareunia severity, progression, sexual satisfaction and quality of life for postmenopausal women (PMW) [1]. In addition to hormonal and non-hormonal therapies, CO₂ laser may improve GSM symptoms as well as sexual activity success rates [2-4]. A large survey conducted in over 1000 PMW women showed that the VEL appears to be safe, with a very low risk for side effects, with no need to suspend sexual activity during and after the treatment [5].
 The neodymium:yttrium-aluminum-garnet (Nd:YAG) laser is a solid-state optical pumping laser with a wavelength of 1064 nm that has a deeper optical penetration and heat. The Nd:YAG laser is one of the most versatile and interesting lasers to dermatological laser medicine, having a wide spectrum of applications. Depending on the wavelength and mode, the Nd:YAG laser can be used for benign pigmented lesions, tattoos, traumatic

Results and conclusion
 This pilot, prospective, comparative study was performed in sexually active PMW attempting the neodymium:yttrium-aluminum-garnet (Nd:YAG) laser combination in superficial dyspareunia.

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Mean visual analog scale (VAS) score over time for the two treatment groups. Vaginal erbium laser (VEL) group and VEL + Nd:YAG group VAS scores were compared using the post-hoc test with Bonferroni correction * $p < 0.001$ versus TO of VEL group. ** $p < 0.001$ versus TO of VEL + Nd:YAG group. § $p < 0.001$ versus corresponding time of VEL group. L1, L2, L3, laser applications, TO (baseline), 2-4 weeks prior to first laser treatment; T1, 1 month from last laser application; T3, 3 months from last laser application; VEL + Nd:YAG, neodymium: yttrium-aluminum-garnet.

Superficial Dyspareunia Treatment with Hyperstacking of Er:YAG SMOOTH Laser: A Short-Term, Pilot Study in Breast Cancer Survivors

Authors: Fidecicchi T,
Gaspar A, Gambacciani M

Published in:
Menopause, 2022



OPEN ACCESS



1. TREATING SUPERFICIAL DYSPAREUNIA IN POSTMENOPAUSAL BREAST CANCER SURVIVORS

The purpose of this study was to evaluate the effects of a modified Vaginal Erbium Laser (VEL) protocol with hyperstack mode on the vaginal vestibulum and introitus to treat superficial dyspareunia in postmenopausal breast cancer survivors suffering from genitourinary syndrome of menopause (GSM).

2. ENHANCING THE VEL PROTOCOL WITH A SECOND STEP OF ERBIUM HYPERSTACKING

This prospective, randomized pilot study analyzed two groups of postmenopausal women suffering from superficial dyspareunia. 34 women (VEL group) were treated with 2,940 nm Er:YAG laser (XS Fotona SMOOTH; Fotona, Ljubljana, Slovenia), while a second group of 34 patients (hyperstack group) received the same treatment along with a modified second step of the VEL protocol for the treatment of the vestibulum and introitus, which consisted of hyperstacked subablative, long pulses with very low fluence. For each group, three laser applications at 30-day intervals were performed. Symptoms were assessed before, after each application, and after 1 and 3 months from the last laser application, using the visual analog scale score for superficial dyspareunia.

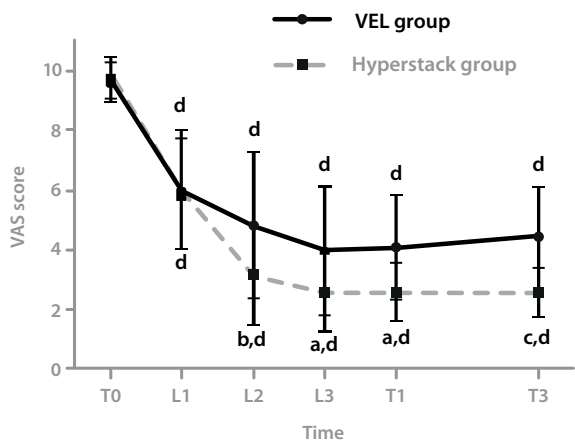
3. RESULTS SHOW GREATER AND MORE PERSISTENT IMPROVEMENT IN HYPERSTACK GROUP

The results of this study showed that superficial dyspareunia improved in both groups over time ($P < 0.001$), regardless of age and years since menopause status. The reduction in the visual analog scale score after the third laser application was 58% in the VEL group versus 73.5% in the hyperstack group. Since the first of the three laser sessions, the hyperstack group showed more notable ($P < 0.001$) and persistent improvement of superficial dyspareunia symptoms.

4. HYPERSTACK TREATMENT LEADS TO MORE SIGNIFICANT IMPROVEMENT

Adding a hyperstack treatment protocol to the standard VEL treatment may enhance the beneficial effects on superficial dyspareunia in breast cancer survivors. The hyperstack treatment of the introitus and vestibulum leads to a more significant improvement in superficial dyspareunia than VEL treatment alone.

Hyperstack mode for superficial dyspareunia



Characteristics of overall trend of means observed in the two groups

Trend	VEL group		Hyperstack group	
	Estimate	95% CI	Estimate	95% CI
Linear	-3,85 ^a	-4.26 to -3.43	-5.52 ^{a,b}	-5.93 to -5.10
Quadratic	2.70 ^a	2.29 to 3.11	3.28 ^a	2.87 to 3.70
Cubic	-0,66 ^c	-1.07 to -0,24	-0,78 ^a	-1.19 to -0.36

Both slopes show significant linear, quadratic, and cubic shapes.
 The parameter estimates with their 95% CI are reported. $P < 0.05$ was considered statistically significant.
 VEL, vaginal erbium laser
^a $P < 0.001$ versus VEL group
^b $P < 0.001$ versus VEL group
^c $P < 0.001$ versus VEL group

Sexual Function After Vaginal Er:YAG: The Results of a Large, Multicentric, Prospective Study

Authors: Gambacciani M,
Albertin E, Torelli MG,
Bracco GL, Casagrande AC,
Martella L, Baiocchi G,
Alfieri S, Russo N, Cervigni M

Published in:
Climacteric, 2020



OPEN  ACCESS



1. EXAMINING EFFECTS OF ER:YAG ON POSTMENOPAUSAL GSM

The aim of this multicentric, prospective study was to evaluate the effects of vaginal erbium laser (VEL-SMOOTH®) on sexual function in postmenopausal women suffering from genitourinary syndrome of menopause (GSM).

2. A LARGE, MULTICENTRIC STUDY OF 1081 POSTMENOPAUSAL WOMEN

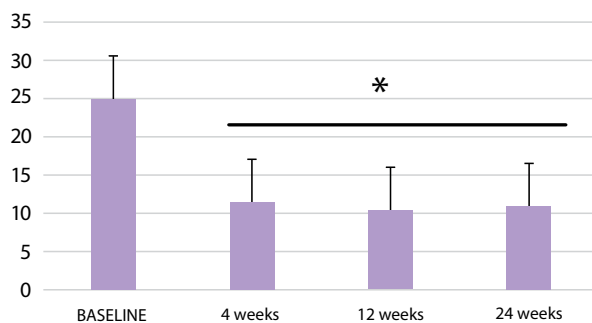
The study was performed on an outpatient basis without anesthesia or drug use before or after the intervention, using an erbium laser (XS Fotona Smooth®) in 1081 postmenopausal women (age 54.3 ±3.9 years) treated with up to three laser applications every 30 days. Patients were assessed using the Female Sexual Function Index (FSFI) and the Female Sexual Distress Scale-Revised (FSDS-R).

3. RESULTS SHOW IMPROVEMENT IN SEXUAL FUNCTION WITH NO SIDE EFFECTS

The FSDS-R scores significantly improved at all follow-ups ($p < 0.01$ vs. corresponding basal values, see Chart). Also individual FSFI domain scores significantly ($p < 0.01$, see Table) increased after VEL-SMOOTH® treatment, and remained significantly higher, up to the 24th week after the end of treatment. The total FSFI scores improved from basal values of 15.5 ±1.5 to 27.0 ±3.5 at the 24-week follow-up ($p < 0.01$). No adverse events were recorded during the study.

4. VEL-SMOOTH® IS AN EFFECTIVE SOLUTION FOR GSM IN POSTMENOPAUSAL WOMEN

The results of this large, multicentric, prospective study show that VEL-SMOOTH® is effective in improving sexual function and overall satisfaction with sexual life in postmenopausal women suffering from severe GSM.



