

# CASE REPORT: Effects of transrectal non-ablative prostate Erbium:YAG laser treatment on a hemiplegic patient with erectile dysfunction and urge incontinence

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## ABSTRACT

**Introduction:** Brain stroke survivors often experience erectile dysfunction (ED). Pharmacotherapy with phosphodiesterase-5 (PDE5) inhibitors is one of the first-line therapies for ED, but it is contraindicated in patients taking nitrites. The quality of life is markedly lower in patients whose condition is also complicated by urge incontinence.

We propose non-ablative erbium: yttrium aluminum garnet (YAG) laser treatment (EL) as a therapeutic approach for these refractory diseases. The efficacy of transvaginal non-ablative EL irradiation in the treatment of women with sexual dysfunction and urge incontinence without causing adverse effects has been reported.

**Aim:** Our aim is to report the case of a 62-year-old hemiplegic man whose ED and urge incontinence improved after transrectal non-ablative prostate EL (TR-PEL).

**Methods:** Ten-minute TR-PEL was performed monthly for 9 months and the effect on ED and urge incontinence was evaluated.

**Conclusions:** ED and urge incontinence both improved dramatically without side effects.

TR-PEL is a promising new treatment procedure. This is an initial report describing the effective use of non-ablative EL in the treatment of a male patient.

**Key words:** Transrectal non-ablative prostate erbium: YAG laser treatment (TR-PEL), erectile dysfunction (ED), urge incontinence.

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## I. INTRODUCTION

Erectile dysfunction (ED) [1] is the consistent or recurrent inability to attain and/or maintain penile erection sufficient for sexual satisfaction. In particular, 48.3% of stroke survivors experience ED. [2] Phosphodiesterase-5 inhibitors (PDE5is) are the first-line therapy for ED but PDE5i treatment is contraindicated in patients using nitrites because additive vasodilatory effects may cause systemic vasodilation and marked hypotension. [3] Angina and arrhythmia are some of the causes of cerebral stroke, and many patients with these conditions take nitrites. Furthermore, the quality of life markedly decreases in patients with stroke complicated by urge incontinence. [4] At present, no treatment exists for such refractory cases.

The present case report focuses on non-ablative vaginal erbium: yttrium aluminum garnet (YAG) laser treatment (VEL), [5-7] which has been reported to be effective for treating sexual dysfunction [5], stress urinary incontinence (SUI) [6] and overactive bladder (OAB) [7] in women without adverse effects. Improvement of the vaginal mucosa improves the sexual function. Transvaginal application extends the effects of laser treatment beyond the surface to the bladder and urethra and has been confirmed to improve SUI. A procedure of transrectal irradiation of the periprostatic area—transrectal non-ablative prostate erbium: YAG laser treatment (TR-PEL)—may be a promising new treatment for improving urge incontinence or ED.

This is an important report that describes the successful treatment of ED and urge incontinence in a patient with refractory symptoms.

## II. CASE REPORT

The patient was a 62-year-old man who developed angina at 50 years of age and had a cerebral infarct at age 60 years that left him hemiplegic on the left side. He developed ED and urge incontinence at the same time, which has persisted to date. At the initial examination,

he was assessed as Brunnstrom stage 4 [8] with decreased spasticity: stage 4 in the arm, hand, and leg on the left side. Transrectal ultrasound revealed that the size of the prostate was normal ( $35 \times 20 \times 25$  mm, 9.16 cc). The New York Heart Association (NYHA) class was classified as 2 and movement of 6 metabolic equivalents (METs) was possible. He had quit smoking at 50 years of age and was taking hypotensive drugs (angiotensin-converting enzyme inhibitors [ACE]). He was continuing to take anticoagulant therapy with warfarin potassium and aspirin. He was also taking nitrites. Drug-induced ED, depression, sleep apnea, diabetes, kidney and liver dysfunction were excluded in the department of internal medicine.

According to the Princeton Consensus Panel, [3] a NYHA class 2 patient can be treated to improve sexual dysfunction, but PDE5s are contraindicated in patients possibly taking nitrites and there are no alternative treatments; thus, we determined that TR-PEL with local anesthesia could be indicated for this patient. The lithotomy position was used during the treatment.

