

Effect of Ultrasound Therapy on Enhancement of Symptomatic Relieve in Cases of Endometriosis

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ABSTRACT

This study was conducted to determine the effect of ultrasonic therapy on alleviating pain as well as, decreasing adhesions in cases of endometriosis. Thirty women suffering from severe pelvic pain, and diagnosed as having moderate endometriosis from Kasr El-Ainy University Hospital. were participated in this study. Their age ranged from 25 to 35 years old and their body mass index (BMI) didn't exceed 30kg/m². They were divided randomly into two groups (A&B) equal in numbers. Patients in group A (study group) were treated by ultrasonic therapy for 24 sessions, 3 sessions per week in addition to the usual hormonal therapy which is used to treat such cases. While, patients in group B (control group) were treated by the same dose of hormonal therapy. All patients in both groups (A&B) were evaluated by present intensity (PPi) scale as well as laparoscopy to detect the degree of adhesions according to the score of the American Society for Reproductive Medicine before and after 24 sessions of treatment. Results of this study showed a statistically highly significant decrease ($P < 0.001$) in the intensity of pain and degree of adhesions in patients who treated by ultrasonic therapy in conjunction with hormonal treatment as compared to those who treated by hormonal therapy. So it could be concluded that ultrasound therapy had an excellent effect in enhancing symptomatic relieve in cases of endometriosis.

Key words: Endometriosis, Pain, Laparoscopy, Adhesions, Therapeutic Ultrasound.

INTRODUCTION

Endometriosis is most simply defined as the presence of endometrial epithelium and/ or presence of endometrial gland and stroma outside the lining of the uterine cavity. It can occur anywhere in the body unusually; however, it is confined to the organs and tissues of the abdomen and pelvis¹⁹.

Endometriosis was diagnosed in approximately 25% (range is 4.5% to 82%) of women who had a laparoscopy because of pelvic pain, compared with 20% (range 2.1% to 78.5%) of women who presented with infertility, and was reported in 4.1% of over 10,000 women who received tubal ligation¹². The overall incidence of endometriosis is 8%

to 10% and it is more common in middle age women^{16,18}.

An islet of endometriosis shows cyclical changes of menstruation. However, there is no outlet for its menstrual discharge, blood and debris collected within the tissues to form a cyst, and this collection increases in size with each menstrual episode. Rupture of endometriotic cysts even small ones is common, and scatter of their contents which include endometrial cells leads to the development of further areas of endometriosis⁹.

An association between endometriosis and infertility in women has long been noted, and many possible mechanisms for the infertility have been identified. Nevertheless, the hypothesis that endometriosis decreases fertility hasn't been definitively proved. In

severe endometriosis, infertility may be explained by an anatomic cause, as adhesions interfere with the release of the ovum from the ovary and its uptake from the fallopian tube¹⁵.

The classic symptoms associated with endometriosis include pelvic pain, adhesions and infertility. Minimal or mild endometriosis may be associated with more severe symptoms than the more extensive lesions, thus, the severity of symptoms does not necessarily correlate with the extent of the disease⁵.

The pelvic pain reflected as dysmenorrhea, intermenstrual pain or dyspareunia. Dysmenorrhea is usually progressive, the pain starts within 2 days of the onset of menstrual flow and usually continues through the menses and occasionally extends for several days afterwards. The pain is most often localized to the lower abdomen and deep pelvis and is often described as dull aching pain. In severe cases, patients may suffer from pain throughout the cycle¹⁸.

Goals of treatment in endometriosis include alleviating pain, minimizing adhesions and preserving a woman's fertility (if desired). It seems understandable that pain is the most common reason for women to seek treatment for endometriosis¹⁴.

Medical management for endometriosis includes estrogen progesterone combinations, progestogens anti progestogens, Danazol and gonadotropin-releasing hormone (GnRH). The ideal medical treatment still has not been developed. All of the currently available treatments are associated with significant side effects, additionally; there doesn't appear any effective medical therapy to improve fertility^{7,13}.

