

Ultrasonographic Response to Low-Intensity Laser Therapy in Chronic Prostatitis.

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Abstract: Purpose: to detect the ultrasonographic and prostatitis-symptom severity index responses to low intensity laser as an adjuvant therapy in chronic bacterial prostatitis in the presence of urogenital chlamydiasis. **Methods of evaluation:** Measurement of the prostatitis-symptom severity index (PSSI) and the ultrasonographic prostatic volume (UPV) in CC. **Methods:-** forty five patients who had chronic bacterial prostatitis in the presence of urogenital chlamydiasis were participated in this study, their ages ranged from 35 to 50 years, they were randomly divided into 3 equal groups in number, groups (A), (B) and group (C). Group (A) received the traditional physical therapy treatment in addition to the low-intensity laser on the prostatic gland (over the perineal trigger points) 3 times/week for 2 months plus the Ciprofloxacin HCL 500 mg tablets as an antibacterial therapy in a dose 500 mg twice a day. Group (B) received the traditional physical therapy treatment plus the Ciprofloxacin HCL 500 mg tablets as an antibacterial therapy in a dose 500 mg twice a day. Group (C) received only the traditional physical therapy treatment. **Results and conclusion:-** Results showed a highly significant reduction in PSSI and UPV at the end of the treatment program in both groups (A) and (B), with non-significant difference in group (C) at the end of the treatment program. So programmes of treatment in groups (A) and (B) were effective in improving the chronic bacterial prostatitis in the presence of urogenital chlamydiasis as manifested by the highly significant reduction in PSSI and UPV. But addition of low intensity laser as an adjuvant therapy in chronic bacterial prostatitis in the presence of urogenital chlamydiasis to the ciprofloxacin HCL in group (A) was more fruitful and beneficial than the ciprofloxacin HCL alone in group (B).

Key words (Low intensity laser, Chronic bacterial prostatitis, Urogenital chlamydiasis, Prostatitis-symptom severity index, Ciprofloxacin HCL and the Ultrasonographic prostatic volume).

Introduction

Chronic prostatitis has been a perplexing problem for urologists for decades, the perils and pitfalls that urologists encounter with epidemiology, etiology, classification and treatment of this syndrome are tremendous. Patients with CCPS exhibits genitourinary voiding complications, pain and sexual dysfunctions, so most urologists acknowledge that prostatitis, especially the chronic type is frustrating and difficult clinical problem to deal with in urology as etiology is unclear^{1, 2,3, 4}.

Most patients with chronic prostatitis have a poor understanding of their condition, and many are generally unhappy with the results of their treatment. Moreover, many clinicians are frustrated in their attempts to treat patients with prostatitis. Unless the patient responds quickly to therapy, which seldom is the case, the tendency is for the clinician to refer the patient elsewhere or to tell the patient he must simply learn "to live with his condition". It is now recognized that prostatitis occurs in several distinct forms or syndromes. These syndromes have separate causes, clinical features and sequelae. Proper clinical management, therefore, is possible only if the clinician is specific in diagnosis and therapeutic strategy^{2,5,6,7,10}.

Chronic bacterial prostatitis (CBP) is a more subtle illness, typified by relapsing recurrent UTI caused by persistence of the pathogen in the prostatic secretory system despite courses of antibacterial therapy. In contrast, patients with nonbacterial prostatitis (NBP) have excessive inflammatory cells in their prostatic secretions despite no history of documented UTI and negative cultures. In patients with prostatodynia (PD), there is no history of UTI, cultures are negative, and typically prostatic secretions appear normal^{1,8,9,10}.

National institutes of health classified prostatitis syndrome into 4 categories. Category I, is a disease that called acute bacterial prostatitis, category II, is a disease that characterized by prostatic inflammation with presence of bacteria in the prostate specific specimens (Expressed prostatic secretion, ejaculate and urine voided after prostatic massage); prostatic pathogenic or uropathogenic bacteria in these specimens, patients of category II prostatitis have recurrent cystitis or lower urinary tract infection^{2,3,6,7,10}.

Category III, now termed CPPS, previously diagnosed as nonbacterial prostatitis and prostatodynia. These patients have complaints of pain with variable voiding and sexual dysfunctions. However category III is subdivided into III A and III B based on the presence or absence of infection in the prostate specific specimens (EPS, ejaculate, VB₃ urine culture), while category IV, recognizes that asymptomatic prostatic inflammation that can lead to prostate cancer, or in entirely healthy patients without symptoms. Beyond the previous classification, some investigators postulate another etiological factor as immunologic, chemical, neuromuscular, anatomic and pressure turbulent voiding with intraprostatic ductal reflux abnormalities. Molecular biological, neurophysiological and urodynamic studies will be needed to exactly define the etiological mechanisms in this proposed classification system^{3, 5, 8,9,11}.

