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Efficacy of low-level laser therapy and pelvic stabilization exercises on postpartum pelvic girdle pain

Skuteczność laseroterapii niskopoziomowej i ćwiczeń stabilizacji miednicy w leczeniu poporodowego bólu obręczy miedniczej

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Abstract

Introduction. Postnatal Pelvic girdle pain (PGP) is common complaint in women all over the world and it has a major impact on health and functioning as it decreases quality of life. The start of PGP is typically by weeks 17–19 of gestation, with a peak of occurrence by weeks 24–36 postpartum continuation. Studies have shown that 5–27% of the women had persisting pain 1–3 months after delivery.

Methods. Ninety postnatal women's was randomly classified into three groups, Group (A): Contains of 30 women's treated with pelvic stabilization exercises. Group (B): Contains of 30 women's treated with low-level laser therapy only and group (C): Contains of 30 women's treated with pelvic stabilization exercises and low-level laser therapy all groups remain twelve sessions over six week's period by two sessions per week. Visual analogue scale, serum cortisol level, pelvic girdle questionnaire, Faber test and P4 test were measured and compared at 0 and 6 weeks after the treatment in the three groups.

Results. All groups improved significantly from pretests to posttests score on both outcome measures of VAS, PGQ, cortisol level, Faber test and P4 test $p = 0001$. These data support the findings that when patients are unable to exercise, low level laser therapy is an appropriate alternative for pain reduction and increased daily function for individuals suffering from postpartum pelvic girdle pain.

Conclusion. Our Results revealed that laser therapy accompanied with pelvic Stabilisation exercise is effective in improving postpartum pelvic girdle pain reducing, pain stress, decrease disability and improve activity of daily level.

Key words:

pelvic girdle pain, low-level laser therapy, stabilisation exercise

Streszczenie

Wprowadzenie. Poporodowy ból obręczy miedniczej (PGP) jest częstą dolegliwością kobiet na całym świecie i ma duży wpływ na zdrowie i funkcjonowanie, ponieważ obniża jakość życia. PGP zaczyna się zwykle w 17–19 tygodniu ciąży, a szczyt przypada na 24–36 tygodni również po porodzie. Badania wykazały, że 5–27% kobiet odczuwało utrzymujący się ból 1–3 miesiące po porodzie.

Metody. Dziewięćdziesiąt kobiet po porodzie zostało losowo podzielonych na trzy grupy, Grupa (A): obejmuje 30 kobiet leczonych ćwiczeniami stabilizującymi miednicę. Grupa (B): obejmuje 30 kobiet leczonych wyłącznie laseroterapią niskopoziomową i grupa (C): obejmuje 30 kobiet leczonych ćwiczeniami stabilizującymi miednicę i laseroterapią niskopoziomową; wszystkie grupy wzięły udział w dwunastu sesjach w okresie sześciu tygodni, dwie sesje na tydzień. W badaniu zastosowano wizualną skalę analogową, zmierzono poziom kortyzolu w surowicy, wykorzystano kwestionariusz dotyczący obręczy miedniczej, test Fabera i test P4 i porównano wyniki na początku i 6 tygodni po leczeniu w trzech grupach.

Wyniki. We wszystkich grupach zaobserwowano znaczącą poprawę, od wyników testów wstępnych do testów końcowych w obu miarach wyniku: VAS, PGQ, poziomu kortyzolu, teście Fabera i teście P4 $p = 0001$. Dane te potwierdzają ustalenia, że gdy pacjentki nie są w stanie ćwiczyć, laseroterapia niskopoziomowa jest odpowiednią alternatywą dla zmniejszenia bólu i poprawy codziennego funkcjonowania kobiet cierpiących z powodu poporodowego bólu obręczy miedniczej.

Wniosek. Nasze wyniki wykazały, że terapia laserowa połączona z ćwiczeniami stabilizującymi miednicę jest skuteczna w łagodzeniu poporodowego bólu obręczy miedniczej, zmniejszaniu stresu, zmniejszaniu niepełnosprawności i poprawie codziennej aktywności.