First, a preoperative transrectal diagnostic ultrasound (DUS) test (F37 and EUP-U531 HITACHI- ALOKA, Tokyo, Japan) was used to observe periprostatic and cavernous blood flow. Next, Xylocaine pump spray 8% (Aspen Japan, Tokyo, Japan) was applied to the anus for local anesthesia for TR-PEL and an anus-sized handpiece, SmoothTouch LA Adapter connected to a FotonaSmooth<sup>TM</sup>XS (Fotona d.o.o.) laser was inserted and positioned under the prostate. Approximately 5 cm of the periprostatic area was irradiated for 10 min using a non-ablative 2940 nm Er:YAG laser on long pulse (Smooth) mode, with following settings: 3.00 J/cm<sup>2</sup>, 2.0 Hz, 7 mm. [5] Since there was no report of a non-ablative laser treatment applied to the rectal mucosa, we thought that an endoscope was needed. Proctoscopy immediately after the procedure confirmed no inflammation of the rectal mucosa. TR-PEL was performed monthly for 9 months without any preparation. The patient was assessed at baseline and during 9 months of treatment using the International Index of Erectile Function (IIEF), [2] the 5-item version of IIEF (IIEF-5), [9] the overactive bladder symptoms score (OABSS), [6] the International Consultation of Incontinence Questionnaire – Short Form (ICIQ-SF), [5] the International Prostate Symptom Score (I-PSS), [4] the amount of daily incontinence confirmed by a bladder diary, the frequency of nocturia, a 1-hour pad test, [6] the DUS of the prostate and penis, and photos of the patient's morning erection. Measurement of prostate-specific antigen (PSA) (CLIA method, BML Tokyo Japan), serum total testosterone (TT) (CLIA method,

BMI), BUN, and Cr blood tests (UV method, BML) were performed at 9:00 a.m. An intracavernous injection of prostaglandin E1 test was unfeasible due to major bleeding caused by the procedure. We used urodynamic, pressure flow and uroflowmetries (EDAP TMS, Lyon, France). The urodynamic and pressure flow evaluation could not be measured accurately due to urethral bleeding from the catheter type instrument. As this report is the 1st case of TR-PEL, follow-up for adverse events included monthly visits for blood tests and genital and rectal examinations.

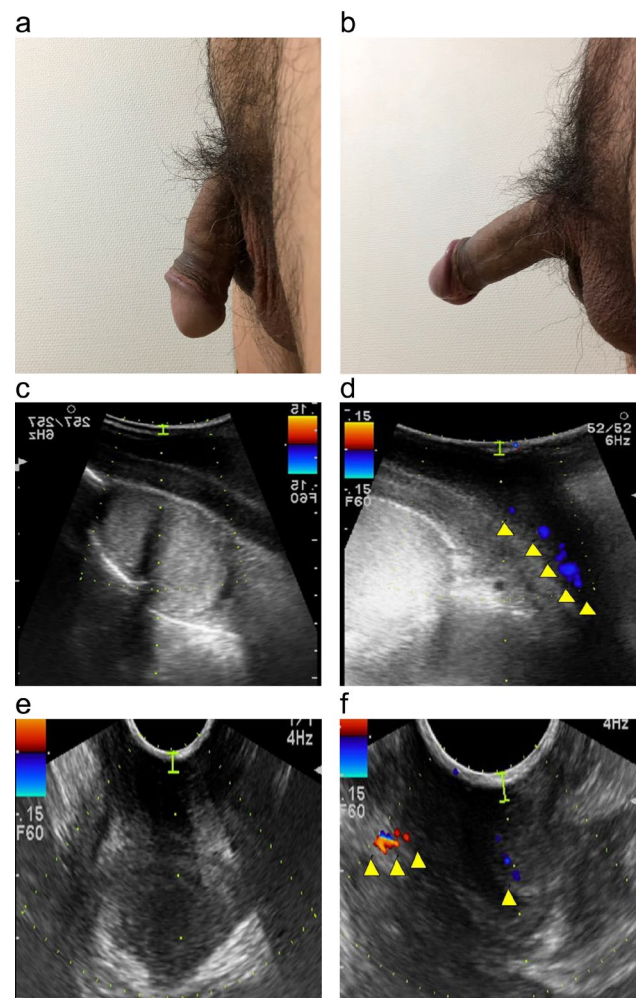


Fig. 1. Baseline and after 9 months of TR-PEL. Figures 1a, c and e were taken preoperatively. Figures 1b, d and f were taken after TR-PEL was performed monthly for 9 months.