The use of light for therapeutic purposes dates back to the ancient Egyptians, Greeks and Romans. Current research into the physiological benefits of light therapy has developed an area of great interest which is the laser. Most research in the uses of laser was reported by European sources. Only during the past decade have American research workers begun to add the results of their studies^{12, 13,14,15}.

The salutary effect of laser therapy in medical practice connects with the improvement of microcirculation and the activation of cell proliferation. The concepts of free radical mechanism of low level laser irradiation (LLLI) stimulating action to the endogenous porphyrins, which are chromophores of LLLI in the red spectral range and known as photo sensitizers, localized in blood cells membrane and absorb photons of the LLLI. This process is the basis for initiation of photosensitized free radical reaction including lipid peroxidation of blood leukocyte membranes with subsequent formation of lipid hydroperoxides. Peroxidative modification of membrane lipids increases cell membrane ionic permeability for calcium ions^{15,17,18,19,21}.

Material and Methods

Subjects:

Forty five patients who had chronic bacterial prostatitis in the presence of urogenital chlamydia were participated in this study, their ages ranged from 35 to 50 years, they were randomly divided into 3 equal groups in number, groups (A), (B) and group (C). Group (A) received the traditional physical therapy treatment in addition to the low-intensity laser on the prostatic gland (over the perineal trigger points) 3 times / week for 2 months plus the Ciprofloxacin HCL 500 mg tablets as an antibacterial therapy in a dose 500 mg twice a day. Group (B) received the traditional physical therapy treatment plus the Ciprofloxacin HCL 500 mg tablets as an antibacterial therapy in a dose 500 mg twice a day, while group (C) received only the traditional physical therapy treatment^{1,6,9,15,17,24}.

Instrumentation:

1- The laser unit is a small hand held machine, class III laser product under the existing requirements of the United States food and drug association regulation. It manufactured by Laserex technology pty ltd Australia. The machine offers two types of laser therapy (continuous and pulsed). Continuous laser therapy is of a common use and many studies had found it effective. The maximum output is determined by the probe connected and the power could be settled. The device has the following treatment parameters: Laser type: Gallium arsenide (Ga-As), maximum average power: 5 milli Watts, wave length: 904 nm, maximum repetition rate: 5 kHz and energy density: 2 J/ session.

2- Ciprofloxacin HCL 500 mg tablets as an antibacterial therapy in a dose 500 mg twice a day: Ciprofloxacin HCL 500 mg is an antimicrobial from the quinolone group of antibiotics that can be distributed to all tissue, so it is used in urinary tract infections, gastrointestinal infections, bone infections, meningitis (H. influenza) and respiratory infections^{6,7,8,9,10}.

Procedures**Evaluation:**

1- Objective prostatitis-symptom severity index (PSSI): It was used to evaluate 10 items of pain or discomfort before and after 2 months treatment program as following; (1) in the peins, (2) in the area between testicles and anus (perineum), (3) in the pubic or bladder area, (4) during or after ejaculation, (5) in the testicles,(6) in the low back, upper leg and groin area, (7) feeling of incomplete bladder emptying after urination,(8) urination too often, (9) difficulty postponing urination, and (10) pain or burning during urination . All patients were instructed to circle a number from 0 to 5 on each line of the 10 items of the PSSI, that best describes the average symptoms that have them, where (0) means that symptom is absent and (5) means that symptom is the worst as patient imagine for the 10 items and eventually the total score was summated to be statistically treated.

2- Trans-rectal ultrasonography: It was done before treatment and at the end of second month of treatment. Trans-rectal probe 6.5 EC 10 with Sony video graphic printer up 890 MD is able to evaluate prostatic volume (three dimensions), presence of calcification around the urethra (prostatic stones), volume of the periurethral zone, presence or absence of posterior prostate lip thickness, detrusor (bladder muscle thickness) and prostate anterior stroma. It was used in this study to assess the ultrasonographic prostatic volume (UPV),^{4,8,9}.

Treatment:

All patients in the 3 groups (A), (B) and (C) were received the same traditional physical therapy and home exercise in the form of relaxation techniques, pelvic floor exercise and instructions for bladder training. Also all patients were received the same medical care and medications.