Słowa kluczowe

ból obręczy miedniczej, niskopoziomowa laseroterapia, ćwiczenia stabilizujące

Introduction

Pelvic girdle pain (PGP) is pain between the hind iliac crest and the gluteal fold, particularly in the zone of the sacroiliac joint (SIJ), which may radiate to the thighs and hips [1]. PGP can occur in conjunction with or separately to pain in the pubic symphysis. There is lessened capacity for activities such as standing, walking and sitting, and the pain or functional faded is reproducible by specific clinical tests. PGP results in greater disability than lumbar pain and is more widespread in pregnant women. PGP can consequence in significant physical incapacity and has important psychosocial effects, including extended leave from work during pregnancy, poorer quality of life (as a result of being unable to carry out normal roles, affecting their ability to care for their children) and predisposition to chronic pain syndrome [2]. The development of PGP in pregnancy is multifactorial and is related to hormonal, biomechanical, traumatic, metabolic, genetic and degenerative factors [3]. Recommended biomechanical pathophysiology focuses on a previously maximally stressed lumbar spine secondary to the expanding uterus [4]. There is a shift in the maternal center of gravity that transfers force onto the lumbar spine, causing stress in the lower back and pelvic girdle, and resulting in compensatory postural vagaries such as increased lumbar lordosis. Women with PGP have increased pelvic, thoracic and lumbar joint mobility, resulting in pelvic instability and pain [5]. Women with previous pelvic or lower back pain in and/or out of pregnancy and/or a history of trauma to the back or pelvis have an increased risk of developing PGP [4]. Multiparity increased BMI, physically stressful work; impulsive distress and smoking also raise a Mather's risk. Nevertheless, age, hormonal contraceptive use, height, weight and time break since last pregnancy are not risk aspects for PGP [6].

Females affected with PGP typically accept abnormal designs of muscle activity, to release and avoid pain. The prolonged this pattern persists, the extra pain was arising from the unphysiological capacity on muscles and joints, the pain in turn was worsen the dysfunction of muscles resulting in a vicious circle. So, the pain frequently becomes more plain in late pregnancy [7].

The local stabilizing muscles, i.e. the diagonally oriented abdominal, the lumbar multifidus, and the pelvic floor muscles, are described to play a significant role in weight transfer in the lumbopelvic region. Also, muscle dysfunction has been related with PGP. It has been optional that raising the activation pattern of the local stabilizing muscles results in functional improvement in lumbopelvic pain The specific stabilizing exercises were defined as exercises for specific activation of the local and the global muscle system, specifically focusing on control of the lumbopelvic region and coordination of muscle recruitment. The aim of SE is to control pain by supporting and protecting the spinal segment from re-injury. SE also re-establish and enhance muscle control to compensate for any loss of segmental stiffness caused by injury or degenerative changes patients [8]. The Low Level Laser (LLL) treatment accelerates the overall healing process through interaction with the targeted tissues while using precise wavelengths of light. Implementation of this treatment regime can be done for those patients who are suffering from various de-

gree of acute to chronic conditions. This treatment may aid in eliminating the pain, reducing the existing swelling and spasms and restoring the normal body functionality and movement [9]. LLL may reduce pain by two mechanisms 1-Anti-inflammatory – LLL reduces oxidative stress: oxidative stress is generally caused through the stress causing to the mitochondria or tissues which remains in the ischemic circumstances and in turn creates nitric oxide. In the cascading step of the process, this released nitric oxide binds with the cytochrome oxidase enzyme through a competitive inhibiting binding mode while replacing the oxygen molecule. As a consequence of this cellular event reduction in ATP production occurs. This entire situation of the stress induction and modulation is likewise related to additional conditions including exact wavelength of light etc. All these factors involved determine the functioning rate of cytochrome c oxidase and helps in increasing the ATP production and diminishing the oxidative stress. A series of molecular events pertaining to the downstream metabolic effects allows the reduction of the interleukin 1β , prostaglandin E₂, tumor necrosis factor α and other inflammatory markers [10].

