

Effect of Core Stability Exercises versus Electro-Acupuncture on Treatment of Low Back Pain in Primary Dysmenorrhea: A Randomized Clinical Trial

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Abstract: The main aim of this study was to determine if core stability exercises have more effect than electroacupuncture on low back pain during menstruation at young female. Forty women diagnosed with low back pain during menstruation, their age ranged from (18-25) years, their BMI didn't exceed 30 kg/m², were selected randomly from outpatient clinic of Al-Ahrar teaching hospital. Women were divided randomly into two equal groups, Group A (electro-acupuncture group): 20 patients, they were treated by electro-acupuncture for 4 weeks, 20 min/session, 3 sessions/week. Group B (Core stability group): 20 patients, they were treated by core stability exercises for 4 weeks, 40 min/session, 5 sessions/week. All participants were evaluated by VAS, Oswestry disability index (ODI) and serum cortisol level before and after treatment. The results of this study revealed that there was a statistically significant decrease in the mean values of VAS, ODI and plasma cortisol level in both groups (A&B) and this significant reduction in favor to group B than group A. It was concluded that core stability exercises could be used as a good complementary treatment in reducing low back pain during menstruation. Also, it could be considered useful treatment to improve flexibility and range of motion.

Key words: Primary Dysmenorrhea • Electro • Acupuncture • Core Stability Exercises

INTRODUCTION

Primary dysmenorrhea (PD) is the most common gynecological symptom reported by women of reproductive age, most commonly under the age of 25 years. It is defined as the recurrent, cramping pain, which occurs during menses and lacks any identifiable reproductive system pathology, with the pain commonly starting within 3 years of menarche [1].

Menstrual low back pain (MLBP) is the third most common form of menstrual discomfort. It affects 46% to 56% of the population. The pain of primary dysmenorrhea starts from few hours before or after the onset of menstruation and may last up to 24-48 hours. This pain mainly felt in lower abdomen as cramping pain but also may radiate to lower parts of back and thigh. Low back pain during menstruation is caused by hormonal changes, Prostaglandins cause dysmenorrhea or painful menstruation through uterine contraction. Heavy contractions can lead to low back pain, as the pain can radiate from the lower abdomen into the low back [2].

PD is usually treated by pharmacological agents that are often accompanied by adverse side effects. Accordingly, integrating alternative nonpharmacological, noninvasive analgesia is preferred. Complementary and alternative therapies include exercise, acupuncture, moxibustion, Chinese herbal medicines, behavioral interventions, topical heat, dietary supplements and so on Yang, *et al.* [3].

Acupuncture is a therapeutic modality using the insertion of fine needles with the concepts of Yin and Yang and circulation of qi. Acupuncture acts primarily by stimulating the nervous system, by local effects due to local antidromic axon reflexes and by releasing opioid peptides and serotonin. Acupuncture is regarded as part of conventional medicine. It is no longer only "alternative medicine," and it is used in Western medicine as the main treatment of some diseases. In particular, acupuncture has been widely used to alleviate diverse pain including menstrual pain [4].

Chinese medicines believe that menstrual symptoms occur due to a lack of blood or blood stagnation or the

existence of “chi” in the body. There are many acupoints which are used for gynecological disorders: Bladder 47 (BL47), Bladder 23 (BL23), Spleen 9 (SP9), Spleen 10 (SP10), or Gongsun and so on. The main and the most effective acupuncture point in the gynecological conditions such as dysmenorrhea is spleen 6 or saninjiao (SP6). SP6 is the junction point of the spleen, liver and kidney meridians. It is considered to fortify the spleen, nourish the liver and the kidney and regulate and harmonize qi and blood, located 3 cun (1 cun = 3.33 cm) directly above the tip of the medial malleolus on the posterior border of the tibia, has been shown to have positive effect on menstrual-related disorders, including primary dysmenorrhea. Therefore, SP6 is mostly used for gynecological indications. SP4 is located on the medial aspect of the foot, in the depression distal and inferior to the base of the first metatarsal bone. SP4 point is an effective point to reduce uterine spasm and contributes to regular menstrual bleeding [5].