The values of 554 Female Sexual Distress Scale-Revised (FSDS-R) tests in baseline conditions and after treatment with vaginal erbium laser (VEL), irrespective of number of laser treatments (see text for details). Data are presented as mean \pm standard error.

*The values were significantly ($p < 0.01$) different vs. basal values

After VEL treatment, 4, 12 in 24 weeks

FSFI domain	Before treatment	After treatment		
		4 weeks	12 weeks	24 weeks
Desire	3.0 \pm 0.5	4.0 \pm 1.5	4.0 \pm 1.5	4.7 \pm 1.5
Arousal	2.7 \pm 1.5	4.0 \pm 1.5	4.0 \pm 1.5	4.0 \pm 1.5
Lubrication	2.1 \pm 0.5	4.8 \pm 0.5	4.9 \pm 0.5	4.8 \pm 1.5
Orgasm	2.7 \pm 0.7	4.0 \pm 0.5	4.0 \pm 0.5	4.0 \pm 1.5
Satisfaction	2.5 \pm 1.5	4.9 \pm 1.5	4.9 \pm 1.5	4.9 \pm 1.5
Pain	2.5 \pm 0.5	4.8 \pm 0.5	4.9 \pm 0.5	4.7 \pm 1.5
Total score	15.5 \pm 1.5	27.5 \pm 2.5	27.6 \pm 2.7	27.0 \pm 3.5

The values of 569 Female Sexual Function Index (FSFI) tests in baseline conditions and after treatment with vaginal erbium laser, irrespective of number of laser treatments (see text for details). Data are presented as mean \pm standard error. The values of each specific domain and total score after the treatment and at the end of the observation period were significantly ($p < 0.01$) different vs. corresponding basal values.

Histological Findings After Non-ablative Er:YAG Laser Therapy in Women with Severe Vaginal Atrophy

Authors: Gaspar A, Silva J, Calderon A, Di Placido V, Vizintin Z

Published in: *Climacteric*, 2020



OPEN ACCESS



1. EVALUATING THE USE OF ER:YAG LASER FOR SEVERE VAGINAL ATROPHY

The aim of this study was to evaluate the effect of non-ablative erbium vaginal laser treatment on vaginal mucosa tissue affected by severe atrophy.

2. VAGINAL BIOPSIES PERFORMED BEFORE AND 3 MONTHS AFTER TREATMENT

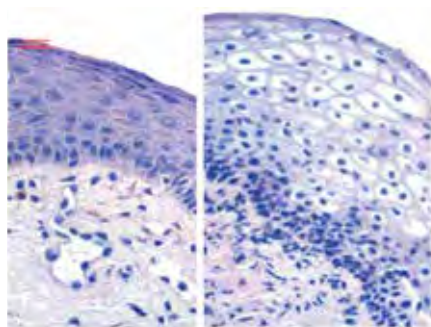
Ten patients with severe genitourinary syndrome of menopause were treated with two sessions of the Er:YAG (XS Dynamis, Fotona, Slovenia) separated by 4 weeks. Vaginal biopsies were performed before and 3 months after the second treatment. The improvement in vaginal atrophy was assessed using multiple measuring tools before and 6 months after the treatment. The degree of patient's satisfaction was also assessed.

3. RESULTS SHOW SIGNIFICANT IMPROVEMENT IN VAGINAL WALL MUCOSA

Microscopic examination showed significant changes in the main structural components of the vaginal wall mucosa after two non-ablative Er:YAG laser sessions. The epithelial thickness increased from 45 μm (10-106 μm) to 153 μm (97-244 μm) measured 3 months after the final laser treatment. Vaginal atrophy improved in all patients by all measured outcomes. The degree of patient satisfaction was very high (3.6 on the Likert four-point scale). No adverse events or complications were observed in any of the sessions.

4. ER:YAG LASER IS A SAFE AND EFFECTIVE TREATMENT FOR SEVERE VAGINAL ATROPHY

The non-ablative Er:YAG laser seems to be a safe and effective method to increase epithelial thickness of the vaginal mucosa in patients with severe vaginal atrophy.



40x magnification shows an average epithelial thickness of patient No.2 before the treatment (left picture) of 106 μm (85-120 μm) with an average of 9 (7-11) layers of cells and no glycogenic load, and after the treatment (right picture) 183 μm (160-215 μm) average of epithelial thickness with an average of 21 (15-25) layers of cells, with a significant amount of glycogen and basal cell hyperplasia.

Thickness of endometrial epithelium	Before laser treatment	3 months after final laser treatment
Epithelial thickness (μm)	45.0 \pm 33.4	152.9 \pm 44.7
Number of cell layers	6.9 \pm 2.4	18.9 \pm 5.6

Long-term Effects of Vaginal Er:YAG Laser in the Treatment of Genitourinary Syndrome of Menopause

1. TWO-YEAR FOLLOW-UP OF PATIENTS

First longitudinal study on the use of minimally invasive Er:YAG technology for the treatment of genitourinary syndrome of menopause (GSM), showing long-term efficacy of RenovaLase® (Dynamis, Fotona, Slovenia).

2. LARGE GROUP OF TREATED PATIENTS

205 postmenopausal women received three laser sessions of RenovaLase® at 30-day intervals. Study assessment was performed throughout the 24-month follow-up period and included the subjective visual analogue scale (VAS) and the objective vaginal health index score (VHIS). Furthermore, postmenopausal women suffering from stress urinary incontinence symptoms were evaluated with the International Consultation on Incontinence Questionnaire—Urinary Incontinence Short Form (ICIQ-UI SF).

3. BETTER RESULTS COMPARED TO LOCAL TREATMENT

Non-ablative Er:YAG laser treatment induced a statistically significant ($p < 0.01$) decrease in VAS for vaginal dryness and dyspareunia, and VHIS was significantly increased ($p < 0.01$) up to the 12th month after the final laser treatment. Values reported after 18 and 24 months returned to the baseline level. Furthermore, 144 women suffering from mild to moderate SUI also showed improvement in urine leakage. No major adverse events were reported.

4. STRONG PROOF OF EFFICACY AND SAFETY OF THE RENOVALASE® TREATMENT

The efficacy of non-ablative Er:YAG laser treatment has been demonstrated by several clinical studies, but data on long-term effects was lacking to fully support it. This longitudinal study therefore fills an important gap in the story of non-invasive treatments for GSM.

Authors: Gambacciani M, Levancini M, Russo E, Vacca L, Simoncini T, Cervigni M

Published in:
Climacteric, 2018



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Intraurethral Er:YAG Laser for the Management of Urinary Symptoms of Genitourinary Syndrome of Menopause: A Pilot Study

Authors: Gaspar A, Maestri S,
Silva J, Brandi H, Luque D,
Koron N, Vizintin Z

-

Published in: *Lasers in Surgery and Medicine*, 2018



OPEN ACCESS



1. ASSESSING THE SAFETY AND EFFICACY OF INTRAURETHRAL ER:YAG TREATMENT

There are several treatment methods available for the management of VVA symptoms of GSM, whereas urinary tract dysfunction often remains overlooked and undertreated. The objective of this pilot study was to assess the safety and efficacy of intraurethral Er:YAG laser treatment of urinary symptoms of GSM.

2. TWO ER:YAG SMOOTH™ MODE TREATMENTS

29 female patients, aged between 56 and 77 years, with diagnosed GSM, having less than 5% of vaginal superficial cells in the cytology, vaginal pH higher than 5, with urinary symptoms of GSM (dysuria, frequency, urgency) and impaired continence due to urethral atrophy, received two sessions of the intraurethral non-ablative Er:YAG SMOOTH™ mode laser therapy (SP Spectro Dynamis, Fotona, Slovenia), with a 3-week interval in-between the sessions. The therapeutic efficacy was determined using ICIQ-SF, the 1-hour pad test and VAS scores. Follow-ups (FU) were at 3 and 6 months.

3. ALL URINARY SYMPTOMS OF GSM IMPROVED

The intraurethral laser procedure performed in this study successfully reduced the symptoms of dysuria, urgency, and frequency in the treated patients. A statistically significant long-term effect was observed, and the positive effects appear to last up to 6 months following laser treatment.

4. AN EFFICIENT, SAFE AND RELIABLE TREATMENT ALTERNATIVE

Non-ablative Erbium SMOOTH™ mode therapy proves to be a valid and reliable alternative to traditional treatment options, as its positive effects last up to 6 months, and based on the modality, both VVA and urinary symptoms can be addressed. Most importantly, Erbium SMOOTH™ laser treatment can be used in patient populations for which other treatment methods are not recommended (e.g. breast cancer survivors).