Nerve blockage analgesia: LLLT Stimulation of analgesic effect can be improved by somewhat higher irradiance energy based treatment which is physiologically happened through the disruption of the axonal transport in the small fibers like nociceptors. In a process there is a transient inhibition occurs in transmission of A-delta and C fiber. Afferent inputs from these peripheral nociceptors become diminished and allow modulation of the reorganization of the synaptic connections. Thus, central sensitization can be lowered through repetitive treatment regime [9].

The aim of this study was to determine whether the combination of low level laser therapy and pelvic stabilization exercises is more efficient, and possibly effective, treatment protocol in the treatment of postpartum pelvic girdle pain, and compare the effectiveness of specific stabilizing exercises with low level laser therapy in PGP subjects in terms of pain intensity, functional status and health-related quality of life following delivery. no other paper used this protocol before that. Our study had shortcomings too. First, main etiology of patients had not been identified and compared, that could lead to some differences in the therapeutic results. The sample size was so small that probably it does not show some differences. It was better that in this study, the more proper placebo be used for the control group. So, it is suggested that future studies be done as multi centric and also with higher sample size. It is recommended that in the future studies a longer period of treatment be considered.

Martials and methods

Design

The study was designed as prospective, randomized, controlled trial. It was carried out between October 2018 and October 2020. It followed the Guideline of Declaration of Helsinki on the conduct of human research. The study has been approved by the Research Ethics Committee of the institute of laser enhanced science, University of Cairo.

Participants

90 patients are randomly divided into three groups were divided randomly into three groups using block randomization

with a manual schedule. For every six participants recruited, two were assigned randomly to each group. Also subjects of each group were matched by age and BMI and were randomly into three equal groups. These works were commanded in physical therapy division of Imbaba general Hospital and in outpatient clinic of National Institute of Laser Enhanced Sciences, Cairo University.

Eligibility Criteria

All 90 women participants from divided Randomly into 3 groups Group (A): collected of 30 patients were treated with pelvic stabilization exercises, group (B): collected of 30 patients, were treated with low level laser therapy, Group (C) collected of 30 women's, were treated with low level laser therapy and pelvic stabilization exercises, For twelve sessions over six week's period, two sessions per week for each group. The ethical committee clearance and an informed consent of the subjects were being taken patients that have all rights to withdraw from the study at any time without any responsibility.

Outcome Measure

Visual analogue scale (VAS) is assessing pain that is a 10 mm calibrated line with zero representing no pain and 10 representing worst pain. [Time Surround: Baseline to six weeks after treatment] [11].

Pelvic Girdle Questionnaire (PGQ)

Includes of 25 items involving to activity/participation and physical symptoms and have reliability, validity, and possibility for use in research and clinical practice. [Time Surround: Baseline to six weeks after treatment] [12].

Serum cortisol level (SCL): is a hormone excreted by the adrenal gland. It is the major corticosteroids. It is responsible for about 95% of all glucocorticoids activity in the body [13]. It released into our body when we are under stress. Cortisol is high in subjects suffering from pain as compared with healthy and pain free subjects, as there is positive correction between the intensity of pain and increased plasma cortisol level. The blood sample was draw for the measurement of plasma cortisol from 9 a.m. to 1 p.m. Each patient was drawn two 5 ml blood samples from cubital vein two times: Time Frame: Baseline to 6 weeks after [14].

Intervention

Laser machine stricture: Laser medium: Semiconductor - Gallium Aluminum-Arsenide (Ga Al As), Model & manufacture: Sundom Laser (Taiwan) RG – 300IB, Wavelength: 810 nm, Output power: 500mw ± 20 mw, Mode: Continuous Wave (CW), Spot diameter: ≤ 10 mm.