Core stability training has become a popular fitness trend that has begun to be applied in rehabilitation programs and in sports medicine. Many studies have shown that core stability exercises are an important component of rehabilitation for LBP. Evidence from the systematic reviews suggests that the core stability exercise is an effective treatment for low back pain patients as it reduces pain and improves function through a recalibration or normalization of physical activity, a reduction of pain experience and its threshold may be reached even better than medically. Basic muscle strength reflects the foundation of every other training phase and can be reached either by hypertrophy or neuronal adaptation. In conclusion, proper training stimuli lead to the optimal physiological performance achieved through neuronal adaptation, followed by hypertrophy [6].

MATERIALS AND METHODS

Study Design: Two Groups: Pre-test and Post-Test

Experimental Design: Women were divided randomly into two groups. Group A: (electro-acupuncture group) It consisted of 20 women diagnosed with low back pain during menstruation, they were treated by electro acupuncture. Group B: (core stability group) It consisted of 20 women diagnosed with low back pain during menstruation. They were treated by core stability exercises.

Participants: This study was conducted on forty women complaining from low back pain during menstruation, they were selected randomly from the rehabilitation center

of out clinic of AlAhrarteaching hospital. Their ages were ranged from 18 to 25 years old. Their body mass index (BMI) didn't exceed 30 kg/m². All women suffered from low back pain during menstruation.

Measurement Procedures: All patients were given a full explanation of the protocol of the study and consent form was signed for each patient before participating in the study.

The following information were collected: name, age, address, occupation, weight, height.

- The visual analogue scale (VAS): It is simple, reliable, valid and optimal tool for prescribing the severity of pain. It was used to measure pain severity for each woman in both groups (A, B) before and after the treatment program. It is 10 cm calibrated with zero representing no pain and 10 representing worst pain. Every participant was asked to mark the point represented the degree of the pain [7].
- Oswestry Disability Index (ODI): It was used to assess functional disability, it is valid and reliable tool for measuring the functional disability in patients with LBP, it consists of 10 questions including the daily functional disability, each question includes six choices, the first statement takes 0 and the sixth statement takes 5. The patient selected the best one which described his disability, the maximum score in this study was 45, then all scores collected and taken as percentage from the total score, the higher score indicate greater disability, scores from 0-20% indicate minimal disability, scores from 40-60% indicate moderate disability, scores from 60-80% indicate crippled disability and scores from 80-100% represent patient who are confined to bed [8].
- Serum Cortisol Level: It would be used to objectively measure pain level for each participant before and after treatment program.

Procedures:

Group A (Electro-Acupuncture Group): This group consisted of 20 women with low back pain during menstruation, each participant of this group received electro acupuncture sessions for 20 minutes per session, 3 sessions per week for 4 weeks. Full instruction was given to each woman about the benefits of electro-acupuncture and its efficacy on reducing low back pain.

Application of Electro-Acupuncture: First the application technique and values were explained to each participant to gain her confidence then each woman was advised to

relax in supine lying position and both legs were cleaned by cotton and alcohol, then needles were inserted intramuscularly by hand manipulation perpendicularly to depth 25-40 mm in acupoints sp4 and sp6 bilaterally, then attached the electrodes to the needle to provide continued electrical stimulation. This sensation was described as numbness.

TENS unit was used to deliver standardized TENS stimulation parameters high Frequency: (50-100Hz) with Pulse width: (20-60ms). The intensity is gradually increased till tingling sensation without muscle contraction, using strong but comfortable intensity, it was adjusted according to the tolerance of each participant. The stimulation was administered for 20 minutes/session 3 sessions/week for 4 weeks Figure (1).

Group B: (Core Stability Group): This group consisted of 20 women with low back pain during menstruation. Each participant received core stability exercises for 40 minutes per session, 5 sessions /week for 4 weeks.

Application of Core Stability Exercises: Full instructions would be given to each woman in group B about benefits of core stability exercises and its efficacy on reducing low back pain.

The treatment sessions started by 5 minutes warm up before the exercise in the form of stretching to back and hamstring muscles (cat camel position & toes touch) then, the exercise program about 30 minutes and at the end 5 minutes cool down.

The Exercises Were, Performed in Two Stages Stage 1: First Two Weeks, Exercises Includes

Drawing-In Maneuver (Abdominal Hollowing Exercise): Woman was asked to lie in supine hook-lying position, with hips in 30° flexion, ask her to contract the abdominals to draw in the abdomen, breathe in and holding for 5 seconds. and then build up the contraction during expiration, breathing normally during the 5 seconds hold. Repeat this exercise 10 times Fig. (2).