Procedures of low-intensity laser in group (A): According to the previously mentioned characteristics and specifications of laser, and with the patient in the comfortable left lateral position for sigmoidoscopy (long axis of the patient's trunk at 45° to the long axis of the couch, feet level with far edge of couch, buttocks raised on sandbag, and buttocks extending about 10 cm beyond the couch near edge), area of treatment was cleaned, and then the 10 exaggerated perineal trigger points between anus and scrotum were irradiated (90 seconds for each one) with the continuous low level laser. The perpendicular contact application of the laser probe with light pressure on the trigger points was used to enhance depth of light penetration. The treatment program was conducted for fifteen minutes, 3 times/ week for 2 months^{4,9,17, 19,22}.

Data analysis:

PSSI and UPV were measured before and after the treatment program and the collected data were fed into computer for the statistical analysis; descriptive statistics as mean, standard deviation, minimum and maximum were calculated for each group. The t-test was done to compare the mean difference of the two groups before and after application and within each group. Alpha point of 0.05 was used as a level of significance^{25, 26}.

Results

In the present study, effects of low intensity laser as an adjuvant therapy in chronic bacterial prostatitis in the presence of urogenital chlamydia on ultrasonographic prostatic volume (UPV) and prostatitis-symptom severity index (PSSI) were investigated. As shown in table (1) and figure (1), the mean values of UPV before treatment was (22.033 ± 0.02232) CC in the first study group, while after treatment was (15.015 ± 0.0126) CC. These results revealed a highly significant reduction in UPV (P<0.0001). While the mean values of UPV before treatment was (22.035± 0.0231) CC in the second study group, while after treatment was (20.022 ± 0.0321) CC. Also these results revealed a highly significant reduction in UPV (P < 0.0001).). But the mean values of UPV before treatment was (22.034 ± 0.0220) CC in the control group (C), while after treatment was (22.032 ± 0.0218) CC. These results revealed non-significant difference in UPV (P > 0.05).

Table (1): Comparison of the mean values of UPV before and after treatment in the three groups in CC.

	Before treatment		After treatment		Mean difference	T.value	P.value
	Mean in CC	± SD	Mean	± SD			
First study group (Laser and Ciprofloxacin HCL group)	22.033	0.0223	15.015	0.0126	7.01800	1026.12	< 0.0001
Second study group (Ciprofloxacin HCL group)	22.035	0.0231	20.022	0.0321	2.01300	197.14	< 0.0001
Control group (C)	22.034	0.0220	22.032	0.0218	0.002000	0.25	0.804

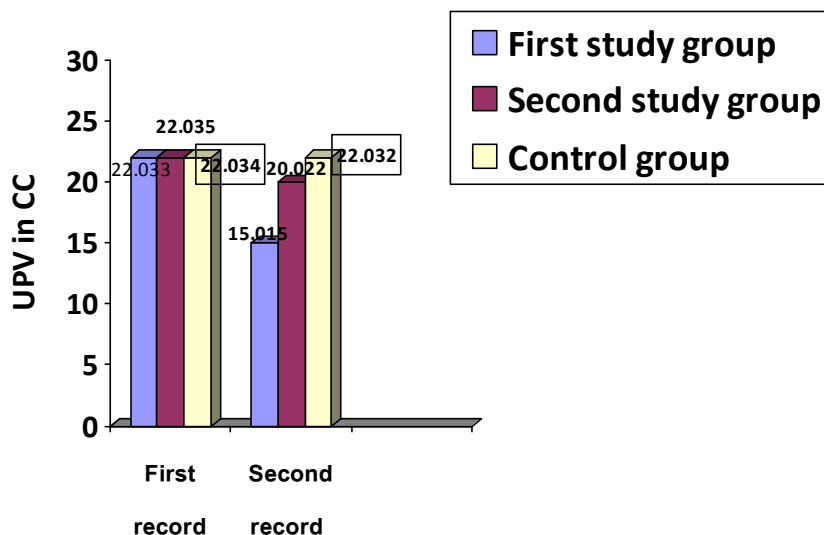


Fig (1): Mean values of the UPV before and after treatment in the three groups.

Also as shown in table (2) and figure (2), the mean value of PSSI before treatment was (42.1222 ± 3.5321) degrees in the first study group (Laser and Ciprofloxacin HCL group), while after treatment was (13.1000 ± 1.9860) degrees. These results revealed a highly significant reduction in PSSI (P<0.0001). The mean

value of PSSI before treatment was (42.2210 ± 3.6221) degrees in the second study group (Ciprofloxacin HCL group), while after treatment was (26.2000 ± 2.8750) degrees. Also these results revealed a highly significant reduction in PSSI (P<0.0001). But the mean values of PSSI before treatment was (42.2215 ± 3.6236) degrees in the control group (C), while after treatment was (42.1110 ± 3.4312) degrees. These results revealed non-significant difference in PSSI (P > 0.05).