Some women may consider alternative treatments for relieving the painful symptoms of endometriosis, this type of treatment includes traditional Chinese medicine, nutritional approaches, exercise, yoga, and

acupuncture. In particular, some physicians have had good luck using nutrition, yoga, exercise and acupuncture in their treatment regimens, although these approaches are not well studied⁴.

Ultrasound is believed to differ from superficial heating modalities by heating deeper tissues when applied with appropriate intensity and frequency. Ultrasound is proposed to promote healing and regeneration in inflamed tissue, to reduce pain, and this is the rationale for the use of ultrasonic for the management of soft tissue disorders²⁰.

Therapeutic ultrasonic has been shown to increase the extensibility of collagen bands on the surface of the scar and adhesions. Also, it aids resorption of adhesions by depolymerisation of mucopolysaccharids, mucoproteins and glycoproteins. Adhesions and intracellular substances converted from gel to the soluble state responding to ultrasonic so, resorption of adhesions occurs by both heating and micro massage effect²².

Therefore, this study is an attempt to determine the effect of ultrasonic therapy on alleviating pain as well as decreasing adhesions in women having endometriosis.

SUBJECTS, MATERIALS AND METHODS

Subjects

This study was carried on thirty women suffering from severe premenstrual pelvic pain and diagnosed by laparoscope as having moderate endometriosis (according to the revised classification of endometriosis of the American Society of Reproductive Medicine¹. They were selected from Kasr El-Ainy University Hospital. Their age ranged from 25 to 35 years old and their body mass index (BMI) didn't exceed 30kg/m².

All patients were free from diabetes, gynecological hemorrhage, impaired sensation and tubo-ovarian abscess. They were divided randomly into two equal groups (A&B). Patients of group (A) treated by therapeutic ultrasonic, three sessions /week for 8 weeks and received the usual regimen of hormonal

treatment (Medroxyprogesterone acetate 100mg) while patients of group (B) were received the same regimen of hormonal treatment (Medroxyprogesterone acetate 100mg) for 8 weeks. The physical characteristics of patient in both groups (A&B) are summarized in table (1).

Table (1): Physical characteristics of the patients in both group (A&B).

| | Age (yrs) | | Weight (kgs) | | Height (cms) | | BMI (Kg/m ²) | |
|--------------|-----------|-----------|--------------|-----------|--------------|-----------|--------------------------|-----------|
| | Group (A) | Group (B) | Group (A) | Group (B) | Group (A) | Group (B) | Group (A) | Group (B) |
| X | 32.93 | 32.66 | 71.40 | 73.25 | 158.90 | 161.50 | 28.64 | 28.26 |
| SD | ±3.45 | ±3.55 | ±5.59 | ±4.32 | ±5.41 | ±4.17 | ±0.89 | ±1.01 |
| MD | 0.27 | | 1.85 | | 2.60 | | 0.38 | |
| t-value | 0.20 | | 1.47 | | 1.78 | | 1.66 | |
| P-value | 0.80 | | 0.15 | | 0.21 | | 0.10 | |
| Significance | Non Sig. | | Non Sig. | | Non Sig. | | Non Sig. | |

Instruments

A- Evaluating instruments: 1- Weight-height scale to measure the body weight and height for each patient before starting the study in order to determine the body mass index (BMI) for each patient. 2- Ultrasonographic machine with vaginal probe as a diagnostic procedure to detect endometriotic cyst to exclude other causes of severe pelvic pain before the application of laparoscopy. 3- Laparoscopy was performed by Gynecologist to confirm the diagnosis of endometriosis which suspected firstly by ultrasonography and in order to determine the degree of adhesions according to score of the American Society for Reproductive Medicine (1997) before starting and after the end of the treatment program for patients in both groups (A & B). 4- Present pain intensity (PPi) scale to evaluate the intensity of pain before starting and after the end of the treatment program for patients in both groups (A & B).

B- Treatment Instrument: Ultrasonic machine was used for the application of ultrasonic therapy for patients in group (A) with the following parameters: Frequency of 1MHz, Mode: continuous wave, Intensity: 1.5W/cm², Duration of treatment: 15 minutes. Each patient was instructed carefully about the nature of the therapeutic ultrasonic and its benefits to obtain her confidence and cooperation before starting the treatment.

