Research Article

A Preliminary Study: The Effectiveness of CO_2 Laser Therapy for Stress Urinary Incontinence

Sebuah Studi Awal: Efektivitas Terapi Laser CO_2 sebagai Terapi Inkontinensia Urin Tipe Tekanan

Fernandi Moegni[1], Nadir Chan[2], Budi I. Santoso[1], Raymond Surya[1], Leonardo[1]

[1]Department of Obstetrics and Gynecology
Faculty of Medicine Universitas Indonesia
Dr Cipto Mangunkusumo General Hospital
[2]Department of Obstetrics and Gynecology
YPK Mandiri Hospital, Jakarta

Abstract

Objective: To evaluate the role of fractioned CO_2 laser intravaginal as a non-invasive treatment for relieving stress urinary incontinence (SUI) symptoms.

Methods: This was a prospective, quasi-experimental study in patients with SUI. The patients were treated through three different sessions in a month apart by the fractioned CO^2 laser Femilift©, produced by Alma Lasers. The patients filled and completed questionnaires about continence assessment, quality of life, and sexuality before and after therapy based on PISQ-12 and ICIQ-UI questionnaire. Perineometry was performed to prove the outcome.

Results: Twenty women were enrolled. At 4 weeks following the third treatment, there was a significant improvement for continence assessment (7.70 ± 4.38 to 4.50 ± 2.88; $p < 0.001$), quality of life and sexuality (28.13 ± 7.06 to 33.13 ±7.80; $p < 0.001$), and vaginal perineometer results (37.20 ± 17.24 to 48.80 ± 16.72; $p = 0.009$).

Conclusions: Fractioned CO_2 intravaginal laser has a role in improving SUI symptoms.

Keywords: fractioned CO_2 laser, stress urinary incontinence, vaginal rejuvenation.

Abstrak

Tujuan: *Untuk mengetahui efektivitas terapi laser CO_2 terfraksi intravaginal sebagai terapi non-invasif untuk mengurangi gejala inkontinensia urine (IU) tipe tekanan.*

Metode: *Penelitian ini merupakan studi prospektif, quasi-eksperimental pada pasien dengan inkontinensia urin (IU) tipe tekanan yang mengikuti terapi laser CO_2 terfraksi intravaginal tiga sesi berbeda, dengan jarak satu bulan menggunakan laser CO_2 terfraksi Femilift© dari Alma Lasers. Subjek mengisi kuesioner mengenai penilaian kontinensia, kualitas hidup dan kehidupan seksual sebelum dan sesudah terapi (kuesioner PISQ-12 dan ICIQ-UI). Selain kuesioner, pemeriksaan perineometri juga dilakukan pada beberapa subjek penelitian untuk membuktikan efektivitas terapi.*

Hasil: *Dua puluh subjek ikut dalam penelitian ini. Penilaian pada minggu keempat setelah sesi terapi ketiga, menunjukkan peningkatan yang signifikan pada penilaian kontinensia (7.70 ± 4.38 ke 4.50 ± 2.88; $p < 0.001$), pada kualitas hidup dan kehidupan seksual (28.13 ± 7.06 ke 33.13 ±7.80; $p < 0.001$), dan pada hasil perineometri (37.20 ± 17.24 ke 48.80 ± 16.72; $p = 0.009$).*

Kesimpulan: *Terapi laser CO_2 terfraksi intravaginal menunjukkan kecenderungan untuk mengurangi gejala inkontinensia urine (IU) tipe tekanan.*

Kata kunci: *inkontinensia urin tipe tekanan, terapi laser CO2 terfraksi intravaginal, vaginal rejuvenation.*

Correspondence author. Leonardo. leo.tanamas@hotmail.com

INTRODUCTION

Stress Urinary Incontinence (SUI) is defined as involuntary urine leakage caused by the loss of urethral support, usually as a consequence of the supporting structural muscles in the pelvis.[1,2] It directly implicates to deterioration on quality of life. In SUI, patients usually report leakage of small amount of urine during activities that increase abdominal pressure such as coughing, sneezing, and lifting of heavyweights.[1-4]