Table (2): Comparison of the mean values of PSSI in degrees before and after treatment in the three groups.

	Before treatment		After treatment		Mean difference	T.value	P.value
	Mean in CC	± SD	Mean	± SD			
First study group (Laser and Ciprofloxacin HCL group)	42.1222	3.5321	13.1000	1.9860	29.022	27.74	< 0.0001
Second study group (Ciprofloxacin HCL group)	42.2210	3.6221	26.2000	2.8750	16.021	13.42	< 0.0001
Control group (C)	42.2215	3.6236	42.1110	3.4312	0.11050	0.09	0.932

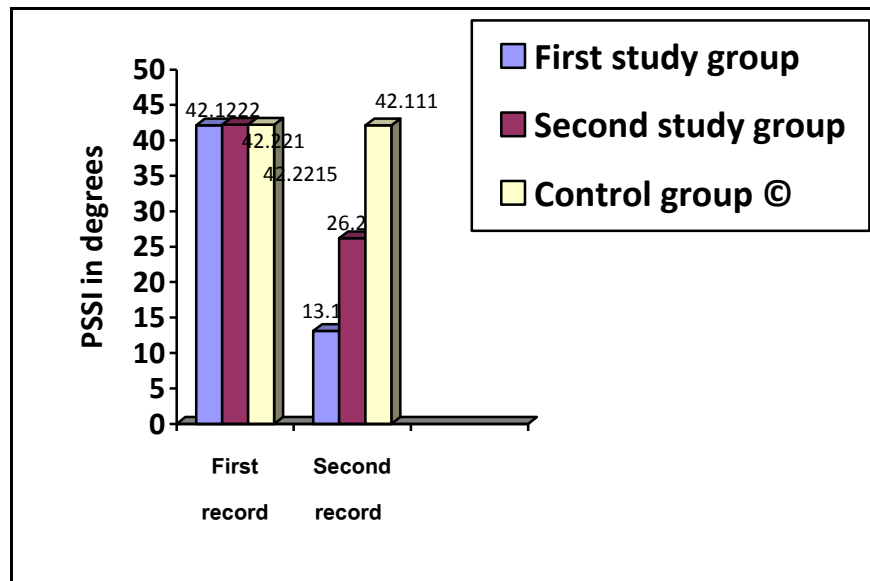


Fig (2): Mean values of the PSSI in degrees before and after treatment in the three groups.

Discussion

The prostate gland is only found in men. It lies just beneath the bladder. It is normally about the size of a chestnut. The urethra runs through the middle of the prostate. The prostate helps to make semen, but most semen is made by the seminal vesicle. Symptoms of the chronic bacterial prostatitis are pelvic pain and voiding symptoms. Pain or discomfort lasts several months, and often longer. It's usually at the base of the penis, and around the anus and lower back sometimes pain spreads down to the tip of the penis and/or into the testes. Ejaculation may be painful. Pain may vary in severity from day to day. So pain may be perineal, penile, testicular, suprapubic, scrotal, ejaculatory and even abdominal ^{2,4,8,10}.

Mild urinary irritation in the form of mild pain during urine passage, also there is an urgent desire to pass urine at times, some hesitancy when trying to pass urine, poor urinary stream, feeling tired with general aches and pains, so voiding complaints may be in the form of frequency of micturition, difficulty to start, difficulty to maintain and difficulty to stop the act, urgency or dribbling, nocturia, decreased force of the stream with bifurcation, hesitancy, sense of incomplete emptying and even retention of urine with enlarged prostate and tenderness of the levator ani muscles during the per rectal examination, eventually all these voiding symptoms and pain will affect the quality of life and even can lead to retrograde ejaculation, erectile dysfunction and impotence^{8,10, 11}.

The prostate is made up of five lobes; anterior, middle, posterior, and two laterals, enlargement of the lateral lobes may be detected on rectal examination. Prostatic urethra extends from the internal urinary meatus to the apex of the prostate and is the widest part of the urethra. The prostate is a glandular organ lies beneath the bladder and is penetrated by the proximal urethra, it appears like the caecum, approximately 4×3×2 cm and clasped on each side by the levator prostate part of the levator ani, the prostate provides about 20% of the seminal fluid, it has a base, apex, anterior, posterior and inferolateral surfaces^{4,7,10}.