Procedures

After evaluation by (PPi) and laparoscopy, the usual regimen of hormonal treatment (Medroxyprogesterone acetate 100mg) was prescribed for all patients of both groups (A&B) in addition to ultrasonic therapy for patients of group (A). Before the application of ultrasonic treatment, patient was asked to evacuate her bladder in order to relieve any compression on the uterus and to be relaxed during the treatment session. Then the patient instructed to assume a relaxed comfortable supine lying position with small

cushions under neck, back and knees to accommodate her body curvature.

The skin of the treatment site (i.e. supra pubic region & right as well as left iliac fossa according to the site of adhesion determined by laparoscopy) was cleaned to remove any debris on the skin to decrease the skin resistance, then gel was distributed on the skin of the treated area. The application of ultrasonic was conducted in series of overlapping circles over the skin of the treated area by frequency of 1MHz, continuous mode, and intensity of 1.5 W/cm², The treatment session continue 15 minutes, 3 times per week for 24 sessions.

Statistical analysis

The results were expressed as means \pm SD. The data were statistically analyzed with Student t-test for comparison of means before and after treatment for each group as well as, comparison of both groups together after the treatment program.

RESULTS

The mean values of present pain intensity (PPI) scores in patients of group (A) before the treatment was 3.30 ± 0.50 , it was decreased as a response to treatment by ultrasonic therapy in conjunction with hormonal treatment to 0.85 ± 0.74 representing a highly significant ($P < 0.001$) decrease in pain intensity with a percentage of 74.2%. While, the mean values of (PPI) scores in patients of group (B) before the treatment was 3.25 ± 0.15 , it was decreased as a response to treatment by hormonal treatment to 2.36 ± 0.39 representing a significant ($P < 0.01$) decrease in pain intensity with a percentage of 27.4%.

On comparing the PPI scores of both groups after the end of the treatment programs, the results revealed a highly significant ($P < 0.001$) decrease with a percentage of difference equal 63.9% in favoring group (A) as shown in table (2) and Fig. (1).

Table (2): The mean values and percentages of present pain intensity scores before starting and after the end of the treatment program for both groups (A&B).

| | Group (A) | | Group (B) | | Relieve after treatment | |
|--------------|---------------|----------------|---------------|----------------|-------------------------|-----------|
| | Pre Treatment | Post Treatment | Pre Treatment | Post Treatment | Group (A) | Group (B) |
| X | 3.30 | 0.85 | 3.25 | 2.36 | 0.85 | 2.36 |
| SD | 0.50 | 0.74 | 0.15 | 0.39 | 0.74 | 0.39 |
| %of Change | 74.2% | | 27.4 % | | 63.9% | |
| P-Value | <0.001 | | <0.01 | | <0.001 | |
| Significance | Highly Sig. | | Sig. | | Highly Sig. | |

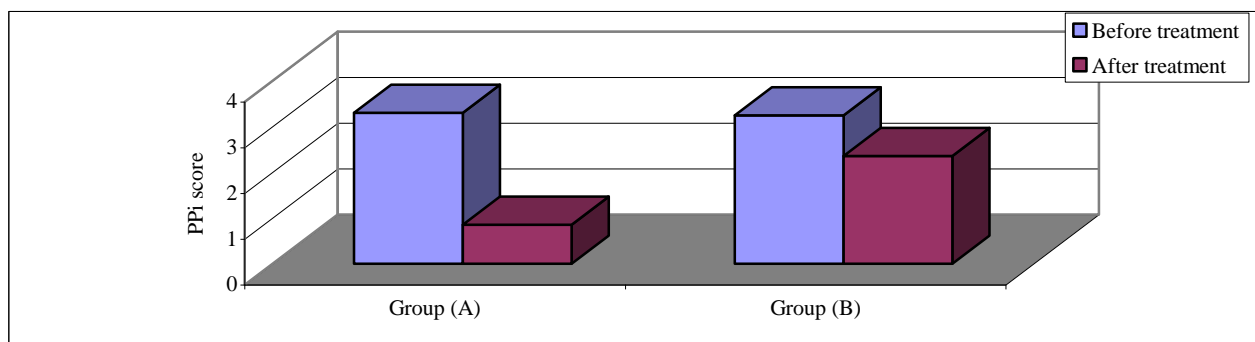


Fig. (1): The mean values of present pain intensity scores before starting and after the end of the treatment program for both groups (A&B).