Average improvement rates (%) from baseline values

	3-month FU	6-month FU
Dysuria	87 (12)	64 (25)
Urgency	79 (18)	44 (35)
Frequency	77 (18)	52 (23)
ICIQ-UI	64 (25)	40 (31)
1-h pad test (g)	59 (13)	42 (20)

Results are presented as mean (SD)

Vaginal Er:YAG Laser as Second-generation Thermotherapy for the Genitourinary Syndrome of Menopause: A Pilot Study in Breast Cancer Survivors

1. A MINIMALLY INVASIVE SOLUTION FOR BREAST CANCER SURVIVORS

The objective of the study was to evaluate the efficacy and acceptability of the RenovaLase® procedure for treating patients with premature GSM due to estrogen blocking therapy.

2. METHODOLOGY

Forty-three postmenopausal breast cancer survivors received 3 RenovaLase® treatments (XS Dynamis, Fotona, Slovenia) with 30 days in-between the sessions. Symptoms were evaluated before the treatment and after 1, 3, 6, 12, and 18 months using two methods: subjective Visual Analog Scale (VAS) and objective Vaginal Health Index Score (VHIS).

3. VERY PROMISING RESULTS

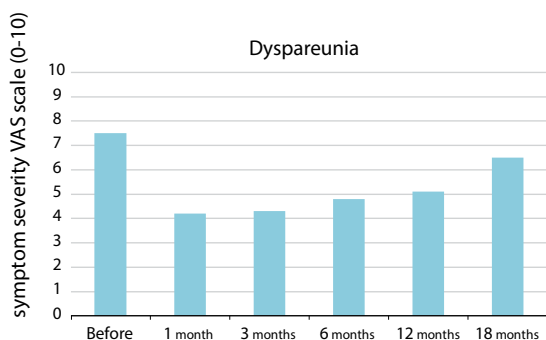
VAS values for vaginal dryness showed a statistically significant reduction from baseline 8.5 ±1.0 cm to 4.4 ±1.2 cm after 3 months, to 5.5 ±1.5 cm after 12 months, and returned to nearly baseline levels at 18 months (NS vs basal values). VAS values for dyspareunia followed a similar pattern. VHIS score showed a statistically significant increase from baseline values of 8.1 ±1.3 to 21.0 ±1.4 after the third treatment and to 18 ±1.8 at twelve months from the final laser treatment. VHIS score was kept above baseline values even after 18 months from the final treatment (NS vs basal values).

4. RENOVALASE IS A SAFE TREATMENT FOR BREAST CANCER SURVIVORS

Results from this study indicate that RenovaLase® is a treatment option for GSM in breast cancer patients whose current treatment options are still very limited.

Authors: Gambacciani M
& Levancini M

Published in:
Menopause, 2017



Effect of VEL on dyspareunia in postmenopausal breast cancer survivors



RenovaLase® Treatment Induces Significant Improvement of Genitourinary Syndrome of Menopause (GSM)

Authors: Gambacciani M, Levancini M, Cervigni M

Published in: *Climacteric*, 2015



Vaginal erbium laser: the second-generation thermo-therapy for the genitourinary syndrome of menopause

ABSTRACT

INTRODUCTION

CONCLUSIONS

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1. HIGH IMPACT JOURNAL

Published in *Climacteric*, the Journal of the International Menopause Society (IMS). The journal was founded in 1998 and has become a leader in publishing peer-reviewed research on menopause.

2. HORMONE-FREE TREATMENT FOR THE SYMPTOMS OF GENITOURINARY SYNDROME OF MENOPAUSE (GSM)

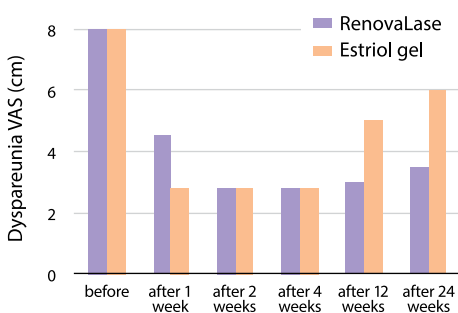
GSM (or vulvovaginal atrophy) is a chronic condition, which affects up to half of all postmenopausal women. Symptoms of GSM include dryness, burning, irritation, lack of lubrication and impaired sexual function. Traditional treatments have been limited to local or systemic estrogen therapy.

3. MATERIALS AND METHODS

45 postmenopausal women with symptoms of GSM were treated with a non-ablative vaginal erbium laser (XS Dynamis, Fotona, Slovenia). As a control group, 25 postmenopausal women were treated with an established treatment for GSM (1 g of vaginal gel containing 50 µg of estriol twice weekly, for 3 months).

4. SIGNIFICANT IMPROVEMENT OF VAGINAL DRYNESS AND DYSPAREUNIA

RenovaLase® treatment resulted in a rapid and long-lasting improvement in the signs and symptoms of GSM. This treatment is of special importance in the treatment of postmenopausal women who cannot be treated with hormones.



Effect of RenovaLase® therapy on dyspareunia using the visual analog score (VAS) on a 10-point scale for the women receiving laser treatment and the women receiving estriol. In the estriol group, a reduction of efficacy can be seen 12 weeks after the end of treatment. Conversely, the RenovaLase® group maintained the same positive results throughout the entire study period up to the 6-month follow-up.



Treating Vaginal Laxity Using Non-ablative Er:YAG Laser: A Retrospective Case Series of Patients From 2.5 Years of Clinical Practice

1. A MINIMALLY INVASIVE TREATMENT FOR VAGINAL LAXITY

The aim of this study was to retrospectively assess the effectiveness and safety of a nonablative Er:YAG laser procedure (IntimaLase®, XS Dynamis, Fotona, Slovenia). for vaginal laxity in patients treated in a clinical practice during a 2.5-year period.

2. A REVIEW OF 2.5 YEARS OF CLINICAL PRACTICE

Laser treatment for vaginal laxity was performed using an intravaginal nonablative Er:YAG laser. Effectiveness was assessed using a Patient Satisfaction Questionnaire and also by independent evaluation of before and after treatment photographs of the patients' introitus. The safety and tolerability of the procedure was monitored in all patients.

3. RESULTS SHOW IMPROVEMENT IN PATIENTS' VAGINAL TIGHTNESS SATISFACTION

The study showed an improvement of sexual gratification and improvement of vaginal tightness, as assessed by patients. The tightness of the introitus was also improved, as assessed by independent evaluators. 92.7% of patients experienced improvement of sexual gratification after the IntimaLase® laser treatment. The results of the visual evaluation of the grade of laxity improvement in the introitus area, when open introitus photos were evaluated, showed that 69% (n = 20/29) of patients had an improvement of laxity.

4. ER:YAG LASER PROVIDES IMPROVEMENT OF SEXUAL SENSATION

The results of this study have confirmed that patients suffering from vaginal laxity can be effectively treated using the nonablative Er:YAG IntimaLase® procedure without adverse effects.

Authors: Mitsuyuki M, Stok U,
Hreljac I, Yoda K, Vizintin Z

Published in:
Sexual Medicine, 2020



Treating Vaginal Relaxation Syndrome Using Er:YAG Fractional Laser: A Retrospective Study

Authors: Setyaningrum T,
Tjokroprawiro BA,
Listiawan MY, Santoso B,
Prakoewa CRS
-
Published in: Gynecology
and Minimally Invasive
Therapy, 2022



OPEN ACCESS



1. A MINIMALLY INVASIVE TREATMENT FOR VAGINAL LAXITY

This study evaluates the effectiveness and side effects of fractional Er:YAG laser therapy in VRS patients. Vaginal relaxation syndrome (VRS) comprises vaginal laxity and stress urinary incontinence (SUI). Laser vaginal tightening (LVT) therapy using a fractional 2940 nm Er:YAG laser may represent a nonsurgical option for both complaints.

2. A RETROSPECTIVE STUDY ANALYZING VRS PATIENTS TREATED BETWEEN 2014 AND 2019

The medical records of 24 VRS patients who were treated with fractional Er:YAG laser therapy (XS Dynamis, Fotona, Slovenia) in a private clinic in Surabaya, Indonesia, were analyzed in the study (54% with vaginal laxity, 33% with SUI, and 13% with vaginal laxity and SUI). Most of the patients were 36–45-year-old and had 2 children, and 79% of the patients had had a vaginal delivery. Objective questions were asked to rate patients' satisfaction with the results of the therapy, namely dissatisfaction, and mild, moderate, or strong satisfaction.

