

Transrectal Non-Ablative Er:YAG Laser Treatment for Chronic Prostatitis/Chronic Pelvic Pain Syndrome

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ABSTRACT

Background: Chronic Prostatitis / Chronic Pelvic Pain Syndrome (CP/CPPS) is a common problem in men. Due to its heterogeneous nature, there is no universally effective treatment. Non-ablative Er:YAG laser therapy represents an effective addition to the available therapeutic options. It has been hypothesized that non-ablative Er:YAG laser therapy improves symptoms of CP/CPPS through increased vascularization of the prostate; however, supporting data is limited.

Aim: The aim of this study was to objectively assess potential changes in prostate vascularity and prostate volume after an intervention with non-ablative Er:YAG laser in patients with CP/CPPS.

Methods: Patients diagnosed with CP/CPPS were treated with non-ablative Erbium YAG laser over the period from 2018 till 2023. They received three laser sessions (L1, L2, L3) in intervals of one to three months, followed by one maintenance session (L4) when the effect started to fade (12-18 months after L3). After each laser session, prostate vascularization and prostate volume were measured via ultrasound (US). Vascularization was estimated from the count of visible blood vessels (VBV) and the observation of the total vascular image, considering both number and size of the vessels.

Results: 51 male patients with average age of 37.4 years (range 22-60) received four transrectal non-ablative Er:YAG laser treatments. Most patients expressed their satisfaction with the treatment results related to improvement of pelvic pain, urinary symptoms and sexual dysfunction. Compared to baseline, visible blood vessels (VBV) and total prostate vascularization showed a statistically significant increase after treatment completion. Prostate volumes showed reduction immediately after each treatment session and these reductions were well maintained through all successive follow-ups.

Conclusions: The improvement of CP/CPPS symptoms after non-ablative Er:YAG laser treatment might be due to the detected increase in prostate

vascularity and improved blood flow. More studies are needed to give additional proof of non-ablative Er:YAG laser efficacy and safety for CP/CPPS.

Key words: CP/CPPS, Er:YAG, prostatitis, prostate volume, vascularization.

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I. INTRODUCTION

Chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS) is the most common form of the symptomatic prostatitis subtypes, comprising up to 90–95% of prostatitis diagnoses[1]. It remains poorly understood, and treatments often fail to provide lasting relief. Unlike types I and II prostatitis, which respond to antibiotic treatment, CP/CPPS is not linked to bacterial infections. The management of CP/CPPS is complicated by its heterogeneous nature, with patients presenting with varying symptoms and levels of disease progression, which has made it difficult to identify a single effective long-term treatment.

CP/CPPS is characterized by lower urinary tract symptoms (LUTS), of which pain (particularly perineal pain and pain on ejaculation) and dysfunctional voiding cause the greatest morbidity and poor quality of life[2]. Many risk factors may lead to progression of LUTS, for instance, prostate volume, metabolic syndrome, and inflammation[3,4]. Prostate size can be indicative of several morbidities, such as benign prostate hyperplasia progression, acute urinary retention, LUTS progression, need for surgery and response to medical therapy[4,5]. A weak but significant relationship between prostate size and the International Prostate Symptom Score (IPSS) has been shown[4].

Various theories about the etiology and pathophysiology of CP/CPPS have led to the

development of a wide range of treatments, each targeting different aspects of the condition[6]. Pharmacological options include α -blockers, 5 α -reductase inhibitors, phosphodiesterase type 5 (PDE5) inhibitors, antibiotics, anti-inflammatory medications, botulinum toxin A (BTA), and other agents, either alone or in combination. In addition, non-pharmacological therapies, such as physical exercise, prostatic massage, acupuncture, pelvic magnetic stimulation, extracorporeal shockwave therapy, and transrectal thermotherapy, have been shown to alleviate symptoms of CP/CPPS[6].

A recent parallel cohort study demonstrated that non-ablative transurethral Er:YAG laser treatment with thermal SMOOTH™ mode is as effective as PDE5 inhibitors in reducing CP/CPPS symptoms, with lasting improvement observed up to a year after just two treatment sessions[7]. The hypothesized mechanism of action involves increased vascularity and improved blood flow to the prostate and periprostatic area. Although changes in vascularity were demonstrated in women treated with non-ablative Er:YAG laser treatment for GSM, no such data exist for patients with CP/CPPS. The aim of this study was to assess potential changes in prostate vascularity and volume before and after transrectal non-ablative Er:YAG laser treatment in patients with CP/CPPS.

II. MATERIALS AND METHODS

This study was performed at our medical center during the period from 2018 till 2023. Patients with diagnosed CP/CPPS were treated with non-ablative Erbium YAG laser. Three laser sessions (L1, L2, L3) were performed with intervals of one and three months, followed by one maintenance session (L4) when the effect started to fade (12-18 months after L3). Laser energy was delivered to multiple locations of the prostate via an R11 probe with an angular adapter. The following parameters were used: SMOOTH mode, 7 mm spot, 3 J/cm², 1.6 Hz, 7 stacks.

