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Original Article

Effect of pulsed electromagnetic field on menstrual distress in primary dysmenorrhic women

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Abstract

Background
Primary dysmenorrhea is a common menstrual cramp that is recurrent and is not owing to other diseases and is a common cause of stay at home and school or work.

Purpose
The purpose of this study was to investigate the effect of pulsed electromagnetic field (PEMF) on menstrual distress in primary dysmenorrheic women.

Patients and methods
A total of 40 women having primary dysmenorrhea were selected from Physical Therapy Department in Al Mataria Teaching Hospital in Cairo. Their ages ranged from 20 to 30 years. They were divided randomly into two groups equal in number: group A (study group), treated with the PEMF, three times/week for 3 months, with each session lasted for 30 min, in addition to medical treatment, and group B (control group, which received medical treatment only (NSAIDs). Menstrual distress questionnaire and visual analog scale were used for assessment of menstrual distress and pain before treatment and after treatment for both groups A and B.

Results
The results showed that there is a significant improvement in menstrual distress and pain scores in both groups A and B after treatment, in favor of group A.

Conclusion
It was concluded that PEMF is effective in improving dysmenorrheic pain and menstrual distress score.

Keywords: Primary dysmenorrhea, menstrual distress questionnaire, pulsed electromagnetic

Introduction

Primary dysmenorrhea is common menstrual cramps that are recurrent and are not owing to other diseases. Cramps usually begin 1–2 days after a woman starts getting her period. Pain usually begins 1 or 2 days before or when menstrual bleeding starts and is felt in the lower abdomen, back, or thighs and can range from mild to severe. Pain can typically last 12–72 h and can be accompanied by nausea, vomiting, fatigue, and even diarrhea. Common menstrual cramps usually become less painful as a woman ages and may stop entirely if the woman has a baby [1].

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'Dysmenorrhea' is derived from a Greek root translating to difficult menstrual flow. Primary dysmenorrhea is defined as recurrent, crampy pain occurring with menses in the absence of identifiable pelvic pathology. It usually begins in adolescence after the establishment of ovulatory cycles [2].

It is caused by myometrial activity resulting in uterine ischemia causing pain [2]. This myometrial activity is modulated and

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augmented by prostaglandin synthesis. Uterine contractions can last many minutes and may produce uterine pressures greater than 60 mmHg. Multiple other factors may play a role in the perception and the severity of the pain [3].

Dysmenorrhea can feature different kinds of pain, including sharp, throbbing, dull, burning, or shooting pain. Dysmenorrhea may precede menstruation by several days or may accompany it, and it usually subsides as menstruation tapers off. Dysmenorrhea may coexist with excessively heavy blood loss, known as menorrhagia [4]. Dysmenorrhea can be classified as either primary or secondary based on the absence or presence of an underlying cause. Secondary dysmenorrhea is associated with an existing condition [5].

The prevalence of dysmenorrhea is estimated to be ~25% of women. Reports of dysmenorrhea are greatest among individuals in their late teens and 20 s, with reports usually declining with age. The prevalence in adolescent females has been reported to be 67.2% by one study and 90% by another. It has been stated that there is no significant difference in prevalence or incidence between races. Yet, a study on Hispanic adolescent females indicated a high prevalence and effect in this group. Another study indicated that dysmenorrhea was present in 36.4% of participants and was significantly associated with lower age and lower parity [1].

Childbearing is said to relieve dysmenorrhea, but this does not always occur. One study indicated that in nulliparous women with primary dysmenorrhea, the severity of menstrual pain decreased significantly after the age of 40 years. A questionnaire concluded that menstrual problems, including dysmenorrhea, were more common in women who had been sexually abused [1].

It was concluded that 14% of women between the ages of 20 and 35 years experience symptoms so severe that they stay home from school or work. Among adolescent girls, dysmenorrhea is the leading cause of recurrent short-term school absence [6].

A new treatment that is able to relieve menstrual cramps is based on magnetic therapy. Magnetic therapy has been advancing for a number of years resulting in countless patients receiving much-needed assistance to relieve menstrual cramps [7].

To relieve menstrual cramps with magnetic technology, just as with relieving any pain, it is most effective when the pain can be stopped at the source. Magnetic therapy is based on a simple but effective premise. People feel pain when the pain impulses in nerves travel through body and register in the brain. Magnetic treatments are designed to stop pain impulses from reaching the brain. Magnetic treatments work when the right strength magnets are placed in proper locations [7,8].