3. RESULTS SHOW SIGNIFICANT SYMPTOM IMPROVEMENT AFTER LVT THERAPY

After 3 LVT treatment sessions, mild satisfaction was observed in 15% of patients, moderate satisfaction was noted in 54% of patients, and high satisfaction was noted in 31% of patients. Among 11 patients with SUI, 36% recovered after the first LVT, and 100% recovered after the second LVT therapy.

4. FRACTIONAL ER:YAG LASER IS AN EFFECTIVE OPTION FOR TREATMENT OF VRS

The results of this retrospective study indicate that LVT therapy with a fractional Er:YAG laser is an effective and safe nonsurgical therapy for treatment of Vaginal Relaxation Syndrome (VRS).

VRS patients who underwent 1, 2 or 3 LVT procedures

	1 LVT	2 LVT	3 LVT
Patients who did not return for follow-up	3 (12,5%)	4 (24%)	0 (0%)
Patients who returned for follow-up	21 (87,5%)	13 (76%)	13 (100%)
Total	24 (100%)	217 (100%)	13 (100%)



Complaints of vaginal laxity in patients undergoing follow-up after 1, 2, and 3 LVTs

	1 LVT	2 LVT	3 LVT
No improvement (vaginal tightness)	1 (7%)	0	0
Mild satisfaction (vaginal tightness)	4 (29%)	0	2 (15%)
Moderate satisfaction (vaginal tightness)	6 (43%)	8 (66%)	7 (54%)
High satisfaction (vaginal tightness)	3 (21%)	2 (17%)	4 (31%)
Newly occurring vaginal laxity	0	2 (17%)	0
Total	14 (100%)	12 (100%)	13 (100%)

The Efficacy of Er:YAG Laser in the Treatment of Decreased Sexual Sensation: A Randomized, Placebo-controlled Trial

Authors: Sathaworawong A,
Manuskiatti W,
Phatihattakorn C,
Ungaksornpairote C, Ng JN
-
Published in: *Lasers in
Medical Science, 2021*



1. EXAMINING EFFECTS OF SUI SEVERITY AND NUMBER OF LASER INTERVENTIONS

The study is believed to be the first randomized, placebo-controlled trial comparing the efficacy and safety of Er:YAG laser (XS Dynamis, Fotona, Slovenia) in treating decreased sexual sensation. Vaginal laxity, a common cause of decreased sexual sensation, is a common problem affecting the quality of life of women worldwide.

2. THREE STAGES OF SUI TREATED WITH THE INCONTILASE® PROTOCOL

Forty-two patients with decreased sexual sensation were randomized into 2 groups: intervention (laser treatment) and control (placebo treatment). Both groups received two treatments, at 1-month interval. Subjective and objective evaluations were done at baseline, 1-, 3-, and 6-month follow-ups. Pain score and adverse effects were also recorded.

3. RESULTS SHOW IMPROVEMENT IN PATIENTS' VAGINAL TIGHTNESS SATISFACTION

In the laser group, there was significant improvement in the patients' vaginal tightness satisfaction at 1- and 3-month follow-ups ($P = 0.002$ and 0.004) and also in the patients' overall satisfaction at 1- and 3-month follow-ups ($P = 0.003$ and 0.001). Pelvic floor muscle contraction was significantly better in the laser group after the first treatment ($P = 0.043$). No serious adverse effects were noted.

4. ER:YAG LASER PROVIDES IMPROVEMENT OF SEXUAL SENSATION

The results of the study show that Er:YAG laser provides improvement of sexual sensation for an average of 3 months following 2 monthly treatments.

Patients' vaginal tightness satisfaction on all follow-up visits

	1-month follow-up n (%)	3-month follow-up n (%)	6-month follow-up n (%)
Laser group			
Worst	0 (0.0)	0 (0.0)	1 (5.0)
No change	1 (4.8)	1 (5.3)	6 (30.0)
Slightly improved	6 (28.6)	6 (31.6)	2 (10.0)
Moderately improved	7 (33.3)	8 (42.1)	6 (30.0)
Significantly improved	7 (33.3)	4 (21.1)	5 (25.0)
Placebo group			
Worst	0 (0.0)	0 (0.0)	0 (0.0)
No change	4 (19.0)	7 (33.3)	7 (33.3)
Slightly improved	11 (52.4)	8 (38.1)	7 (33.3)
Moderately improved	6 (28.6)	6 (28.6)	6 (28.6)
Significantly improved	0 (0.0)	0 (0.0)	1 (4.8)
P value	0.002*	0.004*	0.318

*Statistically significant difference

Effect of Er:YAG Laser on Pelvic Floor Strength and Sexual Satisfaction in Women Complaining of Vaginal Looseness: A Randomized Controlled Trial

Authors: Ahmed SM, Kotb HG, Yousef AM, Ahmed H

Published in: Polish Journal of Physiotherapy, 2019



OPEN ACCESS



1. EXAMINING THE EFFECTIVENESS OF ER:YAG LASER FOR TREATING VAGINAL LOOSENESS

The study aimed to determine the effect of Er:YAG laser on pelvic floor strength as well as sexual satisfaction in women complaining of vaginal looseness.

2. A PROSPECTIVE, SINGLE-BLIND, RANDOMIZED CONTROLLED TRIAL WITH 30 PATIENTS

Thirty women complaining of vaginal looseness with a decrease in pelvic floor strength and sexual satisfaction, aged 40–50 years, were randomized into 2 equal groups. Group (A) received pelvic floor training exercise (kegel exercise) for 8 weeks, while group (B) received Er:YAG laser (Dynamis, Fotona, Slovenia) in addition to kegel exercise for 8 weeks. All women in both groups were evaluated before starting the study, after 4 weeks and after 8 weeks of the treatment with a Peritron device to assess pelvic floor strength and with the Millheiser sexual satisfaction scale to assess sexual satisfaction.

3. RESULTS SHOW IMPROVEMENT IN PELVIC FLOOR STRENGTH AND SEXUAL SATISFACTION

There was a highly significant increase in pelvic floor strength and sexual satisfaction at post 8 weeks and post 4 weeks of treatment, in favor of group (B) ($P = 0.0001$).

4. ER:YAG LASER THERAPY IS AN EFFECTIVE OPTION FOR TREATING VAGINAL LOOSENESS

Er:YAG laser represents an effective, safe and successful therapy adjunct to kegel exercise in treating vaginal looseness in women.

Pelvic floor muscle strength at different measuring periods for both groups

Pelvic floor muscle strength	Pre treatment (Mean ± SD)	Post 4 weeks of treatment (Mean ± SD)	Post 8 weeks of treatment (Mean ± SD)
Group A	58.86 ± 4.27	69.33 ± 3.84	80.33 ± 3.75
Group B	58.86 ± 4.27	75.4 ± 4.06	88.13 ± 2.32
<i>Within groups (Pre vs. Post) Multiple pairwise comparison (Post hoc tests) among different measuring periods for Pelvic floor muscle strength at both groups</i>			
p-value	Pre Vs. Post 4 weeks of treatment	Pre Vs. Post 8 weeks of treatment	Post 4 weeks of treatment Vs. 8 weeks of treatment
Group A	0.0001 ^{HS}	0.0001 ^{HS}	0.0001 ^{HS}
Group B	0.0001 ^{HS}	0.0001 ^{HS}	0.0001 ^{HS}
<i>Multiple pairwise comparison tests (Post hoc tests) for the Pelvic floor muscle strength between both groups at different measuring periods</i>			
Group A Vs. group B	Pre treatment	Post 4 weeks of treatment	Post 8 weeks of treatment
P-value	1.00 ^{NS}	0.0001 ^{HS}	0.0001 ^{HS}

^{NS} P > 0.05 = Non-significant, ^{HS} P < 0.01 = highly significant, P = Probability