Procedures

A) the laser therapy is applied to the sacral region by a typical laser probe at the top, and to the anterior pelvis. The physiotherapist use safety eyewear during all therapeutic sessions and the treatment area are closed, have restricted access and no reflective surfaces. Through therapy at sacral points, the typical probe shifted 1cm/second from a starting point to an end-point repeatedly during treatment time, bilaterally. Energy density 288 J/cm² Fluency of irradiation of 36 J/cm² per point, exposure of 120 seconds per point, eight points of irradiation on the pelvic area 4 point sacral region and 4 point on pubic area the typical probe held perpendicular to the body surface and pressed to the skin [15, 16].

B) Pelvic stabilization exercises. The pressure was on exercising of transverse abdominal muscles, in method of bridging exercise, posterior pelvic rocking exercise, bilateral hip abduction and adduction exercise, hip shrugging, and bilateral knees elevation. The subjects lying on the side, kneeling, four points, sitting, and standing. The subjects were reinvigorated to activate the transversely oriented abdominal muscles regularly during daily activities. Respite for 30-second to one minute between each exercise. Program sessions achieved for 12 sessions twice a week. Each session lasted 45 minutes [17, 18].

Statistical analysis

The scores of VAS, PGQ and cortisol levels in each group before and after the treatment were compared with paired-sample t test. The change between two groups measured before and after physiotherapy was analyzed. A statistical significance was known as p-value < 0.05.

Results

None of the 90 female patients were excluded or dropped out of the study during or after the study period. Patient demographic data including age as well as body mass index (BMI) were collected, which are summarized in Table 1.

Table 1. Basic characteristics of participants

	Group A (N = 30)	Group B (N = 30)	Group C (N = 20)	F-value	P-value	Level of significant
Age [years]	29.53 ± 6.02	27.26 ± 5.83	26.36 ± 6.56	2.111	0.127	NS
BMI [kg/m ²]	29.38 ± 3.53	27.42 ± 3.49	27.87 ± 4.74	2.007	0.141	NS

Significant at alpha level < 0.05, NS – non significant

No treatment related complications were observed in the patients. According to the results given, the mean pain, pelvic girdle questionnaire and serum cortisol level in patients as well as the mean score in all patients after the sixth week showed a significant improvement compared to the beginning of the study (Table 2).

Percentage of significant improvement of pain intensity for groups is variable from group (A) 60.83%, group (B) 54.73% and group (C) 74.34% also percentage of significant improvement of disability by pelvic girdle questionnaire group (A) 66.84%, group (B) 66.17% and group (C) 72.34% and serum

Table 2. Descriptive statistics and 3×2 mixed design MANOVA for Pain level, Pelvic girdle questionnaire and Serum cortisol level at different measuring periods among different groups

Variable	Groups	Pre-Treat Mean ± SD	Post-Treat Mean ± SD	MD	p-value	% of change
Visual Analogue Scale (VAS)	Group (A)	8.17 ± 0.88	3.2 ± 0.61	4.97	0.0001*	60.83%
	Group (B)	8.35 ± 0.82	3.78 ± 0.78	4.57	0.0001*	54.73%
	Group(C)	8.46 ± 1.07	2.17 ± 1.18	6.29	0.0001*	74.34%
Pelvic girdle questionnaire (PGQ)	Group (A)	59.51 ± 7.42	19.73 ± 4.85	39.78	0.0001*	66.84%
	Group (B)	55.72 ± 6.82	18.85 ± 4.6	36.87	0.0001*	66.17%
	Group(C)	55.21 ± 9.33	15.27 ± 3.22	39.94	0.0001*	72.34%
Serum cortisol level (SCL)	Group (A)	18.86 ± 1.76	11.62 ± 2.07	7.24	0.0001*	38.38%
	Group (B)	17.85 ± 1.77	9.64 ± 2.04	8.21	0.0001*	45.99%
	Group(C)	18.57 ± 1.79	7.53 ± 1.4	11.04	0.0001*	59.45%

*Significant at alpha level < 0.05; Group (A) – pelvic stabilization exercises Group (B) – Low level laser therapy Group(C) – laser therapy and stabilization exercises

cortisol level are group (A) 38.38%, group (B) 45.99% and group (C) 59.45%

In the comparison of groups in the final week, the values of pain = Group A vs. B – P = 0.051, Group A vs. C – p = 0.0001*, Group B vs. C – p = 0.0001*.