Before and approximately 15 minutes after each laser session, prostate vascularization was estimated from ultrasound (US) images. Vascularization was estimated from the count of visible blood vessels (VBV) and the observation of the total vascular image, considering both the number and size of the vessels. It was estimated on a 4-point scale (poor, fair, good, very good). Along with vascularization, the prostate volume was measured via US in the same time points.

A transrectal approach was used for delivery of laser energy to the prostate (Fig.1).

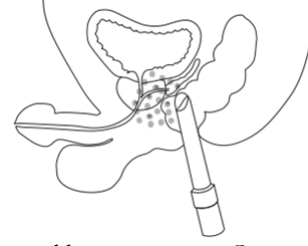


Figure 1: Transrectal laser treatment. Courtesy of Dr. Nobuo Okui

Two weeks after each treatment session, patients were asked to complete a short survey with the following two questions:

- Are you satisfied with the treatment results related to pelvic pain, urinary symptoms and sexual dysfunction?
- Did you experience any adverse effects?

III. RESULTS

51 male patients with average age of 37.4 years (range 22-60) received four transrectal non-ablative Er:YAG laser treatments. At the beginning of the therapy (L1) the overall prostate vascularization was assessed as poor in 35.3% of the patients, as fair in 21.6%, as good in 39.2% and as very good in 3.9% of the patients. Improvements during the treatments and follow-ups were: L2: 7.8% poor, 15.7% fair, 37.3% good and 39.2% very good; L3: 0% poor, 6.3% fair, 27.1% good and 66.7% very good; L4: 5.6% poor, 8.3% fair, 33.3% good and 52.8% very good. Visible blood vessels (VBV) showed a statistically significant increase (Fig. 2) from timepoint L1 to timepoint L4 (Table 1). An increase in total prostate vascularization after laser treatment was detected in US images (Fig. 3). The total prostate vascularization estimate showed a statistically significant increase (Fig. 4) from timepoint L1 to timepoint L4 (Table 2). Prostate volumes showed reduction immediately after the treatment at each of the sessions and these reductions were well maintained through all successive follow-ups. Volumes showed a statistically significant decrease (Fig. 5) from timepoint L1 to timepoint L4 (Table 3).

Table 1: Count of visible blood vessels

Timepoint	Before intervention	After intervention
L1	15.6 $\pm$ 4.5	19.6 $\pm$ 5.9
L2	19.5 $\pm$ 4.7	24.2 $\pm$ 5.3
L3	21.5 $\pm$ 4.3	26.7 $\pm$ 4.4
L4	20.9 $\pm$ 4.4	26.4 $\pm$ 4.0

Table 2: Total prostate vascularization

Outcome at Timepoint	Poor (% of patients)	Fair (% of patients)	Good (% of patients)	Very good (% of patients)
L1	35.3	21.6	39.2	3.9
L2	7.8	15.7	37.3	39.2
L3	0.0	6.3	27.1	66.7
L4	5.6	8.3	33.3	52.8

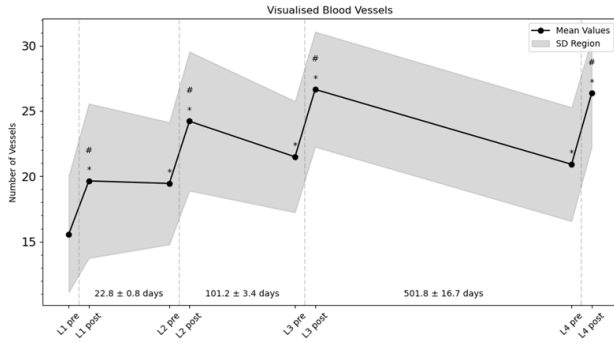


Figure 2: Significant increase of visible blood vessels (VBV).
 * $P < 0.05$ when compared with L1 pre # $P < 0.05$ when compared to the pre value of a given treatment

Timepoint	Before intervention	After intervention
L1	19.5±6.4 cc	18.5±5.9 cc
L2	18.3±6.0 cc	17.2±6.0 cc
L3	18.2±5.4 cc	15.5±4.9 cc
L4	18.5±7.0 cc	14.9±6.1 cc