Sexual satisfaction grades at different measuring periods for both groups

<i>Friedman test for sexual satisfaction grades</i>						
	Group A		Group B			
X2-value	21.535		30			
p-value	0.0001 ^{HS}		0.0001 ^{HS}			
<i>Wilcoxon Signed Rank tests (within groups)</i>						
	Pre Vs. Post 4 weeks of treatment		Pre Vs. Post 8 weeks of treatment		Post 4 weeks of treatment Vs. post 8 weeks of treatment	
	Z-value	p-value	Z-value	p-value	Z-value	p-value
Group A	-2.828	0.005 ^{HS}	-3.638	0.0001 ^{HS}	-2.646	0.008 ^{HS}
Group B	-3.508	0.0001 ^{HS}	-3.453	0.001 ^{HS}	-3.52	0.0001 ^{HS}
<i>Mann-Whitney tests between groups</i>						
Group A Vs. group B	Pre treatment	Post 4 weeks of treatment	Post 8 weeks of treatment			
U-value	71.5	15	0.00			
Z-value	-1.818	-4.229	-5.06			
p-value	0.069 ^{NS}	0.0001 ^{HS}	0.0001 ^{HS}			

^{NS} P > 0.05 = Non-significant, ^{HS} P < 0.01 = highly significant, P = Probability

Up to 3-year Follow-up of Patients with Vaginal Relaxation Syndrome Participating in Laser Vaginal Tightening

Authors: Gaviria PJE, Korosec B, Fernandez J, Montero G

Published in: *Journal of the Laser and Health Academy*, 2016



OPEN ACCESS



1. MINIMALLY INVASIVE APPROACH TO SIGNIFICANTLY IMPROVE WOMEN'S QOL

Non-surgical treatments that promote perineal muscle strength and certain pharmacological agents are very safe, but offer limited efficacy. On the contrary, surgical interventions offer high efficacy but are at the same time associated with a high risk of nerve damage and therefore loss of sensation. The gap between both extremes has been filled with the IntimaLase® treatment, which offers minimal invasiveness but high efficacy.

2. A 3-YEAR FOLLOW-UP TO PROVE INTIMALASE® EFFICACY

Several other clinical studies have shown a positive effect of the laser treatment on vaginal tightness, however, data on the long-term effectiveness was missing. 60 patients received 1-4 laser sessions of IntimaLase® (XS Dynamis, Fotona, Slovenia) at 15 to 30-day intervals. Study assessment was performed throughout the 36 months and included laser vaginal tightening (LVT) questionnaires and self-assessment reports.

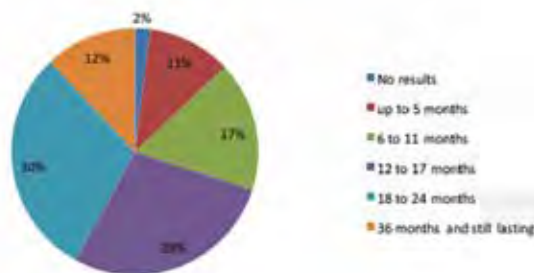
3. GREAT RESULTS

Patients reported the average duration of effect from the treatment was 16 months, with significant improvement of stress urinary incontinence and prolapse. No serious adverse effects were reported. Furthermore, data showed that 58% of patients were extremely satisfied or very satisfied with the treatment and 83.3% of participants would be willing to repeat the therapy.

4. INTIMALASE® TECHNOLOGY AS AN ALTERNATIVE FOR UNCOMFORTABLE, HIGH-RISK SURGICAL PROCEDURES

Because of its minimal invasiveness and positive results, a vast majority of patients finds the principle of IntimaLase® therapy very appealing. Longitudinal studies are bringing more evidence to the field and hopefully more women will stand a chance to undergo the laser treatment first before considering surgical intervention.

The duration of results



Non-ablative Vaginal Er:YAG Laser for the Treatment of Cystocele

1. NEW MINIMALLY INVASIVE OPTION

The principle of non-ablative Er:YAG laser has been widely adopted for treating various conditions associated with pelvic floor dysfunction. Lately it has also been used to treat pelvic organ prolapse (POP). Since surgical treatments often come with the cost of long downtime and a high possibility of adverse events, developing alternative minimally invasive treatments is of a great importance.

2. METHODOLOGY

61 patients with grade II-IV cystoceles were treated (Dynamis, Fotona, Slovenia) 2-5 times at 2-month intervals. Prolapses were photographed and graded using the Barden-Walker scale.

3. EXCELLENT RESULTS

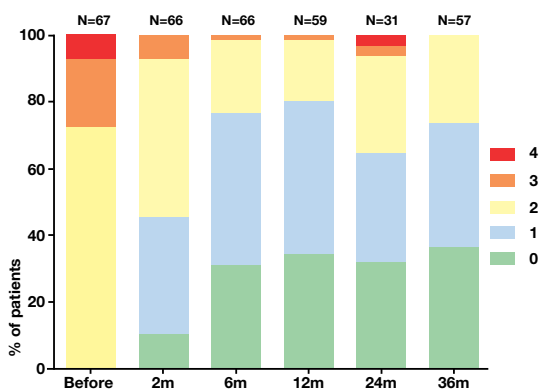
95% of the patients showed a reduction of at least one grade, 85% of which had achieved grade 0 or I, and 15% achieved grade II. 90% of the patients were very satisfied or satisfied with the treatment. No major adverse effects were noted.

4. PROLAPLASE® IS A BREAKTHROUGH, MINIMALLY INVASIVE OPTION FOR PATIENTS WITH POP

Clinical research supports the efficacy of the ProlapLase® treatment. With additional studies this innovative procedure may become a well-recognized minimally invasive alternative to surgery.

Authors: Bizjak Ogrinc U
& Sencar S

Published in: Italian Journal
of Gynaecology and
Obstetrics, 2017



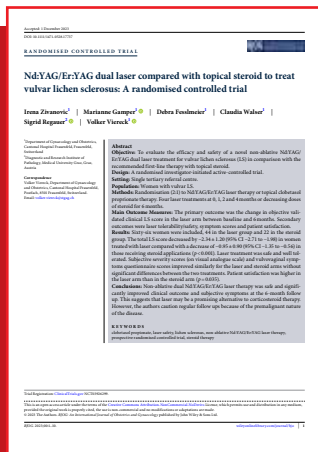
The effect of ProlapLase® on cystocele grade distribution at baseline and follow-ups



Nd:YAG/Er:YAG Dual Laser Compared with Topical Steroid to Treat Vulvar Lichen Sclerosus: A Randomised Controlled Trial

Authors: Zivanovic I, Gamper M, Fesslmeier D, Walser C, Regauer S, Viereck V

Published in: *BJOG: An International Journal of Obstetrics and Gynaecology*, 2023



OPEN ACCESS



1. COMPARING DUAL ND:YAG/ER:YAG LASER TREATMENT WITH CORTICOSTEROID THERAPY

The aim of this randomised controlled trial was to evaluate the efficacy and safety of a novel non-ablative Nd:YAG/Er:YAG dual laser treatment for vulvar lichen sclerosus (LS) in comparison with the recommended first-line therapy with topical steroid.

2. CHANGES MEASURED IN OBJECTIVE VALIDATED CLINICAL LS SCORE

44 women were included in the laser group and 22 in the steroid group. Patients in the laser group received four laser treatments with a dual Nd:YAG/Er:YAG laser (FotonaSmooth SP® Spectro), at baseline and after 1, 2 and 4 months. The comparison group received standardised topical steroid for 6 months. The primary outcome was the change in objective clinical LS score in the laser arm between baseline and 6 months. Secondary outcomes were changes in subjective and objective measures between baseline and 6-month follow-up, safety of the laser treatment and comparisons between laser and steroid outcomes.

3. LASER TREATMENT WAS EFFECTIVE, SAFE AND WELL TOLERATED

The total LS score decreased by 2.34 ± 1.20 (95% CI -2.71 to -1.98) in women treated with laser compared with a decrease of 0.95 ± 0.90 (95% CI -1.35 to -0.56) in those receiving steroid applications ($p < 0.001$). Subjective severity scores (on visual analogue scale) and vulvovaginal symptoms questionnaire scores improved similarly for the laser and steroid arms without significant differences between the two treatments. Patient satisfaction was higher in the laser arm than in the steroid arm ($p = 0.035$).

4. LASER IS A PROMISING ALTERNATIVE TO CORTICOSTEROID THERAPY

Non-ablative dual Nd:YAG/Er:YAG laser therapy was safe and significantly improved clinical outcomes and subjective symptoms at the 6-month follow-up. This suggests that laser may be a promising alternative to corticosteroid therapy.