Regarding the degrees of adhesions, all patients in both groups (A&B) were diagnosed before starting the study as having moderate adhesions according to the scores of the American Society for Reproductive Medicine as determined by the diagnostic laparoscopy. After the treatment programs, there was a

decrease in adhesions in both group, yet this decrease was more pronounced in patients of group (A) who treated by ultrasonic therapy in conjunction with hormonal treatment when compared to those of group (B) with a percentage of decrease equal 54.66% as shown in table (3) and Fig. (2).

Table (3): Degrees of endometriosis after the end of the treatment program in both groups (A&B).

| Degrees of endometriosis | Group (A) | | Group (B) | |
|--------------------------|-----------------|-------|------------------|--------|
| | No. | % | No. | % |
| Minimal endometriosis | 5 | 33.3% | 2 | 13.3% |
| Mild endometriosis | 9 | 60 % | 6 | 40 % |
| Moderate endometriosis | 1 | 6.7 % | 7 | 46.7 % |
| Mean \pm SD | 8.32 \pm 3.96 | | 18.35 \pm 7.12 | |
| Percentage of change | 54.66% | | | |
| Level of significance | P<0.001 | | | |

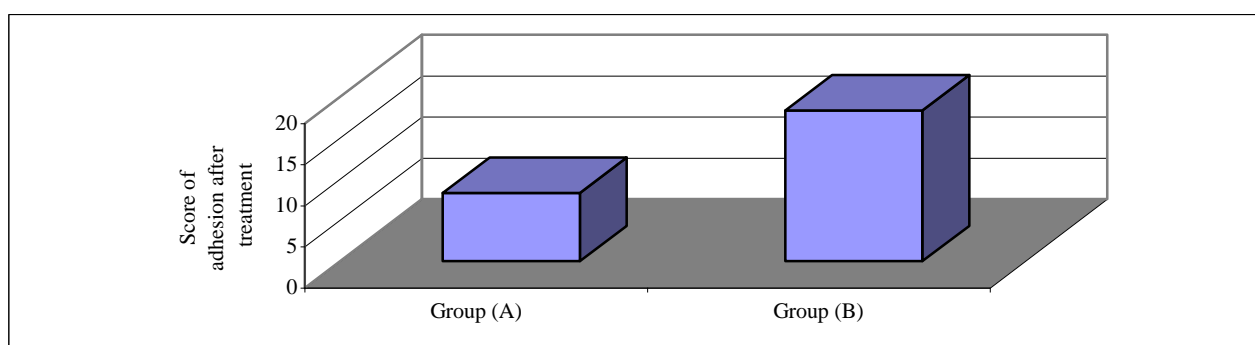


Fig. (2): Degrees of endometriosis (Score of adhesion) after the end of the treatment program in both groups (A&B).

DISCUSSION

Although it has been known that ultrasound can effectively suppress pain and treat adhesions^{2,3&10}, but this modality hasn't yet been used in clinical practice for alleviation of pain and decreasing adhesions in cases of endometriosis. Therefore, the results of this study couldn't be compared with others who studied the same cases but only compared with those who studied the effects of ultrasonic in reducing similar symptoms.

Pain relief obtained in this study could be explained according to the clinical effects that may ultimately exerted by ultrasound in which the generated heat is utilized to relief pain by either ablating the nociceptive nerve and nerve ending or by warming the target tissues. This comes in agreement with Hsieh⁸, who reported that treatment of pain by heating the target tissues has been proven to be effective. The therapeutic effect of ultrasonic is closely tied to its thermal effect; it attempts to rise the temperature of the target tissue from 1 to 4 °C, thus it used to treat deep and chronic pain⁹.

The results of this study are supported by the work of Williams²¹, who reported a significant decrease in the perception threshold for pain after exposure to ultrasound, this effect was developed within 30-60 seconds and was increased both with increasing intensity at constant frequency, as well as with increasing frequency at a constant intensity.