Patients and methods

Patients

The study was carried out on 40 women having primary dysmenorrhea. They were selected from Physical Therapy Department in Mataria Teaching Hospital.

Inclusion criteria

Their age ranged between 20 and 30 years, and their BMI ranged from 18 to 25 kg/m^2. They had a regular menstrual cycle.

Exclusion criteria

Exclusion criteria included the following: pelvic inflammatory diseases, any pelvic pathological condition, cardiac affection, and using a pacemaker, metal implantations, epileptic fits, and mechanical back pain.

All participants were given a full explanation of the protocol of the study, and informed consent form was signed from each participant before participating in the study.

The participants were divided randomly into two groups equal in number, group A (study group) and group B (control group).

(1) Group A (study group)

It consisted of 20 women who were treated with pulsed electromagnetic field (PEMF), three times/week for 3 months. Each session lasted for 30 min, in addition to medical treatment in form of Mefenamic acid 250 mg, three times a day for 3 days at the onset of menstruation.

(2) Group B (control group)

It consisted of 20 women who received medical treatment only, Mefenamic acid 250 mg, three times a day for 3 days at the onset of menstruation as a group A.

Materials

(1) Weight and height scale: it was used to measure the weight and the height to calculate the BMI before the beginning of the study
(2) Visual analog scale (VAS): it was used to assess and measure the amount of pain of each patient before and after the study
(3) Menstrual distress questionnaire: it was used to assess the physical and psychological symptoms that are associated with primary dysmenorrhea having an effect on daily activities
(4) PEMF: healthwaves generator is controlled by SIMED s.r.l. software (level s.r.l. SEDE LEGALE, Catania, Italia) advice for magnetotherapy consists of the control panel, motorized bed, and two solenoids (52 cm in diameter for the stand and 80 cm in diameter for the bed). The control panel is connected to electrical mains, supplying 230 V AC 50 Hz. Graphic display, multifunction control with encoder selection through a MENU-SUBMENU, making the machine easy and intuitive to use. Pillows and cushions were used to support body parts in comfortable relaxed position, and sheets were used to cover the patients during treatment sessions.

Methods

(1) Evaluation procedure
The following evaluation procedures were used for both groups (A and B) before and after the end of the period of treatment at 3 months:

(a) Pain assessment: assessment of pain through using VAS will be performed before and after the treatment. Each patient was asked to place a mark along the line to denote their level of pain

A VAS was used as the primary tool for pain quantification. It is a self-reported 10-cm straight line, which represents the pain intensity, with the two opposite ends representing no pain and worst pain. In between these two phrases, words like mild pain, moderate pain, severe pain, and very severe pain are assigned to each 2 cm distance, correspondingly [9].

(b) Menstrual distress questionnaire: it was used to assess a normal menstrual cycle.

A set of questions was used to evaluate the menstrual symptomatology, which consisted of 47 symptoms under eight different headings.

(i) Pain (muscle stiffness, headache, cramps, backache, fatigue, and general pains).
(ii) Concentration (insomnia, forgetfulness, confusion, lowered judgment, difficulty concentrating, distractible, lowered motor coordination, and accidents during driving a vehicle).
(iii) Behavioral change [lowered school or work performance, take naps or stay in bed, stay at home (absenteeism), avoid social activities, decreased efficiency, and change in eating habits].
(iv) Autonomic reaction (dizziness, cold sweats, nausea, and hot flashes).
(v) Water retention (weight gain, skin disorders, painful breasts, and swelling).
(vi) Negative effect (crying, loneliness, anxiety, restlessness, irritability, mood swings, depression, and tension).
(vii) Arousal (affectionate, orderliness, excitement, feelings of well-being, and activity).
(viii) Control (feeling of suffocation, chest pains, ringing in the ears, heart pounding, numbness, and fuzzy vision).

These factors under each heading, even though represent separate will be empirical interrelated clusters of symptoms [10,11].

(2) Treatment procedure:

(a) PEMF for group A (study group):
It consisted of 20 women who were treated with the PEMF, three times/week, for 3 months. Each session lasted for 30 min. PEMF applied at low frequency (below 25 Hz) and intensity of 50 Gauss with equal 60% of the maximum intensity supplied by the applicators according to the manual of (level s.r.l. SEDE LEGALE)

(b) NSAIDs for both groups (A, study group and B, control group: which was Mefenamic acid 250 mg, three times a day for 3 days at the onset of menstruation.