Pelvic girdle questionnaire values = Group A vs. B. P = 0.93, Group A. Vs. C p = 0.001* Group B vs. C – p = 0.007* Serum cortisol level values = group A vs. B – p = 0.0001*, group A vs. C – p = 0.0001*, group B vs. C – p = 0.0001*.

Therefore, the pain value (P = 0.001) and the disability rate (P = 0.001) for Group C improved significantly compared to the other two groups (Group A and Group B).

As shown in this table 2, there are statistical differences in the three groups studied in this regard. In a group comparison, in the final week significant differences were observed between pain, disability values and cortisol level in third group (C) significant differences between it and other groups.

Discussion

Our study revealed that laser therapy accompanied with pelvic stabilisation exercise can be the most effective way for improving the pelvic pain including pain intensity relief, decrease pain stress and reduction of disability in the patients. According to a review study published, which studied all treatments available for the pelvic girdle pain, it has been shown that multiple treatments have better results compared to single-agent treatments. The most effective introduced therapeutic method in the pelvic stabilisation exercises studies are those which are under the supervision of related specialist. However, the very studies claim that mere pelvic stabilisation exercise does not show enough therapeutic effects. This is enough for showing that there is a need for combining the given therapeutic exercises with the other methods [19, 20]. The

suggested methods include the use of low Level laser therapy, Some previous studies have shown the usefulness of the use of low Level laser, although some of them have shown that the low Level laser reduce pain intensity and disability, but in short term improving effects of this treatment [10]. While we revealed in our study that low Level laser in therapeutic combination with pelvic stabilisation exercises may be effective in a long run and reduce the pain intensity and patient disability. Nevertheless, this result does not reduce the importance of the pelvic stabilisation exercises in the treatment of patients group and we consider this laser therapy efficient as a supplementary treatment along with pelvic stabilisation exercises. The obtained results agree with those of England (2000) who reported that LLLT is an effective method for reducing acute and chronic pain. Too, the results agree with individuals reported by Jones (2004) who concluded that LLLT has biological effects similar to that of non-steroidal anti-inflammatory and steroids. So, it can reduce pain through raising the level of serotonin production and B-endorphin the body natural mood enhancing and pain relief hormones [21, 22].

Also, the results are supported by those reported by Gold (2002) who stated that LLLT is an effective way to treat painful condition by increasing B-endorphin, normalize the speed of A- alpha nerve fiber in its place of on C- fiber, laser rise blood and lymph flow so, eliminates waste metabolism from the site of pain [23]. Elizabeth A. et al. (2004) concluded that Hypothalamo-pituitary-adrenal (HPA) axis is an inescapable stressor with chronic pain. The HPA is the principal neuroendocrine system activated the central nervous system of mammals, which is the cortisol with stressors for end products. The results of this study indicated that the pain was relieved due to the stress hormone cortisol decreased after 12 times treatments. The pain was significantly reduced by depicting the

VAS after treated by the LLLT and pelvic stabilization exercises. However, the variation of pain scale was not obvious when patients received only exercises after twelve times treatment [24].

Conclusion

we could say that our study revealed that low level laser therapy pulse with pelvic stabilisation exercise can be the most effective way for improving the postpartum pelvic girdle pain

pains including pain relief, reduction of disability and improve daily level activity in the patients at least in an acute treatment period.

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Piśmiennictwo/ References

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