Fig. 1: Application of electro-acupuncture



Fig. 2: Abdominal hollowing exercise



Fig. 3: Bridging exercise



Fig. 4: Bird dog exercise

Bridging on the Floor Without Leg Extension (Bridging Exercise): This exercise makes the glutes tense slightly, not just the abdominals. Woman was asked to lay on her back with both knees bent and feet flat on the floor shoulder width apart. Posteriorly tilt her pelvis and flatten the arch of the lower back into the floor, slowly thrust the hips upwards to a bridge position, maintaining the posterior tilt and squeezing the glutes at the top. Hold for a second before lowering back down, making sure the pelvis doesn't drop or rotate toward any side. This exercise was done for 10 times with rest period in between to prevent hyperventilation Fig. (3).

Bird Dog Exercise in Quadrupedal Position: Woman was asked to get on her hands and feet (cat position), then Tighten slightly abdominals, lumbar and pelvic floor

muscles then lift one arm and the opposite leg. Try reaching far away in front of her hand and touching an imaginary wall. Lower her leg and arm back to the plinth and repeat with the other leg and the opposite arm, this exercise was done for 10 times Fig. (4).

Stage 2: Progression of Core Stability Exercises: After 2 weeks once the woman was mastered in transverse abdominis activation then progression was made to stage-2 exercises which includes

Abdominal “Tuck In” in Quadruped Position: While maintaining a neutral spine, kneel on the floor in a quadruped position, ask her to contract the abdominals to breath in deeply without arching the back and hold for couple of seconds then release. This exercise should be done 10 times Fig. (5).

Abdominal Crunches (Hands Behind Head): The woman was asked to lie on her back with her knees bent and feet flat on the floor, place her hands behind her head. Tilt her chin slightly, gently contract the abdomen, curl up and forward so that her head, neck and shoulder blades lift off the plinth. hold for a moment at the top of the movement and then lower slowly back down. This exercise should be done 10 times Fig. (6).

Squatting Against Wall: Woman was asked to stand tall, with her back straight, toes pointing slightly out, shoulders relaxed, with the arms extended in front of her and squeeze her glutes, keep her back straight. Inhale, push her buttocks out and start bending her knees maintaining her weight on the heels not on the toes. This exercise should be done 10 times Fig. (7).

Statistical Analysis: Statistical analysis was conducted using SPSS for windows, version 23 (SPSS, Inc., Chicago, IL). The current test involved two independent variables. The first one was the (tested group); between subject factor which had two levels group (A) received electro-acupuncture and group (B) received core stability exercises. The second one was the (measuring periods); within subject factor which had two levels (Pre-treatment and Post-treatment).

Data were screened for homogeneity of variance and it was normally distributed for VAS, ODI and cortisol level were normally distributed, as assessed by Leven's test of homogeneity of variance ($p > 0.05$). Accordingly, 2x2 Mixed MANOVA test was used to compare the tested variables of interest at different measuring periods at both groups. The alpha level set at 0.05.



Fig. 5: Abdominal “tuck in” in quadruped position



Fig. 6: Abdominal crunches



Fig. 7: Squatting exercise

RESULTS

The current study was conducted on 40 participants, they were randomized for electro-acupuncture group that consisted of 20 women with low back pain during menstruation, each participant of this group received electro acupuncture session for 20 minutes, 3 sessions per week for 4 weeks and core stability group this group

Table 1: Physical characteristics of participants in both groups (A&B)

Items	Group A Mean ± SD	Group B Mean ± SD	Comparison		
			t-value	P-value	S
Age (years)	21.65±3.37	21.25±1.97	0.458	0.65	NS
BMI (kg/m ²)	27.24±1.33	27.06±1.21	0.445	0.659	NS

*SD: standard deviation, P: probability, S: significance, NS: non-significant.