Prostate is an exocrine compound tubuloalveolar gland, surrounding the neck of the urinary bladder. Histological structure is formed of stroma and parenchyma. The stroma is composed of capsule, trabeculae and the reticular network. The capsule is a thick fibromuscular capsule with smooth muscle fibers. The trabeculae are a thick fibromuscular septa extending from the capsule dividing the gland into lobes and lobules. While the reticular network is formed of supporting reticular fibers and cells stained with silver. The parenchyma is formed of acini and ducts; the prostatic acini are about 30 -50 in number, arranged in three concentric groups around the prostatic urethra, where their ducts empty their secretions. In the mucosal group (central zone), there are small acini embedded directly around the urethra. They open in the urethra directly or by short ducts around the entire surface of the urethra. In the submucosal group (transition zone), there are medium – sized acini that open through short ducts into the posterolateral aspect of the urethra. In the main group (peripheral zone), there are a large – sized acini which open into the posterior aspect of the urethra via long ducts. They constitute 70 % of the gland^{1,4,7,8, 10}.

The photoelectric effect first discovered by Hertz and the theory of light elucidated by Albert Einstein. According to the photoelectric effect, when light strikes any material substance, electrons are discharged, creating a current. Simply, light interacts with matter as the energy of the light is transferred to the electrons. In 1905, Einstein offered an explanation for this phenomenon with his Corpuscular Theory of Light. Einstein proposed that light is composed of corpuscular units called photons. He further claimed that a photon is the smallest unit of light and has a dual nature, being both a particle and a wave at the same time^{12, 14,16,18}.

Laser leads to increased lymphatic flow and decreased edema, stimulation repair processes as a result of increased cell proliferation, microcirculation activation and more efficient tissue metabolism, increased antioxidant activity in the blood, stabilizing lipid peroxidation in cell membranes, stimulation of erythropoiesis, normalization of acid base balance in the blood. Reflexogenic effects on the functional activity of different organs and systems. It should be cautioned that an excessive dose of radiation can be detrimental. Thus, at proper doses of light there can be a stimulation of growth, but at high doses an excessive amount of singlet oxygen can be produced, and its chemical action can be detrimental to cells. It is felt that LLLT reduces the excitability of the nerve cells by an interruption of the fast pain fibers with a resultant reduction in pain. LLLT has also been shown to accelerate the repair process of crush damaged nerves and improve function in both the CNS and peripheral nerves after injury^{13, 16,17,20,21,22,23}.

Findings of the present study showed non-significant differences in the pre-treatment records of the UPV and PSSI, between the mean values of the first study and the control groups, between the mean values of the second study and the control groups, between the mean values of the second study and the first study groups. Findings of the present study showed a highly significant reduction in the second records of the UPV and PSSI, between the mean values of the first study and the control groups, between the mean values of the second study and the control groups, between the mean values of the first study and the second study groups. Results of this study revealed a highly significant reduction in the mean values of UPV and PSSI in the first study group after the application of the Laser and ciprofloxacin HCL, also in the second study group after the application of the ciprofloxacin HCL, with non-significant differences in the mean values of UPV and PSSI in the control group after the application of the traditional physical therapy. But comparing second records of the

UPV and PSSI, between the mean values of the first study and the second study groups showed highly significant reduction indicating that addition of the low intensity laser as an adjuvant therapy in chronic bacterial prostatitis in the presence of urogenital chlamydia to the ciprofloxacin HCL in group (A) was more fruitful and beneficial than the ciprofloxacin HCL alone in group (B).

Significant differences showed in this study were consistent with those observed and recorded by^{1,2,13,3,5,15,6,8,21,22,9,24,17}.

Results of this study supports the expectation that both programmes of treatment in groups (A) and (B) were effective in improving the chronic bacterial prostatitis in the presence of urogenital chlamydia as manifested by the highly significant reduction in PSSI and UPV. But addition of low intensity laser as an adjuvant therapy in chronic bacterial prostatitis in the presence of urogenital chlamydia to the ciprofloxacin HCL in group (A) was more fruitful and beneficial than the ciprofloxacin HCL alone in group (B).

Conclusion

Both programmes of treatment in groups (A) and (B) were effective in improving the chronic bacterial prostatitis in the presence of urogenital chlamydia as manifested by the highly significant reduction in PSSI and UPV. But addition of low intensity laser as an adjuvant therapy in chronic bacterial prostatitis in the presence of urogenital chlamydia to the ciprofloxacin HCL in group (A) was more fruitful and beneficial than the ciprofloxacin HCL alone in group (B).

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