The results of the current study are also in agreement with Haysmith⁶, who reported that ultrasound can accelerate inflammatory phase through a rapid resolution of hematoma and edema that reducing the pressure on pain sensitive structures thus help to get rid of pain.

Decrease in PPI score in group (B) as a response of hormonal treatment, comes in consistency with Pactor et al.,¹⁴ who stated

that medical treatment (Pills of combined estrogen and progesterone) help in relieving 30-50% of pelvic pain and dysmenorrhea.

The decrease in the degree of endometriotic adhesions revealed by the current study as a response to the use of ultrasonic is supported by Low and Reed¹¹, who mentioned that heat increases blood flow and thereby increases microvascular hydrostatic pressure that assist in the reabsorption of inflammatory exudates and debris.

These results are also in agreement and supported by Young²², who found that therapeutic ultrasonic has been shown to increase the extensibility of collagen bands on the surface of the scar and adhesions. Also, it aids resorption of adhesions by depolymerisation of muco-polysaccharids, mucoproteins and glycoprotein. By the heating and micro massage effectse of ultrasonic, adhesions and intracellular substances converted from gel to the soluble state so, resorption of adhesions occurs.

Also, the results of the current study are in agreement with Van der Heijden et al.,²⁰, who stated that therapeutic ultrasound produces a combination of non thermal effects including acoustic streaming and cavitations. Non thermal effects of ultrasound are claimed to increase blood flow, vascular permeability, cell metabolism; as well as enhancing fibrous tissue extensibility.

These results are also confirmed by that of Roebroek et al.,¹⁷, who found that the use of therapeutic ultrasonic may assist in pain relief and in the alleviation of other symptoms of inflammation, such as edema. In addition, ultrasound increases the extensibility of collagen, thus facilitating the stretching of scars or adhesions.

Consequently, the results of this study revealed that ultrasound therapy had an

excellent effect in alleviating pain and reducing adhesions of endometriosis so, it could be considered as an alternative method for treating such cases without any side effects or complications to the patients.

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الملخص العربي

تأثير استخدام الموجات فوق الصوتية على الإسراع بتخفيف الأعراض المصاحبة لحالات التغدغ الرحمي

تهدف هذه الدراسة لاختبار مدى تأثير استخدام الموجات فوق الصوتية على الإسراع بتخفيف الأعراض المصاحبة لحالات التغدغ الرحمي. وقد أجريت الدراسة على ثلاثين مريضة من مريضات التغدغ الرحمي تم اختيارهن من مستشفى قصر العيني الجامعي تراوحت أعمارهن بين 25-35 عاما ومعدل كتلة الجسم لديهن لا يتجاوز 30 كجم/م² تم تقسيمهن إلى مجموعتين ضمت كل مجموعة 15 مريضة. وقد تم علاج مريضات المجموعة الأولى بالموجات فوق الصوتية 3 مرات أسبوعيا لمدة 8 أسابيع بالإضافة إلى العلاج الدوائي المعتاد في مثل هذه الحالات بينما تناولت مريضات المجموعة الثانية العلاج الدوائي بنفس الجرعة ولنفس المدة الزمنية وتم تقييم جميع المريضات عن طريق مقياس شدة الألم وكذلك منظار البطن لبيان درجة الالتصاقات المصاحبة للحالات قبل وبعد انتهاء فترة الدراسة (8 أسابيع) . وقد أسفرت النتائج عن انخفاض ذو دلالة إحصائية في المجموعتين إلا أن هذا الانخفاض كان أكثر وضوحا في مريضات المجموعة الأولى اللاتي أظهرن انخفاضا قدره 74.2 % في مقياس شدة الألم مقارنة بانخفاض قدره 27.4 % في المجموعة الثانية وكذلك انخفاض قدره 54.66 % في درجة الالتصاقات مقارنة بالمجموعة الثانية . ومن ذلك يمكن استخلاص أن الموجات فوق الصوتية لها تأثير فعال في الإسراع بتخفيف الأعراض المصاحبة لحالات التغدغ الرحمي .

الكلمات الدالة : التغدغ الرحمي- الألم – الإلتصاقات- منظار البطن – الموجات فوق الصوتية .