Table 2: Mean ±SD and p values of VAS pre and post-test at both groups

VAS	Pre test	Post test	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	7.05±1.79	5.9 ±1.86	1.15	16.31%	0.0001*
Group B	6.63 ±1.53	4.68±1.49	1.95	29.41%	0.0001*
MD	0.42	1.22			
p- value	0.44	0.031*			

*Significant level is set at alpha level <0.05 SD: standard deviation, MD: Mean difference P-value: probability value

Table 3: Mean ±SD and p values of ODI pre and post-test at both groups

ODI	Pre test	Post test	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	42.4±11.04	39.7 ±9.99	2.7	6.36%	0.003*
Group B	43.63 ±10.69	32.15±8.15	11.48	26.31%	0.0001*
MD	-1.23	7.55			
p- value	0.726	0.014*			

*Significant level is set at alpha level <0.05 SD: standard deviation, MD: Mean difference P-value: probability value

Table 4: Mean ±SD and p values of cortisol level pre and post-test at both groups

Cortisol level	Pre test	Post test	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	10.92±3.17	10.41 ±3.32	0.51	4.67%	0.016*
Group B	10.96 ±2.84	8.37±2.47	2.59	23.63%	0.0001*
MD	-0.04	2.04			
p- value	0.961	0.037*			

*Significant level is set at alpha level <0.05 SD: Standard deviation MD: Mean difference P-value: probability value

consisted of 20 women with low back pain during menstruation, each participant received core stability exercises for 40 minutes per session, 5 sessions /week for 4 weeks. There were no significant differences ($p > 0.05$) in the mean values of age and BMI between both groups (Table 1).

As presented in Table (2), Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of VAS at post treatment in compare to pre-treatment in both group (P -value = 0.0001*). Considering the effect of the tested group on VAS, Multiple pairwise comparison tests revealed that the mean values of the "pre" test between both groups showed no significant differences with ($P = 0.44$). As well as, it revealed that there was significant difference of the mean values of the "post" test between both groups with ($p = 0.031^*$), this reduction in favor to group B than group A.

As presented in Table (3) Multiple pairwise comparison tests revealed that there was significant reduction of ODI at post treatment in compare to pre-treatment in both group A & B with (P -value = 0.003 * & 0.0001*) respectively. Considering the effect of the tested group on ODI, Multiple pairwise comparison tests revealed that the mean values of the "pre" test between both groups showed no significant differences with ($P = 0.726$). As well as, multiple pairwise comparison tests revealed that there was significant difference of the mean values of the "post" test between both groups with ($p = 0.014^*$) and this significant reduction in favor to group B than group A.

As presented in Table (4) Multiple pairwise comparison tests revealed that there was significant reduction of plasma cortisol level at post treatment in compare to pre-treatment in both groups (A & B) with (P -value = 0.016* & 0.0001*) respectively. Considering

the effect of the tested group on cortisol level. Multiple pairwise comparison tests revealed that the mean values of the "pre" test between both groups showed no significant differences with ($P = 0.961$). As well as, it revealed that there was significant difference of the mean values of the "post" test between both groups with ($p = 0.037^*$) and this significant reduction in favor to group B than group A.

DISCUSSION

Primary dysmenorrhea is defined as menstrual pain in the absence of any organic cause and is most common in women under the age of 25 years. Menstrual disorders are highly prevalent among women of reproductive age and especially in young women; they commonly include menstrual pain and mood disturbances. Many women with dysmenorrhea also experience other menstrual-related symptoms such as back pain, headaches, bowel changes, nausea and vomiting (9).

This study was carried out to determine if core stability exercises more effective than electro acupuncture on low back pain during menstruation at young female. This study demonstrates that there was significant reduction of VAS, ODI and plasma cortisol level at post treatment in compare to pre-treatment in both groups (A & B). As well as it revealed that core stability group who received core stability exercises showed more improvement in pain level and functional disability than electro-acupuncture group as there was significant reduction in all measuring variables in favor to core stability group than electro-acupuncture group.

Concerning the effect of electro acupuncture in relieving low back pain during menstruation and improving function can be explained by activation of 'pain-gate mechanisms (involves excitation of the A beta ($A\beta$) sensory fibers and by doing so, reduces the transmission of the noxious stimulus from the 'c' fibers, through the spinal cord and hence on to the higher centers) and endogenous opiate mechanisms (activation of the opioid mechanisms provide pain relief by causing the release of pain mediators, an endogenous opiate (encephalin and endorphin) in the spinal cord which will reduce the activation of the noxious sensory pathways) [10].

The results of this study are supported by Carvalho, *et al.* [11] who reported that patient with chronic low back pain have pain reduction after 3 weeks of treatment with electro-acupuncture, as they experienced reduced pain intensity and improved functional capacity.