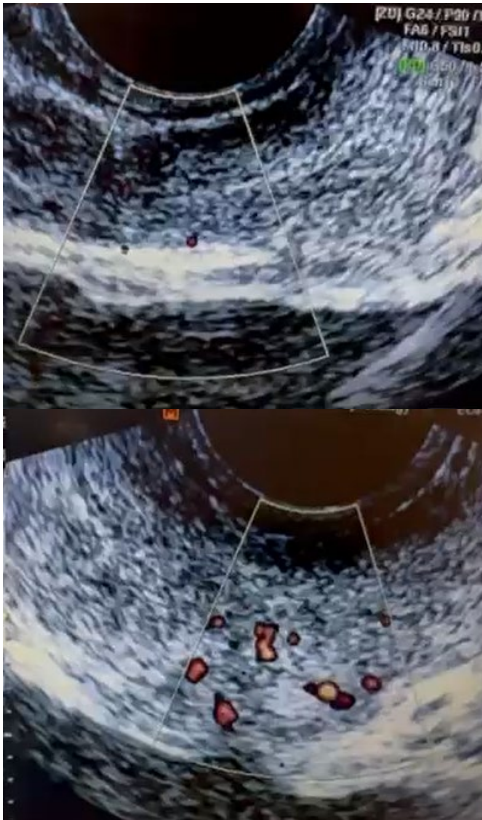


Figure 3: Example of prostate vascularization before and after laser treatment

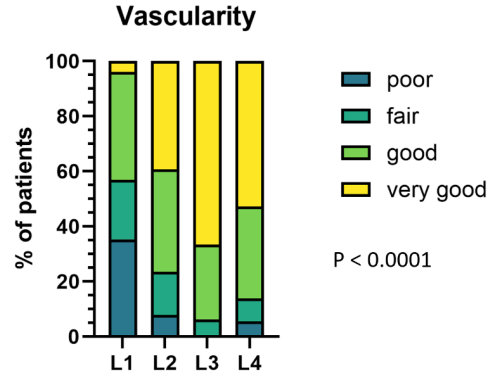


Figure 4: Total prostate vascularization at 4 different time points

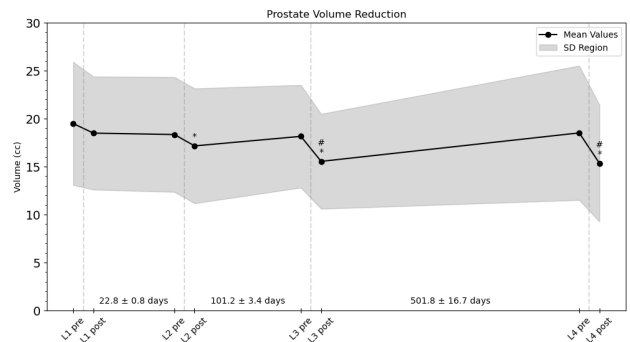


Figure 5: Prostate volume at 4 different time points.

In response to the survey, the patients did not report any adverse effects following the therapy and most of them expressed their satisfaction with the treatment results related to improvement of CP/CPPS symptoms (pelvic pain, urinary symptoms and sexual dysfunction).

IV. DISCUSSION

CP/CPPS has no clear infectious etiology, and its multifactorial pathogenesis has led to a wide range of treatment strategies—with varying and often limited efficacy[6]. However, no single approach has emerged as definitively effective for all patients[8]. Within this context, non-ablative Er:YAG laser treatment serves as a promising new modality. Unlike ablative lasers, the SMOOTH™ mode Er:YAG laser delivers controlled thermal energy that enhances tissue vascularity and promotes local microcirculation without damaging the epithelium. This treatment can be administered either transurethraly[7] or transrectally, as demonstrated in this study, with the latter approach presenting less discomfort for the patients.

This study clearly demonstrated an increase in prostate vascularity (Fig.3) and a reduction in prostate volume (Fig. 5) immediately after each laser treatment session, all of which was maintained through successive follow-ups. Most patients expressed their satisfaction

with the treatment results related to improvement of pelvic pain, urinary symptoms and sexual dysfunction. An objective increase in prostate vascularity has been reported[9] previously in a hemiplegic patient with erectile dysfunction and urge incontinence, treated with the same transrectal non-ablative Er:YAG laser modality. Hence, this treatment modality might alleviate CP/CPPS symptoms by improving vascularization and blood flow of the prostate and periprostatic area. No adverse events were observed or reported by the patients in this study after laser treatment. As pain severity was not specifically evaluated, we cannot claim effectiveness of this treatment for pain reduction based on this study. However, a study by Gaspar et al. (2020) has previously demonstrated a significant decrease in the VAS pain score after treatment, along with significant improvement in IPSS score. Gaspar et al.[7] hypothesized about the mode of action of non-ablative Er:YAG laser treatment for CP/CPSS, which is now supported by our objective findings.

The limitations of this study are the absence of a control group, a relatively small number of patients and a lack of pain severity quantification before and after the treatments. Nevertheless, our objective measurements of prostate vascularity and volume are a valuable contribution to the understanding of positive effects of non-ablative Er:YAG laser therapy in CP/CPSS.

V. CONCLUSIONS

This study indicates that non-ablative Er:YAG laser therapy increases prostate vascularity and reduces prostate volume, with effects sustained for up to 18 months. Although pain severity was not directly evaluated, patients reported symptom improvement and expressed satisfaction with the treatment. The effect of non-ablative Er:YAG laser treatment in CP/CPSS symptoms relief seems to be related to the observed increased prostate vascularity and consequently improved blood flow. Non-ablative Er:YAG laser therapy presents a valuable addition to current treatment options for CP/CPSS, particularly given its safety profile and potential benefits in symptom relief.

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