Improvement of lichen sclerosus (LS) score, VAS symptoms and VSQ at six months follow-up

Variable	Baseline, mean ± SD	Six months, mean ± SD	Change, mean ± SD	p value, within
LS score total				
Laser (n = 44) ^a	6.27 ± 1.25	3.93 ± 1.34	-2.34 ± 1.20	<0.001
Steroid (n = 22)	6.05 ± 1.50	5.09 ± 1.15	-0.95 ± 0.90	0.014
p value between	0.397	<0.001	<0.001	
VAS total (itching, burning, pain)				
Laser (n = 44) ^a	11.59 ± 6.87	5.75 ± 6.50	-5.84 ± 6.19	<0.001
Steroid (n = 22)	9.36 ± 5.60	4.00 ± 3.12	-5.36 ± 6.33	0.001
p value between	0.303	0.647	0.881	
VAS total (Q1-16)				
Laser (n = 44) ^a	8.11 ± 3.58	4.89 ± 4.42	-3.23 ± 3.21	<0.001
Steroid (n = 22)	7.68 ± 3.20	5.36 ± 4.27	-2.32 ± 3.43	0.043
p value between	0.473	0.637	0.408	

Efficacy of Non-ablative Laser Therapy for Lichen Sclerosus: A Randomized Controlled Trial

1. COMPARING THE EFFECTS OF LASER TO TOPICAL CORTICOSTEROID TREATMENT

A total of 40 patients were included in the study and were randomized into the active group (combined treatment with topical corticosteroids and laser) or control group, who received treatment with topical corticosteroids only.

The patients in the active group received three Nd:YAG laser treatments (SP Spectro Dynamis, Fotona, Slovenia) every 14 days. One week before the first laser treatment, the patients in this group started pre-treatment with topical corticosteroid betamethasone (Diprosone) to alleviate symptoms and increase treatment comfort. This therapy lasted 3 weeks with decreasing dosage: twice daily during the first week, once daily during the second week, and every second day during the third week.

The control group received the topical corticosteroid betamethasone (Diprosone) for 4 weeks with decreasing dose: twice daily during the first 2 weeks, once daily during the third week, and every second day during the fourth week.

2. THE EFFECTS ARE HISTOLOGICALLY PROVEN

The thickness of sclerosis was reduced significantly after the combined treatment, but not after the corticosteroid treatment.

3. IMPROVEMENT HAS BEEN MEASURED OBJECTIVELY AND SUBJECTIVELY

Both the combined and corticosteroid treatments reduced the intensity of symptoms (itching, burning, pain) compared with the baseline, however, the reduction was statistically significantly better in the active group for all symptoms. The effect of LS on the quality of the patient's sex life was significantly reduced only in the active group.

4. ADDITIONAL ADVANTAGES OF LASER TREATMENT

Most patients have a negative attitude towards the long-term use of topical corticosteroids, so they seek better and more permanent solutions. Initial results regarding laser therapy appear promising not only due to its efficacy, but also its ease of use, as patients do not need to apply their medicine on a daily basis.

Authors: Bizjak Ogrinc U,
Sencar S, Luzar B,
Lukanovic A

Published in: *Journal of Obstetrics and Gynaecology Canada*, 2019



Use of Er:YAG Laser in the Treatment of Vulvar Lichen Sclerosus

Authors: Gomez-Frieiro M & Laynez-Herrero E

Published in: International Journal of Women's Dermatology, 2019



OPEN ACCESS



1. EVALUATING ER:YAG LASER FOR TREATMENT OF VULVAR LICHEN SCLEROSUS

The aim of this research was to evaluate the efficacy and safety of Er:YAG lasers to improve signs and symptoms of vulvar lichen sclerosus.

2. ONE OF THE FIRST STUDIES TO ASSESS ER:YAG FOR LICHEN SCLEROSUS

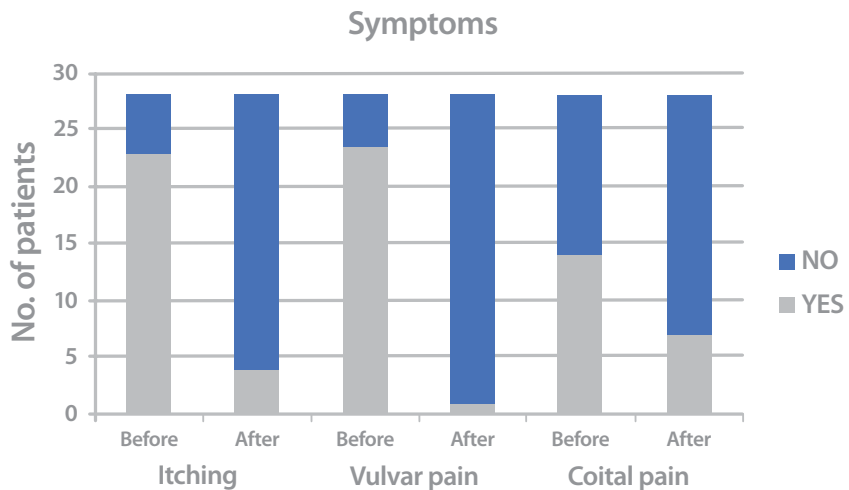
The study population consisted of 28 women with symptomatic vulvar lichen sclerosus. Three nonablative, thermal-only Er:YAG laser treatment (SP Spectro Dynamis, Fotona, Slovenia) sessions (7 J/cm², 2 Hz, 7 mm spot) were performed at 4-week intervals. Based on the presence of symptoms, lesions, and affected zones, a scale with a maximum of 14 scores was established for use before and after treatment. The impact of lichen sclerosus on patients' lives before and after treatment was evaluated with an 11-point visual analogue scale, and treatment discomfort was assessed at each session.

3. STATISTICALLY SIGNIFICANT IMPROVEMENTS OBSERVED POST TREATMENT

The results of this study showed that Er:YAG laser treatment significantly reduces symptoms of lichen sclerosus such as itching and vulvar pain, but not coital pain. After analysis of each scoring component, individual statistically significant reductions were observed in itching, pain, ecchymosis, excoriations, and hypopigmentation. Three sessions with monthly intervals using the indicated parameters quantifiably reduced the impact of lichen sclerosus on patients' lives.

4. ER:YAG LASER IS RECOMMENDED FOR ADJUVANT TREATMENT OF VULVAR LICHEN SCLEROSUS

The Er:YAG laser is a safe, well tolerated, and effective method for treatment of vulvar lichen sclerosus supplementary to topical steroids. The authors encourage doctors who have this technology to use it as a complementary and safe alternative that has proven to be effective.



Frequency of lichen sclerosus symptoms before and after laser treatment



Effects of Non-ablative Vaginal Er:YAG Laser Treatment for Interstitial Cystitis/Bladder Pain Syndrome: A Case Series (UNICORN-2 Study)

1. EXAMINING THE EFFECTIVENESS OF NON-ABLATIVE ER:YAG LASER FOR PATIENTS WITH IC/BPS

There are no established treatments for interstitial cystitis/bladder pain syndrome (IC/BPS). The authors conducted a study to verify the effectiveness of non-ablative vaginal Er:YAG laser (VEL) treatment for patients with IC/BPS who were resistant to conventional treatments.

2. A YEAR-LONG STUDY OF 12 IC/BPS PATIENTS

A total of 12 patients without improvement after several treatments underwent nonablative vaginal Er:YAG laser treatment (XS Dynamis, Fotona, Slovenia) once a month for 12 months. The numeric rating scale-11 (NRS-11), O'Leary-Sant interstitial cystitis symptom and problem indexes (ICSI and ICPI), functional bladder capacity, and daily urinary frequency were recorded.

3. RESULTS SHOW IMPROVEMENT IN 9 OF 12 PATIENTS

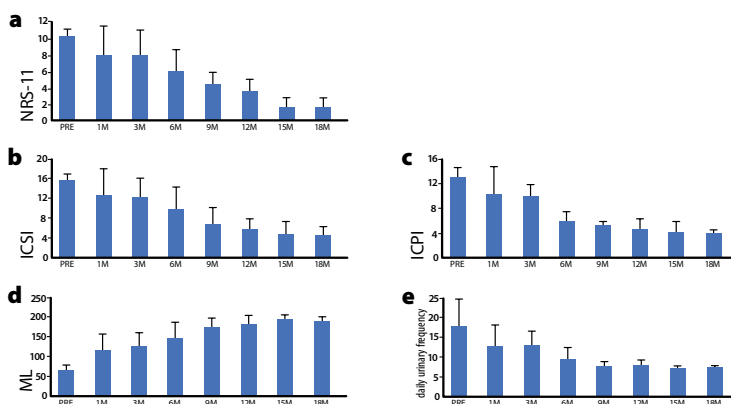
VEL treatment demonstrated efficacy for both ulcerative and non-ulcerative patients with IC/BPS. The response rate was 75% (9 out of 12). The NRS-11 scores and ICSI and ICPI improved in all responders. The bladder capacity and urinary frequency also normalized. The residual effect lasted for 18 months from the first treatment, without long-term side-effects.