The results of this study are supported by Qorbanalipour, *et al.* [12] who showed that electro acupuncture treatment can be an effective method for treating symptoms of primary dysmenorrhea. Stimulation on acupoints sp4 and sp6 by electro-acupuncture can reduce spasticity of the uterine arteries, improve blood flow and finally reduce menstrual pain and its symptoms; it was more effective than acupuncture in reducing distress in primary dysmenorrhea and has long-term effects for at least 1 month.

Also, the results are supported by Toroski, *et al.* [13] who reported that non-pharmacologic interventions are considered as first-line options in patients with chronic low back pain because fewer harms are associated with these types of therapies than with pharmacologic options. one of them is electro-acupuncture that is most cost-effective than NSAIDs, as therefore can be considered as an alternative treatment for CLBP, with reasonable cost-utility.

On the other side, the results of this study stand in contrast with those of Torres, *et al.* [14] as they concluded that electro acupuncture has no effect on low back pain. Although acupuncture, both manual and electrical, is increasingly used to treat LBP, recent studies have concluded that its efficacy still needs to be established. Discrepancies in its application and the low methodological quality of the studies produce inconsistent results and lead to it not being recommended according to the current clinical practice guidelines for patients with non-specific LBP.

Concerning the significant decrease in VAS, ODI and cortisol level in core stability group than electro-acupuncture group post treatment could be explained by the ability of core stability exercises to reduce pain, provide local strength and balance, decrease back injury and maximizing force control and stability of the spine. The spinal stability is not only dependent on muscular strength but also proper sensory input that alters the central nervous system and control the interaction between the body and the environment, providing constant feedback and allowing refinement of movement, thus a complete core stabilizing program would consider sensory and motor components related to these systems for optimal spinal stabilization [15].

Also, the significant reduction in the pain intensity in the core stability group than electro acupuncture group might be explained by the effect of core stability exercise in increasing the tissue blood flow (TBF) to the pathological area which may help to facilitate the healing process by supplying more oxygen, nutrients and

hormones to the affected area as well as removing waste products and irritant substances from the sensitive tissues [16].

The result of this study is in agreement with the findings of Javadian, *et al.* [17] who demonstrated that, an 8-week stabilization exercise program (involving abdominal bracing and abdominal hollowing exercises) plus routine exercise was more effective than routine exercise alone in reducing pain and disability in a similar sub-group of LBP patients, both post-intervention and at a 3-month follow-up.

Also, the result of this study is consistent with those of Natour, *et al.* [18] as they found that one of the long effect regarding the treatment of low back pain is that core stabilization training (CST) for muscular box and the muscular boundaries of the lumbopelvic area provide a corset-like stability leads to spinal stability.

The result of this study runs in the same line with that of Coulombe, *et al.* [19] who found that in the short term, core stability exercise was more effective than general exercise for decreasing pain and increasing back-specific functional status in patients with LBP as they reported that core exercises produced better outcomes than general exercise and it is the most likely to improve mental health based on large effect.

The result of this study is supported by the finding of Paungmali, *et al.* [20] and Saleh, *et al.* [21] as they reported that the lumbopelvic core stability exercise training might contribute to endogenous induced analgesic response and reduce low back pain as supported by elevated Plasma β -endorphin but remain plasma cortisol within normal. The outcome of the study didn't consider long term follow up of the Plasma β -endorphin and plasma cortisol.

The result of this study is also supported by Smits, *et al.* [22] who reported that core stability exercise has been known as a beneficial intervention in the management of several medical problems. Core stability exercises strengthen and coordinate the muscles around the abdominal, lumbar and pelvic regions. Also, core stability exercises mainly affect the lumbosacral muscles and increase blood supply in lumbosacral structures.

On the other side, the results of this study stand in contrast with those of Shamsi, *et al.* [23] as they concluded that core stability exercise has no more effect than general traditional trunk exercises for reducing LBP and they founded no additional benefits of combining core stability exercise to conventional physiotherapy for treatment chronic low back pain. This result provide

evidence that both types of training enhance lumbopelvic stability and reduce pain and disability. However, there is no evidence that one type of exercise is more effective than the other in doing so. No study was found in the literature using tests of core stability as an outcome measure in comparing the effects of core stability exercise and traditional trunk exercise.

CONCLUSION

It could be concluded that core stability exercises could be used as an effective treatment in reducing low back pain during menstruation, as it is safe and decreased pain without needs of any drugs.

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