One of alternative treatment of SUI is through laser. This option has been reported to stimulate collagen neogenesis, skin and tissue remodelling, also rejuvenation in wound healing, dermatological and gynecological applications.[5-9] When recruiting this technology for intravaginal gynecological treatments, it is expected to exploit natural healing responses to trigger epithelial tissue regeneration to strengthen urethral support. The treatment exploits a unique combination of minimal superficial ablation and deeper thermal deposition of the fractioned CO_2 laser energy, delivered via a probe designed specifically for the vaginal anatomy. In response, it causes collagen and elastic fiber remodelling, glycogen synthesis and transudate production yielding a state typical of the reproductive age.[10]

This prospective study aims to evaluate the effectiveness of fractioned CO_2 laser intravaginal treatment in SUI patients.

METHODS

This was a prospective, quasi-experimental study, which was performed in YPK Mandiri Hospital. Women diagnosed with SUI were asked to participate in this study and signed the informed consent unless they refused. Patients were treated with three different sessions, 1 month apart by the fractional CO_2 laser Femilift© sponsored by Alma Lasers. Patients were filled the standardized questionnaire from ICIQ – IQ and PISQ – 12 in Bahasa to evaluate the effectiveness of fractioned CO2 laser treatment before and after 1 month of last therapy. They completed questionnaires about continence assessment, quality of life and sexuality. To prove objectively, the independent OB-GYN evaluated a vaginal perineometry.

The result was shown descriptively through frequency and percentage or mean (SD) for normal distribution and median (minimum-maximum) for abnormal distribution. The analysis used paired t-test in SPSS version 23 for Mac. This study has been approved by the Ethical Research Committee of the Faculty of Medicine University of Indonesia under number 389/UN2. F1/ETIK/2017.

RESULTS

There were 20 subjects included with the mean age of 54,95 ± 9,30 years old. Demographic characteristics were depicted in Table 1.

Table 1. Characteristics of the Subjects

Variables	Category	Median (min-max) or n (%)
Age (years old)		54.95 (49 – 69)
	≤ 50 years	4 (20)
	> 50 years	16 (80)
BMI (kg/m2)		25.84 (19.38 – 32)
BMI classification11	> 30	2 (10)
	≤ 30	18 (90)
Parity	Primipara	2 (10)
	Multipara	18 (90)
Delivery mode	Spontaneous	18 (90)
	Vacuum extraction	2 (10)
	Cesarean	n/a
Birth weight (grams) median		3517.5 (3100 – 4100)
Birth weight classification[11]	≥ 3.000	20 (100)
	< 3.000	0 (0)
Menopause	Yes	12 (60)
	No	8 (40)

Progressive improvements before and after the treatment regiments were reported in Table 2. We observed a statistically significant improvement in ICIQ – IU score, PISQ-12 score and in perineometers.

Table 2. Treatment Results before and after the Regiments

	Pre-treatment score	Post-treatment score	*P-value*
ICIQ-UI score (N=20)	7.70 ± 4.38	4.50 ± 2.88	< 0.001
PISQ-12 score (N=16)	28.13 ± 7.06	33.13 ± 7.80	< 0.001
Perineometers (N=5)	37.20 ± 17.24	48.40 ± 16.72	0.009

Data were presented as mean ± SD. Statistical analysis was performed using paired T-test.

All patients completed ICIQ-UI questionnaire and there was a significant difference before and after treatment. Sixteen patients filled in PISQ-12 questionnaire (4 patients were not sexual active) and there was statistically different between groups. Perineometers were also done to objectively observe the difference before and after the treatment regiments, but only 5 patients agreed to do the test, and we also got a statistically significant difference between the groups.

DISCUSSION

Currently, there are many initial nonsurgical therapies for patients with SUI, such as behavioural therapy, pelvic floor muscle exercises, electric stimulation, vaginal cones, occlusive and intravaginal devices and pharmacological treatments. However, these strategies require the patient to show patience, motivation, and time commitment and undergo training. Women are unlikely to comply with a strict program of behaviour modification and regular pelvic floor exercises.[12] Therefore, other non-invasive methods are still urgently required and one of the instruments is fractioned CO_2 laser intravaginal.