4. A PROMISING TREATMENT OPTION FOR PATIENTS WITH IC/BPS

Nonablative vaginal Er:YAG laser treatment is a safe and effective treatment for patients with IC/BPS.

Authors: Okui NP, Okui M, Vizintin Z

Published in: *Climacteric*, 2020



Effect of VEL treatment according to (a) the numeric rating scale-11 (NRS-11), (b) the O'Leary-Sant interstitial cystitis index (ICSI), (c) the O'Leary-Sant interstitial cystitis problem index (ICPI), (d) functional bladder capacity (IVL) in ml and (e) daily urinary frequency. The x-axis of all graphs indicates time, showing progress from before VEL treatment to 1, 3, 6, 9, 12, 15, and 18 months.

Er:YAG Treatment for Relief of Long-term Symptoms Related to Episiotomy Scars - 1-Year Follow-up

Authors: Novakov Mikic A,
Pajk F, Vizintin Z

-

Published in: *European
Gynecology and
Obstetrics*, 2022



OPEN ACCESS



1. ASSESSING THE EFFICACY OF ER:YAG TREATMENT FOR EPISIOTOMY SCAR SYMPTOMS

The purpose of this study was to evaluate Erbium:YAG (Er:YAG) laser treatment for relief of long-term symptoms related to episiotomy scars.

2. 110 PATIENTS RECEIVED THREE ER:YAG LASER TREATMENT SESSIONS IN A TWO-STEP PROTOCOL

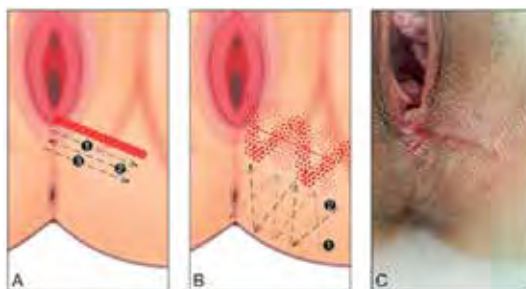
This single-arm study included patients with episiotomy scars complaining of at least one of the following: dyspareunia, pain while sitting, pain at pressure, pulling, bumps at perineum, and bleeding after intercourse. 110 patients aged 22–50 years (mean age 33 years) received three Er:YAG laser treatment sessions (XS Dynamis, Fotona, Slovenia) in a two-step protocol: full-spot cold ablation along the scar, and fractional ablation across the whole episiotomy surface.

3. RESULTS SHOWED SIGNIFICANT IMPROVEMENT WITH MINIMAL SIDE EFFECTS

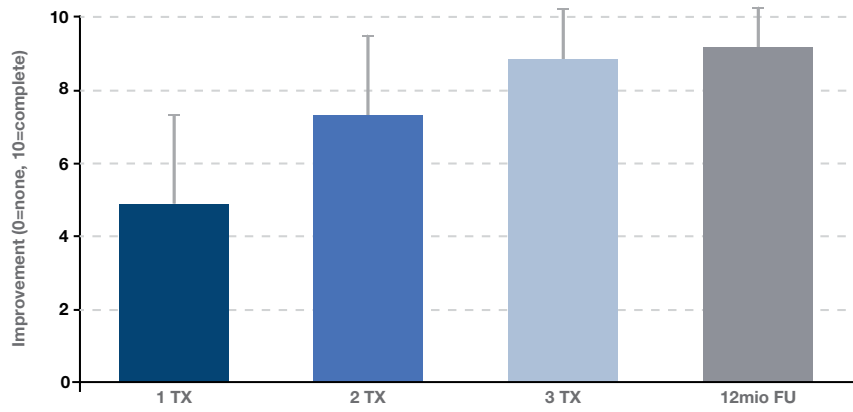
Improvement and side effects were monitored at every treatment and 3 and 12 months after the last procedure. Average improvement increased with each treatment session and was maintained during 12 months of follow-up (average improvement at 12 months was 9.1 ± 1.1 on a 0–10 scale). All patients achieved improvement and 52.7% became symptom free. Average pain during the procedure (without anesthesia) was 5.4/10. Side effects were mild and transient.

4. LASER TREATMENT FOR EPISIOTOMY SCARS IS AN EFFECTIVE ALTERNATIVE TO SURGERY

The study confirmed that Erbium laser treatment is an excellent candidate as a less invasive alternative to surgery for relief of long-term symptoms related to episiotomy scars.



Two-step protocol for Er:YAG laser resurfacing of episiotomy scar. A) Full spot cold ablation along the scar with non-overlapping pulses (2 mm spot size, 300 mJ energy and 0.1 ms pulse duration). B) Fractional ablation (5 mm spot size, 800 mJ and 0.6 ms pulse duration) across the whole episiotomy surface with 2 cm margins. C) Immediately after the procedure.



Mean improvement in episiotomy scar symptoms (error bars represented standard deviation) after each of three laser treatment sessions (TX) and at follow-up 12 months after the last laser treatment (12 mo FU)

Sutureless Laser Labiaplasty of Labia Minora

Authors: Bizjak Ogrinc U
& Sencar S

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OPEN ACCESS



1. EXAMINING THE EFFICACY AND SAFETY OF SUTURELESS LASER LABIAPLASTY

The purpose of this study is to report on a “sutureless” laser labiaplasty and to evaluate the efficacy and safety of this technique. Vaginal labiaplasty, the surgical reduction of the labia minora as a treatment for labia hypertrophy, has become a common procedure, with many different techniques yet no optimal approach suggested.

2. A RETROSPECTIVE ANALYSIS OF 80 FEMALE PATIENTS

A retrospective chart review analysis of 80 female patients who underwent laser labiaplasty with 2940 nm Er:YAG laser (SP Dynamis, Fotona, Slovenia) between February 2015 and April 2018 was conducted. The labiaplasty procedure was carried out in around 30-40 minutes, and there were no intraoperative complications. The patients were asked about or checked for side effects and answered a questionnaire regarding their satisfaction.

3. THE MAJORITY OF PATIENTS SHOWED HIGH SATISFACTION, WITHOUT SIDE EFFECTS

The majority of women (71 or 89%) did not experience any side effects, 7 (9%) developed wound infection, bleeding was reported by 1 patient, and 1 woman reported hematoma formation. All of the patients reported high satisfaction. There were no partly satisfied or dissatisfied patients.

4. SUTURELESS LASER LABIAPLASTY CAN BE CONSIDERED SAFE AND EFFECTIVE

Sutureless laser labiaplasty is a safe and effective way of improving women’s lives and is associated with a high degree of patient satisfaction.



Patient before and 3 weeks after procedure

Effectiveness and Safety of Ablative Er:YAG Laser Treatment for External Genital Warts

1. EXAMINING THE USE OF ER:YAG LASER FOR REMOVING GENITAL WARTS

The aim of this study is to evaluate the effectiveness and safety of using ablative Er:YAG laser for removal of external genital warts (EGW), also called condylomata acuminata (CA).

Authors: Bizjak Ogrinc U
& Sencar S

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Medical journal, 2020

2. MORE THAN 100 FEMALE PATIENTS INCLUDED IN RETROSPECTIVE COHORT STUDY

This was a retrospective cohort study performed at the Juna Gynecology Clinic in Ljubljana, Slovenia. A total of 133 female patients older than 18 years (mean age 39.6 ±12.9 years, range: 19–80) that were clinically diagnosed with EGW and were treated with ablative Er:YAG laser (Dynamis, Fotona, Slovenia) between January 2012 and December 2017 were included in the study. EGW had been present from one to seven months, with a mean presence of 2.1 ±2.0 months. The majority of the warts were on the labia majora with some also on the mons pubis. The size of the lesions was 2–8 mm.



3. THE MAJORITY OF PATIENTS SHOWED COMPLETE CLEARANCE, WITHOUT RECURRENCE

The majority of the 116 patients who completed therapy (74 patients) received only one treatment and 82 of the patients (n = 95) showed complete clearance of the lesions, without recurrence observed to date of analysis. Complete clearance was achieved after an average of 1.33 treatment sessions. Recurrence was reported by 21 patients (18). Recorded adverse effects of laser treatment were mild and transient.