Figures 1a and b are photographs of morning erection tumescence taken at the patient's home. Figures 1c and d show observations of the cavernous arteries by diagnostic ultrasound. The arrows indicate the cavernous arteries, which were imaged by Doppler ultrasound (DUS). The left image shows the shaft and the right image shows the penile tip. The penis was imaged on the sagittal plane. Figures 1e and f show transrectal diagnostic ultrasound images. Arrows indicate the periprostatic arteries, which were imaged by DUS.

With regards to ED, the patient's morning erection improved as shown in 1a (preoperative) and Figure 1b (after 9 months). Prostate DUS showed reperfusion of multiple arteries on the right prostate after treatment, in comparison to DUS at baseline, in which no vessels of  $\geq 1$  mm were identified, as shown in Figure 1c (preoperative) and Figure 1d (after 9 months). DUS of the penis showed that the cavernous arteries, which were not identifiable preoperatively (Fig. 1e), improved later (Fig. 1f). The patient's IIEF and IIEF-5 scores improved from 15 points to 38 points and 5 points to 17 points, respectively.

In terms of urge incontinence, the amount of daily incontinence improved from 600 mL to less than 10 mL by daily pads. The frequency of nocturia improved from 7 times to 1 time. The maximum urine volume in the bladder improved from 200 ml to 300 ml. The patient's one-hour pad test results improved from 122 mL to 3 mL. Finally, the T scores for the OABSS, ICIQ-SF, and I-PSS improved from 13 to 2, 21 to 4, and 21 to 4, respectively. The uroflowmetries test show the urination before treatment was an interrupted-shaped type and required a urination time of 60 seconds. After treatment, it was plateau-shaped and improved to a micturition time of 24 seconds.

There were no adverse physical effects and there was no change in the Brunnstrom stage. No pain was reported in the rectum, prostate or penis. There was no lower urinary tract closure. No changes were seen in the renal function. The patient's PSA level decreased from 1.2ng/mL to 0.62ng/mL (standard  $\leq 4.0$  ng/mL), and his TT level increased from 320ng/dL to 540ng/dL (standard 142.4–923 ng/dL). His BUN and Cr levels did not change.

### III. DISCUSSION

The report is the first case to apply non-ablative Er:YAG laser for men. TR-PEL was effective for treating ED and urge incontinence in this patient with refractory symptoms.

Re-canalization of the pelvic floor is the mechanism that underlies the effects of TR-PEL, as ischemia of the pelvic floor is often involved in the onset of ED and urge incontinence.

This patient showed left-side hemiplegia; thus, the left sides of the bladder and urethra showed marked dysfunction. [4] However, the healthy right side was predicted to be affected by age-related impeded blood flow and responded to TR-PEL. DUS showed vascular improvement on the healthy side.

Re-canalization to the penis was demonstrated by the improvement of the patient's ED, through the mechanism as the systemic vasodilation induced by the administration of PDE5is. [4]

Although the mechanism is unknown, the increase in the TT values is also of interest. TT inhibits the expression of nitric oxide synthase (NOS) and PDE5. [10] PDE5 is an enzyme that breaks down cyclic GMP, the intracellular second messenger of nitric oxide. It is abundant in the corpus cavernosum and causes erection and improves urge incontinence.

There were no systemic adverse effects in this patient because the effects of this treatment were seen in the penis, bladder and urethra. There were no systemic vascular effects because only the blood flow in the pelvic floor was improved; thus, there were no changes in the blood pressure, pulse or renal function, which is a major difference from the systemic effects of PDE5is. There was not considered to be a risk of prostatitis or prostate cancer because there was no increase in the patient's PSA level.

The efficacy and lack of local adverse events in association with this treatment can be attributed to the fact that the procedure was non-ablative with the laser in the long pulse (Smooth) mode. [5-7] The optical penetration of 2940 nm Er:YAG lasers is very shallow; thus, repetitive pulsing at a low intensity is used to produce controlled hyperthermia of the vessels of the pelvic floor through the mechanism as thermal diffusion. This method prevents adverse effects on the mucosal surface by taking advantage of its non-ablative characteristics. The absence of both systemic and localized side effects is another benefit of this new treatment.

### IV. CONCLUSIONS

We understand that this paper has several limitations. The most important is that we do not have a significant number of patients and sufficient follow-up. However, despite all these limitations, our study is the first to demonstrate the benefits of a non-ablative erbium laser in ED and Urge Incontinence in these types of patients. We can conclude that this procedure could be an effective option for these patients. Nevertheless prospective, randomized, controlled studies, with larger number of patients and longer follow up will be needed to better determine the use of this new option of treatment for this type of patient.

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