Previous studies have shown molecular changes and collagen synthesis in the atrophic vagina after fractional CO_2 treatment.[9,10,13,14] The biostimulative effect of fractioned CO_2 laser treatment restores most vaginal functions, including secretion, absorption, elasticity and lubrication, and the thickness of the vaginal epithelium.[15] The production of elastic fibres and stimulation of neocollagenesis, that leads to the increased thickness of the vaginal epithelium may be related to the restoration of urethral coaptation mechanisms involved in the pathophysiology of SUI.[14,15]This cascade of events provides relief from discomfort in menopausal women.

Recent pilot studies have shown remarkable improvement in SUI after laser energy treatment including recovery of the submucosal blood vessel plexus and an increase in periurethral muscle tone that is related to the urethral closure pressure mechanism.[14,15]

These preliminary results warrant further assessments in a bigger sample size and over a longer follow – up period, later to be followed by validation in randomized studies. These studies must consider the longevity of both subjective and objective improvements, as well as the need for maintenance treatments.

CONCLUSION

Our preliminary results suggest that fractioned CO_2 intravaginal laser has a role in improving symptoms in mild SUI patients. Fractioned CO_2 intravaginal laser is a minimally invasive tool, which provides for a novel approach to treat SUI symptoms.

REFERENCES

1. Abrams P, Cardozo L, Fall M, et al. The standardization of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. Am J Obstet Gynecol. 2002;187:116-26.
2. McKenzie S, Watson T, Thompson J, Briffa K. Stress urinary incontinence is highly prevalent in recreationally active women attending gyms or exercise classes. Int Urogynecol J. 2016; 27(8):1175-84.
3. Wood LN, Anger JT. Urinary incontinence in women. BMJ. 2014;349:4531.
4. Cervigni M, Gambacciani M. Female urinary stress incontinence. Climacteric. 2015;18 (Suppl 1):30-6.
5. da Silva JP, da Silva MA, Almeida AP, aLombardi Junior I, Matos AP. Laser Therapy in the tissue repair process: a literature review. Photomed Laser Surg. 2010;28(1):17-21.
6. Sadick NS. Update on non-ablative light therapy for rejuvenation: a review. Lasers Surg Med. 2003;32(2):120-8.
7. Loffer FD. Hysteroscopic endometrial ablation with the Nd:Yag laser using a nontouch technique. Obstet Gynceol. 1987;69(4):679-82.
8. Fistonic N, Fistonic I, Gustek SF, et al. Minimally invasive, non-ablative Er: YAG laser treatment of stress urinary incontinence in women – a pilot study. Lasers Med Sci.2016;31:635-43. doi:10.1007/s10103-016-1884-0.
9. Bader A. Non-invasive management and treatment of female stress urinary incontinence with a CO2 laser. HJOG. 2015;14(4):106-10.
10. Kaufmaan R, Hibst R. Pulsed Erbium: YAG laser ablation in cutaneous surgery. Lasers Sur Med. 1996;19(3):324-30.
11. Eftekhar T, Hajibaratali B, Ramezanzadeh F, Shariat M. Postpartum evaluation of stress urinary incontinence among primiparas. Int J Gynecol Obstet. 2006;94(2):114-8.
12. Salvatore S, Leone Roberti Maggiore U, Athanasiou S, et al. Histological study on the effects of microablative fractional CO2 laser on atrophic vaginal tissue: an ex vivo study. Menopause. 2015;22(8):845-9.
13. Ronconi L, Galli M. MonaLisa TouchTM: the latest frontier in the treatment of vaginal atrophy. DEKA Ed. Sci Series. 2012;2:61-111.
14. Gonzalez P, Ruiz AI, Galindo L. Tratamiento de la atrofia vaginal en la menopausia con laser de CO2 fraccional microablativo. Rev Enfer Tract Gen Inf. 2014;8:36–40.
15. Salvatore S, Maggiore UL, Origoni M, Parma M, Quaranta L, Sileo F, et al. Microablative fractional CO2 laser improves dyspareunia related to vulvovaginal atrophy: a pilot study. J Endometriol Pelvic Pain Disord. 2014;6(3):150–6.