Results

Physical characteristics of the patients

The physical characteristics of all subject in both groups (A&B) which showed a statistically non-significant difference ($P > 0.05$) in age and body mass index (BMI) (Table 1).

Visual analog scale scores

Table 2 represents the VAS scores for both groups (A and B) before treatment and after treatment. There was a nonsignificant statistical difference ($P > 0.05$) between both groups (A and B) before treatment. However, there was a highly statistically significant difference ($P < 0.001$) between both groups (A and B) after treatment, in favor of group A (Fig. 1).

Menstrual distress questionnaire

Table 3 represents the menstrual distress questionnaire scores in both groups (A and B). There was a statistical nonsignificant difference ($P > 0.05$) between groups (A and B) in menstrual distress questionnaire scores before treatment. However, there was a highly statistically significant difference ($P < 0.001$) after treatment in both groups A and B, in favor of group A (Fig. 2).

Discussion

Primary dysmenorrhea is characterized by a crampy suprapubic pain that begins somewhere between several hours before and a few hours after the onset of the menstrual bleeding. Symptoms peak with maximum blood flow [12] and usually last less than 1 day, but the pain may persist up to 2–3 days. Symptoms are more or less reproducible from one menstrual period to the other [13]. The pain is characteristically colicky and located in the midline of the lower abdomen but may also be described as dull and may extend to both lower quadrants, the lumbar area, and the thighs. Frequently associated symptoms include diarrhea, nausea and vomiting, fatigue, light-headedness, headache, dizziness and, rarely, syncope and fever [14,15]. These associated symptoms have been attributed to prostaglandin release [2,3].

Occasionally adolescents may experience menstrual pain with their first periods without any demonstrable underlying cause, especially when the bleeding is heavy and accompanied by clots [16].

This study was conducted to investigate the effect of PEMF on primary dysmenorrhea. A total of 40 women having dysmenorrhea recruited in this study were chosen from Al

Table 1: The physical characteristics of all participants in both groups (A and B), which showed a statistically nonsignificant difference ($P>0.05$) in age and BMI

Variables	Group A (study group)	Group B (control group)	*t*	*P*	Level of significant
Age (years)	26.20±2.86	24.80±2.82	−1.559	>0.05	NS
BMI (kg/m^2)	21.81±2.31	21.92±2.23	0.164	>0.05	NS

Table 2: Intergroup and intragroup comparisons between mean values of visual analog scale scores in both groups (A and B)

VAS scores	Group A (study group)	Group B (control group)	*t*	*P*	Level of significant
Pretreatment	6.30±1.84	6.70±1.63	0.729	>0.05	NS
Posttreatment	2.75±1.33	4.55±1.54	3.955	<0.001	HS
Mean difference	3.55	2.15	12.862	<0.001	HS
% change	56.35	32.09 ↓↓	11.831	<0.001	HS

HS, highly significant; VAS, visual analog scale.

Table 3: Intergroup and intragroup comparisons between median value of menstrual distress questionnaire scores in both groups (A and B) before treatment and after treatment

MDQ scores	Group A (study group)	Group B (control group)	*Z*	*P*	Level of significant
Before treatment	110.0 (73.0-123.0)	103.0 (64.0-125.0)	−0.772	>0.05	NS
After treatment	65.0 (48.0-89.0)	80.5 (52.0-109.0)	−3.518	<0.001	HS

HS, highly significant; MDQ, menstrual distress questionnaire.

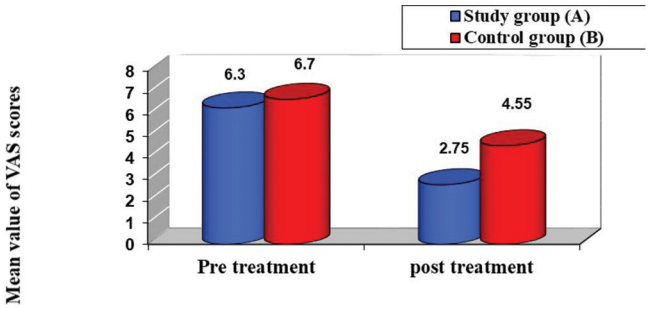

Figure 1: Mean values of VAS in both groups (A and B) before treatment and after treatment. VAS, visual analog scale.