4. ER:YAG LASER IS A SIMPLE, QUICK AND SAFE PROCEDURE FOR REMOVAL OF EGW

Er:YAG laser removal of EGW is a simple, quick and safe procedure, particularly suitable for large volume EGW or those that are located in anatomical sites difficult to access by other techniques.



Age group	No. of patients [n]	Mean no. of treatments (95% CI)	Patients requiring single treatment [n, (%)]	Effectiveness of treatment CC [n, (%); 95% CI]	Mean no. of treatments needed for CC ^b (95% CI)
19-29	26	1.96 (1.43-2.49)	14 (54.8)	21 (80.7; 73.6-89.9)	1.62 (1.11-2.13)
30-39	35	1.63 (1.26-1.99)	24 (68.6)	27 (77.1; 79.5-84.8)	1.19 (0.94-1.43)
40-49	31	1.45 (1.15-1.75)	21 (67.7)	29 (93.5; 89.1-98.0)	1.34 (1.09-1.60)
50-59	12	1.25 (0.96-1.54)	9 (75.0)	10 (83.3; 76.6-90.1)	1.10 (0.87-1.33)
60-69	8	1.50 (1.05-1.95)	4 (50.0)	4 (50.5; 40.9-59.1)	1.00 (1.00-1.00)
70-80	4	1.50 (0.58-2.42)	2 (50.0)	4 (100; 100-100)	1.50 (0.58-2.42)
Overall	116	1.60 (1.42-1.78)	74 (63.8)	95 (81.9; 74.9-88.9)	1.33 (1.17-1.48)



Effectiveness (Complete Clearance (CC)) of Er: YAG laser treatment within the age groups

Safety of Vaginal Erbium Laser: A Review of 113,000 Patients Treated in the Past 8 Years

Authors: Gambacciani M, Cervigni A, Gaspar A, Novakov Mikić A, Gaviria PJE, Koron N, Vizintin Z

Published in: *Climacteric*, 2020



OPEN ACCESS



1. EVALUATING THE FREQUENCY OF ADVERSE EFFECTS FROM VAGINAL ERBIUM LASER (VEL)

The aim of this study was to obtain information on the frequency of occurrence of adverse effects (AEs) related to vaginal erbium laser (VEL) treatment.

2. LARGEST SURVEY ON AES FOR PROCEDURES PERFORMED IN GYNECOLOGY WITH EB DEVICES

A global survey was conducted among practitioners using the non-ablative VEL treatment. Users were invited to provide the number of patients treated with VEL (Fotona, Slovenia) and the number of observed laser-related AEs.

The survey was conducted from August 2018 to April 2019. Responses from 535 practitioners were collected, with a total of 113,174 patients treated in the period from 2012 to 2019.

3. AES WERE MILD TO MODERATE, TRANSIENT AND APPEARED WITH LOW FREQUENCIES.

Out of 535 respondents, 160 (30%) shared detailed information about the indications they treated in a population of 62,727 patients, whereas 188 respondents (35%) provided information on the frequency of AEs observed in their treated population of 43,095 patients. All observed AEs were mild to moderate, transient and appeared with low frequencies.

4. VAGINAL ERBIUM LASER (VEL) TREATMENTS APPEARS TO BE VERY SAFE

Minimally invasive thermal-only laser treatments using the non-ablative VEL procedure appear to be safe, and carry a very low risk profile.

Reported adverse effect (AEs), mean frequency of AE occurrence, range of reported frequencies, and calculated overall frequency

Adverse effect	Number of respondents reporting the AE (n)	Mean of frequencies (%)	Range of frequencies (%)	BCa bootstrap interval ^a	24 weeks frequencies (%) ^b
Vaginal discharge	47	6.53	0.00-100	3.69-9.67	4.01
Edema	23	3.72	0.00-100	1.80-5.86	3.45
Pain (during treatment)	30	1.92	0.00-50.0	1.09-2.92	1.44
Pinpoint bleeding	33	1.55	0.00-50.0	0.87-2.36	1.16
Dryness	14	0.22	0.00-7.37	0.10-0.36	0.48
De novo urinary incontinence	13	0.28	0.00-14.3	0.12-0.49	0.21
Burns	7	0.10	0.00-10.0	0.02-0.22	0.16
Post-operative pain	7	0.47	0.00-37.7	0.07-1.06	0.10
Mild irritation of the introitus	4	0.56	0.00-70.0	0.007-1.70	0.44
Discoloration	2	0.10	0.00-16.7	0.003-0.32	0.02
Itching	2	0.06	0.00-10.0	0.001-0.24	0.01
Infection	4	0.03	0.00-3.33	0.001-0.07	0.01
Abnormal bleeding	1	0.04	0.00-6.67	0.04-0.16	0.005
Dyspareunia	1	0.004	0.00-0.69	0.04-0.17	0.002

^aBCa, bias-corrected and accelerated (BCa) bootstrap interval, based on 1000 bootstrap samples (999 for burns, 982 for introital irritation, 985 for infection, 866 for itching, 653 for abnormal bleeding, 637 for dyspareunia, 858 for discoloration); ^bcalculated as the number of AEs per patients included in the safety analysis (n=43,095)

Effects of Non-ablative Er:YAG Laser on the Skin and the Vaginal Wall: A Systematic Review of the Clinical and Experimental Literature

1. EVALUATING THE EFFECTS OF NON-ABLATIVE ER:YAG LASER ON THE SKIN AND THE VAGINAL WALL

The aim of this systematic review was to summarize current knowledge about the effects of non-ablative Er:YAG laser on the skin and vaginal wall.

2. A REVIEW OF STUDIES FROM MEDLINE, EMBASE, COCHRANE, AND THE WEB OF SCIENCE

Studies investigating objectively measured effects of non-ablative Er:YAG laser on the skin or vaginal wall were included. The authors identified in vitro or ex vivo studies on human cells or tissues, studies in rats, and clinical studies. Most studies were on the skin (n = 11), while the rest were on the vagina (n = 4). Owing to the lack of methodological uniformity, no meta-analysis could be performed and therefore results were presented as a narrative review.

3. RESULTS SHOW A POSITIVE RESPONSE IN MULTIPLE OBJECTIVELY MEASURED EFFECTS

Although the methods used were not comparable, there were demonstrable effects in all studies. Immediately after application, an increase in superficial temperature, partial preservation of epithelium and subepithelial extracellular matrix coagulation were documented. Later, an increase in epithelial thickness, inflammatory response, fibroblast proliferation, an increase in the amount of collagen, and vascularization were described.

4. ER:YAG LASER PRODUCES POSITIVE EFFECTS WITHOUT EPITHELIAL ABLATION

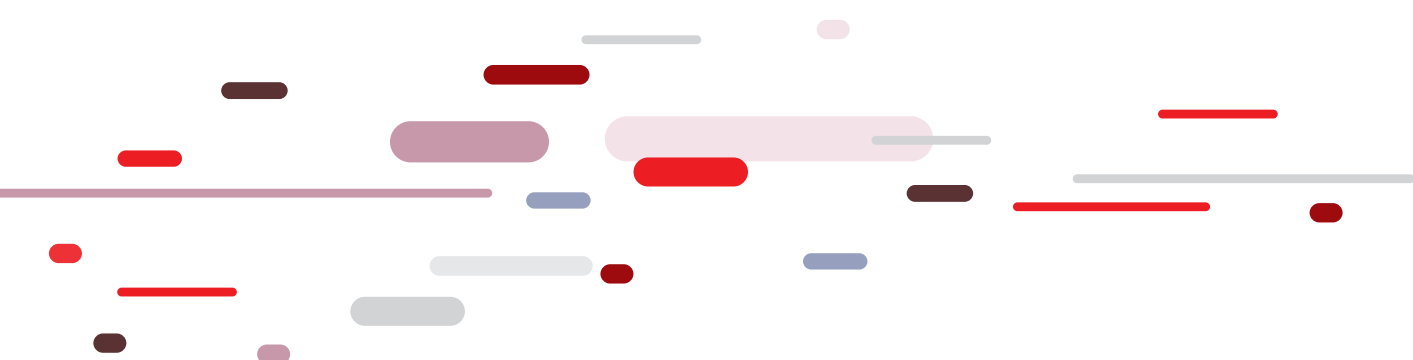
Er:YAG laser energy may induce changes in the deeper skin or vaginal wall, without causing unwanted epithelial ablation. Laser energy initiates a process of cell activation, production of extracellular matrix, and tissue remodeling.

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Bosteels J, Krofta L, Deprest J*

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