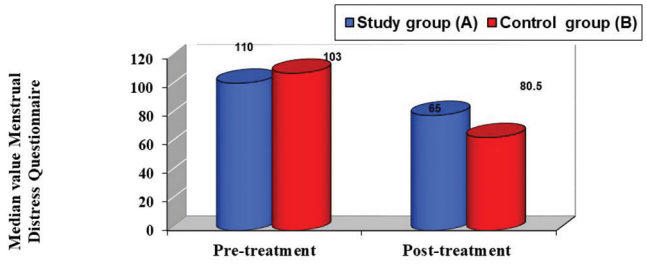

Figure 2: Median value of menstrual distress questionnaire in both groups (A and B) before treatment and after treatment.

Mataria Teaching Hospital in Cairo. Their ages ranged from 20 to 30 years old. They were divided randomly into two groups equal in number. Group A consisted of 20 women who were treated with PEMF, three times/week for 3 months. Each session lasted for 30 min, in addition to medical treatment (NSAIDs). Group B consisted of 20 women who received medical treatment only (NSAIDs).

VAS and menstrual distress questionnaire were used to assess dysmenorrheic pain and pain distress.

The results showed that there was a significant improvement after treatment in both groups (A and B) in favor of group A regarding VAS and menstrual distress questionnaire scores.

So, it can be concluded that PEMF is a very effective adjunct method in reducing dysmenorrheal pain and menstrual distress.

PEMFs have been used extensively in many conditions and medical disciplines. PEMFs produced a significant reduction of pain, improvement of spinal functions, and reduction of paravertebral spasms [17].

The results agree with Markov (2000), who stated that magnetic field therapy has analgesic, anti-inflammatory, vasodilatation, and anti-edematous activity without adverse effect and accompanied by an increase in the threshold of pain sensitivity and activation of the anticoagulation system.

PEMF treatment stimulates the production of opioid peptides, activates mast cells, and increases electric capacity of muscular fibers [18].

Khamaganova and colleagues stated that high-frequency PEMF over 10–15 single treatments every other day either eliminates or improves, even at 2 weeks following therapy, in 80% of patients with pelvic inflammatory disease, 89% with back pain, 40% with endometriosis, 80% with postoperative pain, and 83% with lower abdominal pain of unknown cause.

The result was supported by Jorgensen *et al*. [19] who stated that PEMFs have also been found only slightly useful in treating pain, muscle spasms, and swelling during wisdom tooth extraction [20].

PEMF therapy has been used successfully in the management of postsurgical pain and edema, the treatment of chronic wounds, and in facilitating vasodilatation and angiogenesis [21].

These results are in agreement with Laurence and Lynne [22] who reported that magnetic fields affect pain perception in many different ways. These actions are both direct and indirect. Direct effects of magnetic fields are neuron firing, calcium ion movement, membrane potentials, endorphin levels, nitric oxide, dopamine levels, acupuncture actions, and nerve regeneration. Indirect benefits of magnetic fields on physiologic function are on circulation, muscle, edema, tissue oxygen, inflammation, healing, prostaglandins, cellular metabolism, and cell energy levels.

Moreover, these results are in agreement with Mohamed and Mostafa [23] who reported that the effect of PEMF therapy could be attributed to one of the following mechanisms: first, the physiological mechanism for relieving pain through presynaptic inhibition or decreasing excitability of pain fibers [24]. Second, the molecular mechanism may through changes in the ion channels or neuronal membrane [25]. Third, PEMF can modulate the actions of hormones, antibodies, and neurotransmitters at surface receptor sites of a variety of cell types [26]. Fourth, PEMF reduces inflammation, improve circulation, and improve joint mobility by its effect on connective tissue, muscles, and organs [27].

Moreover, exposure to a magnetic field significantly inhibits the experimentally induced inflammation and edema. PEMF was used to treat soft tissue inflammation through the magnetic field action by altering the cell membrane potential and influencing ionic fluxes. Inflammatory edema and hematoma formation were decreased by PEMF treatment and microcirculation was significantly enhanced [28]. PEMF was used to reduce edema and improve microcirculation by facilitating water reabsorption, accelerating hematoma resolution, and decreasing the number of circulating neutrophils [29,30].

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Conflicts of interest

There are no conflicts of interest.

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